Proceedings

of the Marine Safety Council

United States
Coast Guard

September 1983

Proceedings
of the Marine Safety Council

Vol. 40, No. 8
September 1983

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DIST. (SDL No. 117)
A: abcde(2); fghklmntuv(1)
B: n(50); c(16); e(5); f(4); gj(3); r(2); bkiq(1)
C: eglmp(1)
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When you have finished reading this issue, please pass it on.

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A major wave (note its height against the trees) sweeps into the beach front in the vicinity of Hawaii's Putumaille Tuberculosis Hospital in April 1946. Seismic sea waves are a dreaded phenomenon. For more on this subject, see "Tsunamis--the Scourge of the Pacific," beginning on page 202. Photograph by Mrs. Harry A. Simms, Sr.

A Letter from the Editor

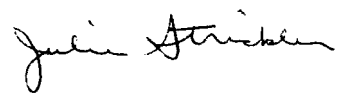
I would like to thank you for your response to the questionnaire that appeared in the July issue. I was very pleasantly overwhelmed by the numbers returned. Your comments and suggestions were much appreciated, and I have already approached a number of authors, questionnaires in hand, to see about getting the articles you requested.

A couple of suggested additions to the *Proceedings* would depend on input from you. One reader proposed that we start a question and answer column with questions from readers directed to the various Coast Guard branches at Headquarters. Another suggested a new department called the "Safety Idea Center—Ideas That Worked." How about it? Are there points you have wondered about and that you imagine other mariners have wondered about, too? Have you discovered ways to increase safety that you would like to let other mariners know about? Here's your chance to ask your questions and share your ideas.

Some of you said that you would be interested in submitting articles and asked how to go about it. Simply send them to my attention at the address of the Marine Safety Council: Commandant (G-CMC), U.S. Coast Guard, Washington, DC 20593. Several readers said they would like to see more firsthand accounts by vessel officers or crewmen of how lives have been saved or how safety is promoted. Any takers?

Some of you wrote that you would like to see periodic updates on the status of regulatory items discussed in the Keynotes section of the *Proceedings*. You suggested that we publish interim reviews summarizing Coast Guard rulemaking projects. The Coast Guard does, in fact, publish such a review as part of the Department of Transportation's Semi-annual Regulations Agenda. This agenda covers current and projected rulemakings and completed actions. For each item, it has a title, a summary of the item's content, and a timetable showing what actions have been taken (public hearings held or notices of proposed rulemaking published, for example), when the actions were taken, and what the applicable Federal Register references are. Space limitations unfortunately prohibit my reprinting the agenda in the *Proceedings* (it runs 20 some pages). We have limited copies of the most recent semi-annual agenda, published in the Federal Register on April 25, 1983, and anyone interested should send a check for $3.25, payable to "U.S. Coast Guard," to this office (same address as preceding paragraph). The next edition is to be published in October; mention of it will be made in the Keynotes section of the *Proceedings* for the benefit of those of you who do not subscribe to the Federal Register.

As this issue goes to the printer, I'll be going off to the West Coast on vacation. That means there won't be anyone here to put out the *Proceedings*, so the next issue you should look for is a combined issue for October/November. There will be someone here to hold mail for me, however, so please feel free to deluge me with questions, safety ideas, and articles.



The Case of the Missing Freon-12

"Some 100 pounds of refrigerant were unaccounted for--it was unlikely that the leak-detection equipment, combined with our audio and visual senses, would have missed a leak of that magnitude. Where could the Freon-12 be hiding?"

by W. H. Campbell
Assistant Chief, Systems Technology Division
Office of Research and Development

A marine engineer must often have a grasp of deductive reasoning rivaling that of Sherlock Holmes or Hercule Poirot.

Classic detective stories all follow a certain pattern. First, the detective gathers all the clues. Then he uses his knowledge, experience, and intuition to cull the relevant facts and discard the remainder. Finally, he studies the situation from as many angles as possible.

This last step is especially important for marine engineers—aboard ship, as in fiction, things are not always what they appear. Take the case of the missing Freon-12, for example.

Many years ago I reported on board a merchant cargo vessel as first assistant engineer. The vessel had been laid up without a crew for six months and put back in service on short notice.

The ship's refrigeration system was put in operation and the reefer boxes loaded with three months' worth of provisions. As soon as provisioning had been completed, we set sail from Baltimore, heading toward the Atlantic Ocean via Cape Henry, Virginia. The temperatures of the recently filled reefer boxes were relatively high; there was nothing unusual about this, and the temperatures gradually came down into their normal ranges during the night. My tour of the engineering spaces after breakfast indicated that all reefer boxes were functioning well. However, a short time later the meat box, which usually maintained a temperature between 5 and 10°F, was 15°F and rising slowly.

A survey of the refrigeration plant indicated that the Freon-12 refrigerant level in the receiver *(see illustration)* had dropped from three-fourths full to one-fourth full. Our preliminary diagnosis was that there was a large leak in the system. An exhaustive search of the entire system with a Halide torch and an electronic leak detector did not turn up any breach, however. The meat box temperature maintained its slow but steady ascent toward 32°F, the point at which many thousands of dollars' worth of stores would have spoiled. (The other reefer boxes, the dairy box and the vegetable box, continued to maintain their proper temperature levels of 36°F and 40°F, respectively). Additional Freon-12 was transferred from storage cylinders into the system. Once replen-

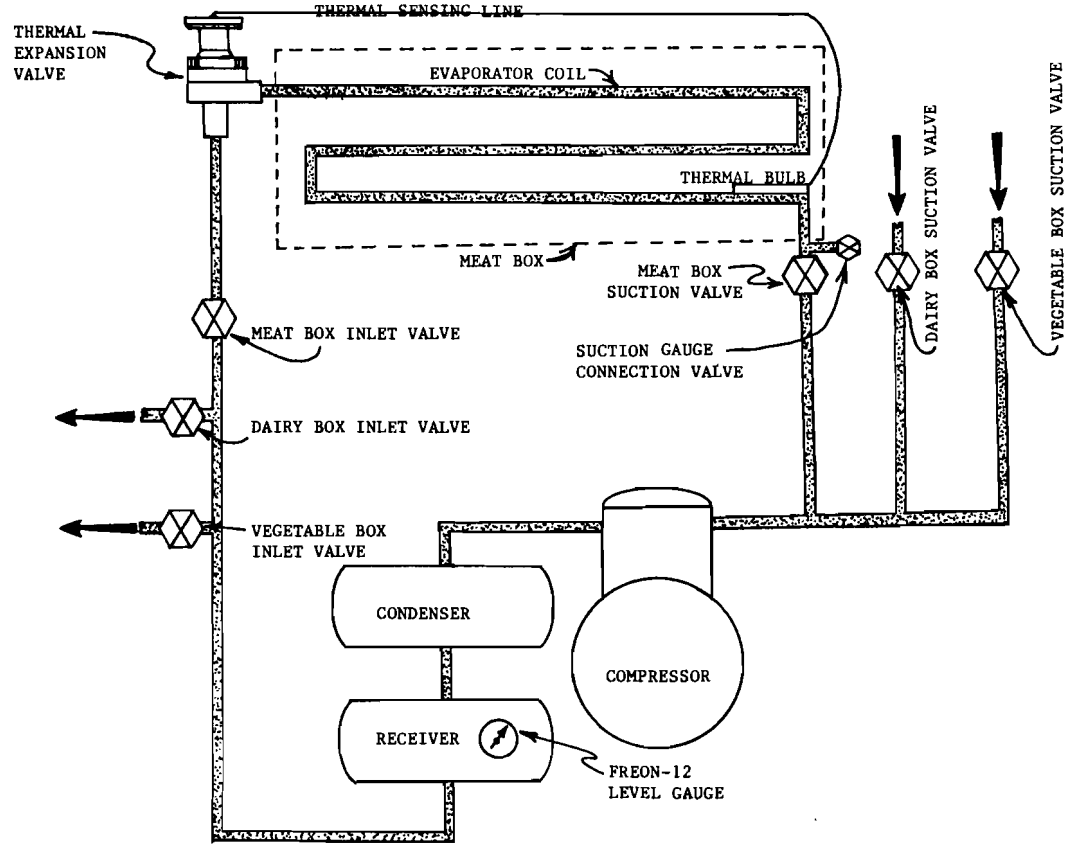
ished, the receiver again measured three-fourths full. But once again, the refrigerant receiver level dropped, and once again a subsequent search uncovered no leaks. Some 100 pounds of refrigerant were unaccounted for—it was unlikely that the leak-detecting equipment, combined with our audio and visual senses, would have missed a leak of that magnitude. Where could the Freon-12 be hiding?

On a hunch, I disconnected the suction-pressure gauge on the outlet end of the meat box evaporator coil. A steady stream of liquid Freon-12 spewed forth where I should have encountered a low-pressure gas. Quickly, I jury-rigged an empty refrigerant cylinder to the gauge connection and filled it with liquid Freon-12. I attached a second cylinder and filled it as well. As part of the liquid Freon-12 was removed, the remaining Freon-12 had room to vaporize and absorb heat, and the meat box temperature dropped into the normal range.

It was obvious that there was an obstruction somewhere before the suction (outlet) valve that was causing the refrigerant to back up and fill the evaporator coil with liquid. I reviewed the refrigeration system's drawings and specifications and found nothing in the meat box evaporator coil that could be identified as a potential trouble spot.

To investigate further, we secured the entire refrigeration system and pumped all refrigerant down into the receiver. Next, we removed the bonnet of the suction valve to see whether the valve was jammed in the closed position. Although the valve appeared to be operating satisfactorily, we removed the internal valve disc, replaced the bonnet, and placed the refrigeration system back in operation. Once again, the Freon-12 refrigerant became trapped within the meat box evaporator coil.

We secured the refrigeration system once again, evacuated the refrigerant from the affected evaporator coil, and removed the meat box thermal expansion and suction valves. We followed this step by bolting a jury-rigged test device onto the body of the thermal expansion valve and slowly admitting compressed air (reduced to 5 psig) from the ship's service (150 psig) compressed air system. We checked the open suction valve and found no indication of passage of air. We then secured the compressed air into the evaporator coil and moni-



Under normal circumstances, this refrigeration system works as follows: the liquid Freon-12 refrigerant flows from the receiver through the thermal expansion valve. As it passes through the valve, it drops in pressure, and it enters the evaporator as an aerosol spray. The aerosol immediately begins to absorb heat and cool the evaporator and its surrounding area. By the time the Freon-12 exits from the evaporator, it has absorbed enough heat that it has changed into a gas. It exits through the suction valve and goes into the compressor. The compressor raises the pressure of the Freon-12 gas and discharges it into the condenser. In the condenser the temperature of the Freon-12 is reduced by sea water passing through internal tubes. As its temperature is lowered, the Freon-12 changes back into a liquid and is ready to be reused.

tored the pressure.* The air pressure within the coil maintained 5 psig for over an hour. Whatever was blocking the passage of Freon-12 had to be inside the coil between the suction gauge connection and the suction valve.

Meanwhile, the temperature in the meat box was rising to the danger point. The blockage had to be removed. At a brief meeting with the chief engineer, we discussed the situation and the alternatives. Because of the internal configuration of the suction valve, using a snake to remove the blockage was impractical. We therefore settled on trying to dislodge the blockage using compressed air. The original test device was refitted with a 600-psig gauge and the ship's service compressed air admitted gradually until 150 psig was reached within the coil. Still the coil remained blocked. Because of the design limitations of the ship's service compressed air system, it was impossible to obtain additional compressed air pressure safely, so I began a search for an alternative.

In searching the engineering spaces, I discovered several spare B2 carbon dioxide (CO_2) fire extinguishers. Could they solve the problem? After removing the applicator nozzle and attaching a bottle to the test device, we discharged the cylinder. The pressure gauge on the test device indicated 270 psig, and still the evaporator coil remained block. We connected and discharged a second CO_2 cylinder. As the pressure within the coil passed 300 psig, there was a sharp report similar to that of a small-caliber rifle, followed by the sound of the venting of a high-pressure gas. The pressure gauge on the test device plummeted to zero, and the venting sound ceased shortly thereafter. I disconnected the test device and ensured that there was no pressure remaining in the evaporator coil. I then proceeded to the vicinity of the suction valve. Lodged in the suction valve body was a large "glop" (about 1½ inches in diameter) of a white, waxy substance quite unlike anything that I had ever seen before. I removed it for future study.

We again closed up the meat box evaporator coil and evacuated the air entrapped in the system, using the refrigeration system's own compressor. We accomplished this by breaking the compressor discharge line and allowing the air to vent to the atmosphere as the system was pumped down. Although the normal operating procedure does not permit pumping into a vacuum, we adjusted the limit switch so that as much of the air as possible could be removed. This greatly reduced the likelihood that entrained moisture would freeze in the thermal expansion valves and cause additional problems. We reconnected the discharge line and once again placed the refrigeration system in operation. This time, however, the meat box temperature settled into the normal range and remained there. The crisis was over. Now it remained to be determined how our obstruction came to be lodged in the evaporator coil.

Since the substance in question appeared to be similar to paraffin wax, the lubricating oil for the refrigeration compressor was a primary suspect. After all, many lubricating oils are paraffin-based, and small amounts of lubricating oil become entrained in the Freon-12 refrigerant and are carried throughout the system. Also, special oil must be used in refrigeration compressors because of the low-temperature environment. We drained the off-line refrigeration compressor crankcase and refilled it with proper lubricating oil from the storeroom. Then we put the freshly replenished refrigeration compressor in service and replaced the oil in the other compressor. Samples of the oil that had been removed were taken and labeled for future analysis.

Many months later, when the ship returned to the United States, the oil samples and the "glop" were sent ashore for analysis. The report confirmed that the lubricating oil used in the main propulsion and auxiliary turbines had inadvertently been put into the refrigeration compressors and that the "glop" was paraffin. The mystery was now solved.

The moral of this story?

> Use the proper replacement parts, lubricants, etc., if you wish to avoid problems.

If I may be allowed the literary license to paraphrase Ecclesiastes, "For everything there is a purpose." ‡

* The author is well aware of the danger of using compressed air or gas for such purposes and does not recommend that they be used indiscriminately. However, because of the gravity of the situation, the risk was deemed acceptable. This particular vessel's refrigeration system had been hydrostatically tested to a pressure of 500 psig.

Death by Asphyxiation

Three tank vessel casualties occurring in the Southeast Texas Gulf Coast area had one factor in common--they all stemmed from the hazards associated with petroleum products. This month's account of a fatality involving tank entry is part one of a three-part series.

by CDR F. H. Halvorsen
Executive Officer
Marine Safety Office, Port Arthur, Texas

Setting the Scene

The primary port area in the extreme southeastern region of Texas is on the Sabine-Neches Waterway. It includes the ports of Port Arthur, Beaumont, and Orange. Commercially, the area is a major petroleum-chemical complex; crude oil arrives by vessel and pipeline, is refined into gasoline, heating oil, and chemical feedstocks, and is either used locally or distributed by vessel, rail, pipeline, or truck. U.S. and foreign crude-oil tankships, bulk carriers loading grain and petroleum coke, freighters, and refined-product carriers engage in deep-draft shipping. Vessels of 100,000 tons routinely enter port. Vessel types not normally encountered elsewhere include molten sulfur carriers, a wide variety of liquefied gas carriers, and mobile offshore drilling units.

Meteorologically, the area is considered part of the Sun Belt. Temperatures are moderate, rarely exceeding 100°F, but the summer months are extremely humid. For the purposes of this series of articles, the reader will note that the moderate climate and warm Gulf waters increase the vapor pressure and hence the potential hazards of petroleum products and chemicals carried and stored in the area.

The SS SOCONY VACUUM Incident

The incident to be described this month is a grimly familiar one. It occurred two years ago on the SOCONY VACUUM, a clean-product carrier transporting gasolines and lube oils. On August 7, 1981, at about 5:00 in the evening, the vessel had nearly completed offloading at a terminal in Beaumont. The last tank to be stripped was No. 7 center, which was routinely used as the slop tank for tank washing residues.

This series of articles was adapted from a paper presented by the author at last year's session of the annual Marine Chemists' Seminar, held in San Francisco July 12 - 14, 1982.

Suction had been lost on the stripping pump, and the chief mate, after attempting a number of maneuvers, determined that there was a hole in the stripping line in tank 7C. He felt that entry into the tank was necessary to temporarily patch the hole so that the remaining cargo could be offloaded. The product in question amounted to an innage of only six inches.

Tanker personnel recognized the extreme danger posed by such an undertaking; they knew that hydrocarbon vapors were present in the tank in concentrations both flammable and toxic. All personnel involved decided to use a self-contained breathing apparatus (SCBA). They consciously chose not to use the manually-operated fresh-air breathing apparatus (FABA) which was available.

The chief mate donned a pressure-demand SCBA and entered the tank. He was tended by a five-man observation and safety crew on deck and had a steel-cored-rope lifeline attached to the SCBA harness. He made the descent to the tank bottom, a distance of some 60 feet. Soon after reaching the bottom, he became aware that he did not have a good seal on his mask (this was later determined to be the result of facial hair). The chief mate immediately ascended the ladder and exited the tank. He removed the SCBA. The second mate then donned the same SCBA, entered the tank, and descended to the bottom. He had made only a brief search for the suspected hole in the stripping line when the low-air alarm (25% maximum pressure) sounded. He climbed the ladder and left the tank without aid. He did not seem in any way physically impaired.

The chief mate then put on a second SCBA and reentered the tank. Since there were no more spare bottles, the FABA was broken out and made ready for use as a backup device. The chief mate made his way to the bottom of the tank and began to search for the suspected leak. As he moved about the tank, he again noted that his face seal was not adequate and, becoming mildly alarmed, again decided to exit the tank. He returned to the vicinity of the ladder and pulled on his safety line in an attempt to signal the safety party on deck to pull him over some deep web frames. The men on deck misinterpreted his movements. They concluded that he was in distress and began heaving on the safety line, which then fouled at the base of the ladder. Believing the chief mate to be in serious distress, the second mate donned the FABA, decided the unit was being provided sufficient air by the man turning the crank device, and entered the tank to assist the chief mate. Almost as soon as the second mate reached the tank bottom, he went limp and collapsed near the ladder. The men on deck attending the second mate's safety line began to heave around, but the second mate's head became lodged in the ladder handrail. The chief mate at the tank bottom noted the second mate's distress and proceeded up to the ladder to help him. Fume inhalation through his leaking mask and exhaustion soon forced him to stop, however. At this point, one of the safety team members entered the tank without any respiratory protection and hauled the prostrated second mate back to the deck.

Personnel on deck immediately began mouth-to-mouth resuscitation on the second mate. Noting that no pulse was present, they also commenced cardiopulmonary resuscitation. A crew member who had had previous training as a military corpsman was summoned; he noted that the second mate's complexion was blue and his lips purplish--a sign of high CO_2 levels, indicating asphyxiation. The second mate was removed by shoreside personnel to a local civilian hospital, where he was pronounced dead. An autopsy was performed at a local funeral home the following day. The death was found to be "probably asphyxial in nature" and not due to a cardiac failure. The cause of death was officially noted as asphyxiation.

Analysis

The ambient temperature in this part of Texas in August hovers around 80°F and may reach 100°. At these temperatures gasoline has a vapor pressure approaching the 8 - 10 psia range. As the gasoline was offloaded, air would have been drawn in as the tank liquid level fell. Gasoline fumes have a higher density than air, and for a short time after offloading, a condition called "vapor stratification" would have existed in the tank. Personnel could thus have expected to encounter a gradient of concentrations as they descended the tank, from essentially air at the top of the tank to a concentration approaching the equilibrium vapor pressure, or maximum gasoline vapor concentration, at the bottom.

This would expose personnel to both of gasoline's hazards: its toxicity, which would be of increasing concern as the vapor concentration increased toward the bottom of the tank, and flammability, which would be a danger as personnel passed through that part of the tank where the vapor concentrations were between the upper and lower flammability limits.

Gasoline is toxic both by ingestion (swallowing) and by inhalation. Also, if splashed on the skin and allowed to remain there, it will cause irritation and remove the skin's natural oils. Regular-grade gasoline is more hazardous than unleaded because the lead compounds added to it for antiknock purposes are highly toxic *(see Chemical of the Month, August 1981).* A person who inhales gasoline vapors in massive amounts may exhibit the following symptoms: signs of inebriation, vomiting, dizziness, fever, drowsiness, confusion, and blue color of lips, ear lobes, skin, and fingernail beds. Gasoline vapors act primarily as a central-nervous-system depressant; the blue pallor of the skin, a sign of the high CO_2 content of the blood, results from insufficient respiratory rates. Though recommended exposure limits vary according to the composition of the gasoline, the Coast Guard's CHRIS Manual, Volume 2, notes that an "accepted" short-term exposure limit for leaded gasoline is a vapor concentration of 500 parts per million (ppm) for 30 minutes. The concentration in this case may have been in the 50 percent (or 500,000 ppm) concentration range near the bottom of the tank.

Several factors must be considered in analyzing this casualty. First and foremost is the disturbing fact that tank vessel personnel entered a space where both toxic and readily ignitable vapors were present. Even though personnel used breathing apparatus theoretically sufficient for the toxic environment, the tank was still extremely hazardous from the flammable vapors aspect. Any ignition source could have ignited the vapors within the tank. In the author's opinion, it is doubtful whether the need to remove six inches gasoline innage warranted a tank entry involving the potential for an explosion.

Another major issue in this casualty was the cause of death of the second mate. From witnesses' statements and the condition of the body after exposure, it would appear that a massive exposure to gasoline vapors occurred. Although the second mate safely entered the tank once with an SCBA, the second time he entered he was wearing a fresh-air breathing apparatus, a rather antiquated device carried on most U.S. tank vessels only to comply with a past Coast Guard requirement. The Coast Guard has recognized that FABAs are not as safe as SCBAs and now requires that FABAs, once they are no longer serviceable, be replaced by SCBAs (Navigation and Vessel Inspection Circular 10-80).

It appears that the fresh-air breathing apparatus, or its operation, was the culprit in this casualty. When the Coast Guard investigator tested the FABA following the casualty, he found that the flow of air was insufficient for his needs—the device was simply not providing enough air. Only after asking the crank operator to turn the crank as rapidly as possible did he perceive that he was getting enough air from the unit. The investigator further theorized that the air being received by the second mate was from immediately outside the mask. This could have been caused by an improper seal or a faulty exhalation check valve. Another possibility became apparent when the apparatus was inspected after the casualty. The Coast Guard investigator found that one of the two supply lines to the mask from a "Y" fitting at the end of the hose line was not connected. This would have permitted the second mate to draw vapors from the atmosphere immediately around him. Since no witness remembers seeing the disconnected fitting when the man was removed, however, this remains speculative.

What is left after all analysis is the unnecessary death of a merchant mariner. The scenario is a distressingly common one: a licensed officer enters an almost empty cargo tank to check a line or valve. He becomes distressed. Others enter to assist. In this case, only one death resulted. Tragically, in most such cases, two or three deaths result.

Some Recommendations

Personnel should be advised to wear protective clothing whenever they have to enter cargo tanks. None of the personnel in this case were wearing such clothing, leaving their skin exposed to liquid gasoline and the danger that it would remove the skin's natural oils. The industry needs to address personnel protection standards for tank entry where toxic, corrosive, or irritating products are concerned.

All types of breathing apparatus need to be carefully inspected. Since FABAs will no doubt continue to be used until they are no longer serviceable, they must be given special attention.

Better piping design would perhaps eliminate much of the need for tank entry.

Above all, unnecessary tank entry should be held to an absolute minimum. A cargo tank well within the explosive range is no place for vessel personnel under any circumstances. ‡

Next month: the SS MONTICELLO VICTORY incident

Tsunamis

The Scourge of the Pacific

The word "tsunami" comes from two Japanese words: tsu, *meaning port or harbor, and* nami, *meaning wave or sea. The name fits: these massive sea waves can inundate ports and harbors and leave them devastated.*

by Patricia Lockridge

In August 1868, Rear Admiral L. G. Billings was on duty aboard the U.S. Ship WATEREE, anchored one-fourth mile offshore of what is now Arica, Chile. At 4 p.m. he and his shipmates were startled by a violent trembling of the ship. An earthquake! Running on deck, they observed in the distance a great cloud of dust and a nodding and swaying of the hills, then the crash of falling houses as the town of Arica was reduced to rubble. A landing party dispatched in a small boat to aid the screaming survivors onshore was dashed against the rocks by the first of many waves that surged through the harbor. Then a second earth tremor occurred, followed by the total withdrawal of water from the harbor area, leaving the flat-bottomed WATEREE high and dry. The returning sea merely lifted the WATEREE gently, but it capsized and destroyed the round-

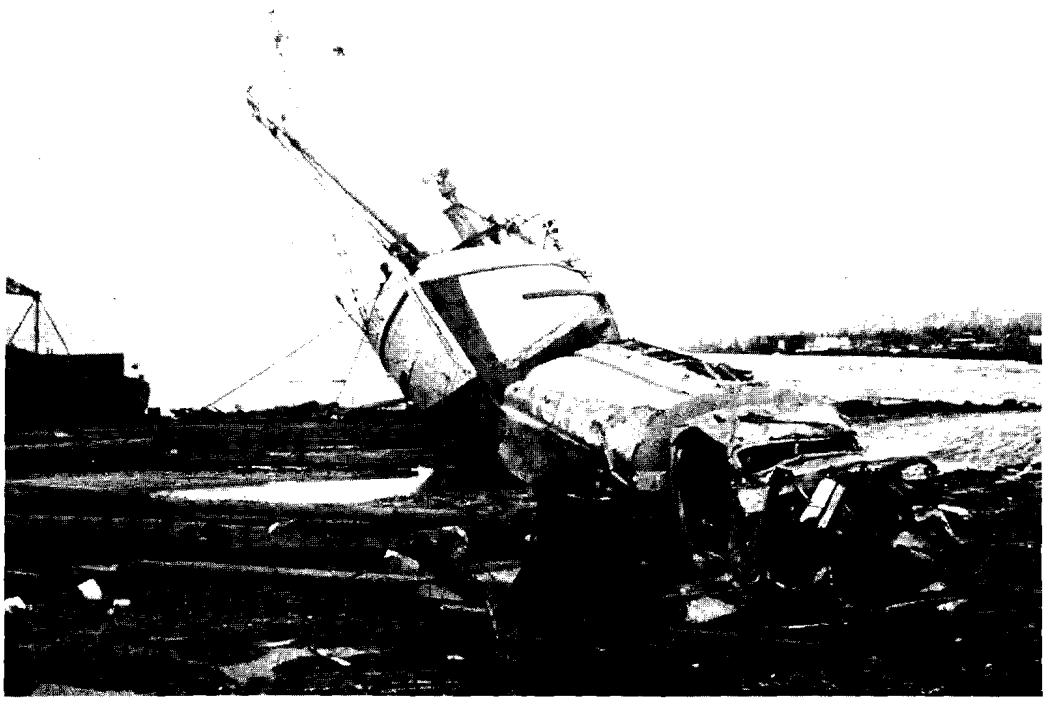
The bore, or advancing wave crest, of a tsunami spawned by an earthquake in the Aleutian Islands passes a damaged railroad bridge over the Wailuka River (Hawaii Island, Hawaii, April 1946). Photo courtesy of the University of California at Berkeley

Patricia Lockridge is data base manager for tsunami data at the National Geophysical Data Center in Boulder, Colorado. This center is operated by the National Oceanic and Atmospheric Administration as part of its Environmental Satellite, Data, and Information Service.

bottomed ships nearby in the harbor. A sea full of currents and countercurrents washed the remaining ships back and forth out of control.

About 8:30 p.m., Billings and the others saw the thin line of phosphorescent light which marked the crest of the approaching dreaded wave—a *tsunami.* The WATEREE was overwhelmed, submerged beneath a mass of sand and water. Thanks to its flat bottom, it was able to make it back to the surface and ride the wave inland.

Morning light revealed that the WATEREE had been carried three miles up the coast and two miles inland to the foot of the Andes. Had the wave carried it only a few feet farther, the ship would have been torn to pieces against the mountainside.



The tsunami that left a Texaco chemical truck demolished and the CELTIC beached swept into Resurrection Bay, Alaska, in March 1964. Photo courtesy of the U.S. Department of the Interior

Although tsunamis occur most often in the Pacific Ocean, they can be generated by major earthquakes in other areas. A large tsunami in October 1918, for example, created waves with heights of more than 20 feet along the western shore of Puerto Rico.

Such incidents illustrate vividly the devastating effect that earthquake-generated ocean waves can have on ships anchored in a harbor. These waves, correctly called tsunamis or seismic sea waves, have extremely long periods. In deep ocean their length from crest to crest may be hundreds of miles, but their height from crest to trough may be only a few feet. For this reason, in the open oceans they cannot be felt aboard ships or seen from the air.

The most frequent cause of tsunamis, as in the case of the wave that overwhelmed the WATEREE, is crustal movement along a fault: a large mass of rock drops or rises and displaces the column of water above it. This column of water—a tsunami—travels outward from the source at the fantastic speed of 500 mph or more. As the tsunami enters the shallow water along coastlines, the velocity of its waves diminishes and its wave heights increase.

The arrival of a tsunami may be heralded by a gradual recession of coastal water (if the trough precedes the first crest) or by a rise in water level of about one half the amplitude of the subsequent recession. This is nature's warning to evacuate coastal areas, and it should be heeded, for tsunami waves can crest onshore to heights of more than 100 feet.

In the last 40 years in the United States alone, 355 people have lost their lives in

A tsunami sweeps into Miyako Bay, Japan, in May 1968. Photo courtesy of the Japan Meteorological Agency

The damage done to the Seward, Alaska, port facilities, like that done to the Texaco truck on the preceding page, was caused by a tsunami generated by an earthquake in Anchorage. Photos courtesy of (left) the U.S. Department of the Interior and (right) NOAA/EDIS

tsunamis and $485 million in property damage has been left along the coastlines.

A tsunami warning system was established in 1948 to minimize the effects of these waves in the Pacific. An array of seismic (earthquake) detectors on the Island of Oahu and a network of seismograph stations around the Pacific contribute data that permit the Tsunami Warning Center in Honolulu to make a quick location of an earthquake's point of origin and determine its magnitude. When an earthquake of magnitude sufficient to generate a tsunami occurs, a tsunami "watch" begins, and tide stations near the earthquake origin are alerted to report any unusual wave action in their area. When a confirmation of unusual tidal activity is received at the Center, a tsunami "warning" is issued and travel times of the tsunami are calculated. This gives authorities a chance to warn the shipping industry and to evacuate residents of low-lying areas.

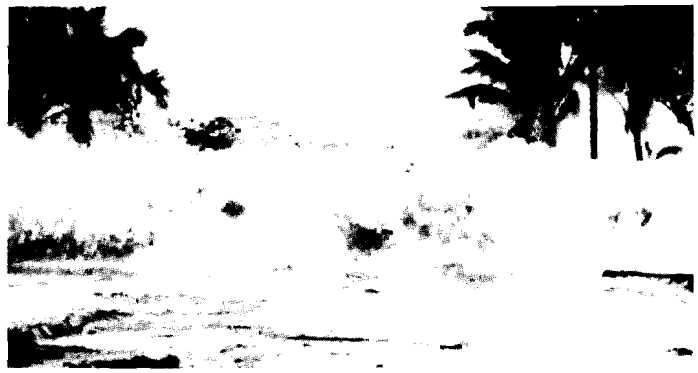
Studying past incidents is another means of

The National Geophysical Data Center and the World Data Center A for Solid Earth Geophysics occupy the same premises and share staff members.

The national center has on microfiche about 3,000 mareograms covering 250 "tsunamigenic" events recorded at U.S. and foreign tide stations since 1854. Over 700 photographs compiled from 26 sources depict wave action and damage caused by 13 tsunamis. A catalog listing these photographs is available from the center at the address below.

The world center has microfilmed copies of records dating back to 1960 from the Worldwide Standardized Seismograph Network of about 120 stations. The data include 50 million bathymetric observations for the U.S. coastal areas. Another important data set, the Pacific Tsunami Historic File, is available in digital format. This extensive listing contains more than 1,600 tsunami events spanning the years 173 A.D. to the present. The World Data Center plans to make these data available in map form in the near future.

Requests for data from either of the two centers should be directed to NOAA, NESDIS/NGDC E/GC11, Attn: Pat Lockridge, 325 Broadway, Boulder, Colorado 80303.



A major wave strikes the beach front area in Hawaii (April 1946). Photo by Mrs. Harry A. Simms, Sr.

mitigating the effects of tsunamis. The National Geophysical Data Center/World Data Center A for Solid Earth Geophysics has developed data bases to further tsunami research. These sets of data include mareograms (tide gage records), damage photographs, seismic source data, and catalogs of descriptive material on tsunamis. Seismic source data are held in a digital file that contains information on tsunami generation, including location, magnitude, and origin time for each generating earthquake.

When an earthquake occurs in the Pacific Ocean Basin, authorities must quickly decide on a course of action. Is a tsunami likely to be generated? If so, what areas will be affected by it? How can damage from the tsunami be kept to a minimum? Much has been accomplished toward understanding and predicting this sometimes devastating natural hazard, but much remains in the realm of the unknown. The mystery surrounding tsunamis makes them a fascinating subject for researchers and laymen alike. ↕

And sometimes, without warning . . .

A very recent example of a tsunami is the disaster that befell Japan only a few months ago. The following paragraphs are excerpted from the article "Quake, Tidal Waves Kill 41 in Japan," by ***Tracy Dahlby****, which appeared in The Washington Post May 27, 1983:*

TOKYO, May 26—A powerful earthquake rocked Japan's picturesque northern coastline today, spawning 15-foot tidal waves, leaving at least 41 persons dead and causing widespread damage over seven of the country's prefectures.

The quake, the most deadly to hit Japan in 15 years, hit shortly after noon with its epicenter in the Sea of Japan about 100 miles off the shore of Akita prefecture and 340 miles north of Tokyo. The quake registered a magnitude of 7.7 on the Richter scale and left 60 persons injured and 61 others missing.

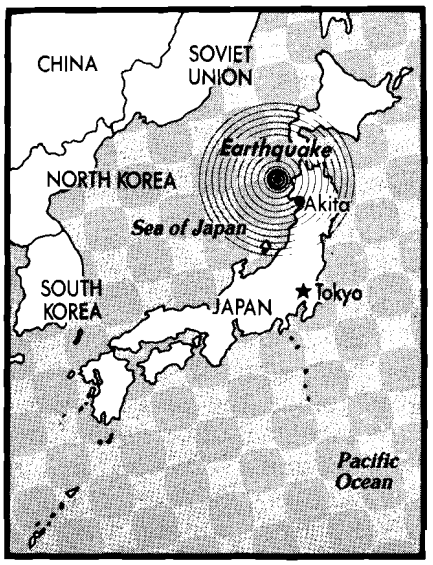
Among the most vivid scenes recorded live by television cameras were those of the actual quake itself. In Akita city, people were shown fleeing from their homes as pavement buckled and broke. Others were seen by viewers throughout the nation squatting on streets in an attempt to shelter themselves alongside parked cars from falling debris.

The heaviest toll, however, came as a result of a violent series of tidal waves, the first of which slammed into the coastline only minutes after the quake and before local government authorities had time to issue an alert.

In the most tragic incident, 49 elementary school children and their teachers on a seaside outing were swept away by the high waves. Two of the children's bodies were later recovered, and 11 others were missing and presumed dead.

At a landfill project about 37 miles north of Akita city, six workers were killed when the towering waves smashed into a breakwater that they were building. Vessels of Japan's Maritime Safety Agency dispatched to look for another 39 missing workers were forced to call off the search because of darkness.

Japanese television crews



By Dave Cook—
The Washington Post

operating out of helicopters captured bizarre scenes of automobiles floating out to sea and fishing boats that had been deposited in farmers' fields by the high waves.

Estimates of the financial toll from the earthquake and tidal waves were not immediately available. But Japan's National Police Agency estimated that more than 400 homes in the area had been destroyed along with 375 vessels, mostly belonging to local fishermen. ↕

Breaking the Ice on Arctic Shipping

by LCDR David B. Anderson
Secretary, Ship Structure Committee

As the need for domestic oil and gas has increased, so have lease sales of oil fields in and around Alaska. While oil and gas carriers have yet to venture into the heavily ice-covered waters surrounding Alaska, that is likely to change in the next few years. There may be no alternative to sending gas carriers in, since building a gas pipeline through Alaska would be prohibitively expensive, according to Richard P. Voelker.

Voelker is Vice President of ARCTEC, Incorporated, a Columbia, Maryland-based firm engaged in ice-related research and modeling. ARCTEC is the prime contractor for the trafficability tests of Alaskan waters being conducted under the sponsorship of the Maritime Administration. In a recent presentation to the Ship Structure Committee at Coast Guard Headquarters, Voelker reviewed the tests and their findings, namely, that marine transportation of petroleum products through the ice-covered waters is feasible.

(The Ship Structure Committee, which carries out research of interest to the maritime community, is sponsored by the Commandant of the Coast Guard and has as cofunding members the Naval Sea Systems Command, the Maritime Administration, the American Bureau of Shipping, the Military Sealift Command, and the Minerals Management Service.)

MarAd's trafficability tests began in 1978. They include analyses of ice samples and determination of the properties of different types of ice as well as studies of damage to icebreakers and research into how damage could have been prevented by changes in design. The Ship Structure Committee, as one of its many projects, outfitted the bow portion of the Coast Guard icebreaker POLAR SEA with instruments to measure ice impact. The data obtained during the vessel's successful deployment in May 1983 are currently being analyzed, and the committee plans to publish a report interpreting the data in terms of improved design criteria for ships and offshore structures. Details on how to order the report will appear in a future issue of the *Proceedings*. ⚓

A scientist takes ice samples during MarAd's trafficability tests. In the background is one of the Coast Guard's polar-class icebreakers.

Keynotes

The Coast Guard published the following items of general interest in the Federal Register between June 13, 1983, and July 19, 1983:

Final rules:

CGD 09-83-09	Special Local Regulations: International Freedom Festival Fireworks; Detroit River, Michigan (published June 16)
CGD 12-83-02	Special Local Regulations; Sacramento Water Festival '83, Sacramento River, California (June 23)
CGD 83-042	Drawbridge Operation Regulations, correction (June 27)
CGD 82-063b	Revision of (Coast Guard) Staff Codes and Addresses, correction (June 27)
CGD 80-107	Documentation of Vessels, correction (June 27)
CGD 83-040	Disestablishment of Marine Safety Office Minneapolis/St. Paul (June 30)
CGD 83-036	Vessel Bridge-to-Bridge Radiotelephone Regulations; amendment of informational note (June 30)
CGD 09-83-11	Special Local Regulations; 1983 Hydro Grand Prix, Niagara River, Tonawanda Channel (June 30)
CGD 78-079b	St. Marys River Vessel Traffic Service (July 5)
CCGD3-82-11	Anchorage Grounds, Delaware Bay and River, correction (July 5)
CGD 83-019a&b	Disestablishment of Merchant Marine Technical Branch, Ninth Coast Guard District (two documents, July 11)
CGD 83-040	Disestablishment of Marine Safety Office Minneapolis/St. Paul, correction (July 19)

Proposed rules and notices of proposed rulemaking (NPRMs):

CGD 78-151	Inland Waterways Navigation Regulations; Connecting Waters from Lake Huron to Lake Erie, corrections (June 13 and June 16)
CGD9 83-17	Drawbridge Operation Regulations; Ontonagon River, Michigan (June 23)
CGD 80-159	Stability Requirements for Great Lakes Vessels, Extension of Comment Period (June 27)
CGD 08-83-03	Drawbridge Operation Regulations; San Bernard River, Texas (June 30)
CGD 82-025	Drawbridge Operation Regulations; Navigable Waters of the United States; supplementary notice of proposed rulemaking (July 5)
CGD 82-025	Drawbridge Operation Regulations; Navigable Waters of the United States, correction (July 7)

Questions concerning regulatory dockets or comments on the items described below should be directed to the Marine Safety Council at the following address:

Commandant (G-CMC)
U.S. Coast Guard
Washington, DC 20593
Tel.: (202) 426-1477

* * *

72 COLREGS Amendments Adopted (CGD 83-041)

On June 16, 1983, the President signed a Proclamation adopting the amendments to the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS) which were agreed to in London on November 19, 1981. The Coast Guard published the Proclamation in a final rule appearing in the Federal Register on June 23. The rule went into effect immediately.

The following explanation of the changes is reprinted from issue No. 1, 1983, of *IMO News*, the magazine of the International Maritime Organization:

"The amendments affect a number of Rules, perhaps the most important being those connected with Rule 10. Under the existing Rule, a vessel restricted in her ability to maneuver when engaged in an operation for the maintenance of the safety of navigation such as tending buoys or carrying out a hydrographic survey or engaged in dredging, had to comply in all respects with the provisions of Rule 10. This made it impracticable for these vessels to carry out their work.

"In 1979 the [IMO] Maritime Safety Committee adopted an amendment to the Convention which was designed to overcome this difficulty, but for procedural reasons the amendment could not be finally adopted by the Assembly which met in that year. Instead the Assembly adopted a resolution recommending governments to note and be guided by the proposed amendment until it could be formally adopted in 1981. The amendment will exempt vessels engaged in the work described above from complying with the Rule to the extent necessary to carry out their operations.

"Other changes affect the following rules:

"**Rule 23** (Power-driven Vessels underway): these concern the lights to be carried by vessels under 12 meters in length.

"**Rule 24** (Towing and Pushing): a new paragraph has been inserted dealing with the lights and shapes to be shown by inconspicuous or partly submerged vessels or objects (such as dracones).

"**Rule 27** (Vessels not under Command or Restricted in their Ability to Maneuver): changes are made to regulations dealing with power-driven vessels engaged in certain towing operations, certain vessels engaged in diving operations, and vessels engaged in mine clearance operations.

"Other rules affected are Rules 1, 3, 13, 22, 25, 29, 30, 33, 34, 35, 36, 37, and 38.

"Amendments have also been made to two of the four annexes to the convention. They are Annex I, which deals with positioning and technical details of lights and shapes, and Annex III, which deals with technical details of sound signal appliances."

The amendments to the COLREGS which went into effect in June are included in the publication "Navigation Rules, International - Inland," COMDTINST M16672.2, available from the Government Printing Office. The current edition indicates old and new language through the use of boxes and italics. A revised edition, to be published this winter, will contain only the new wording.

Rules Governing Shipping Safety Fairways Amended (CGD 81-80A)

On June 30, 1983, the Coast Guard published a final rule restructuring and revising the rules which describe shipping safety fairways and fairway anchorages (Part 166 of Title 33 of the Code of Federal Regulations). These are the rules which prohibit the presence of offshore structures within designated fairways and allow structures in fairway anchorages only if they are at least two miles apart. No substantive changes have been made in the rules.

The rules were originally published by the Army Corps of Engineers in two different sections of the Code of Federal Regulations. Most of the language dealt specifically with the Gulf of Mexico. The Coast Guard's final rule consolidates the rules into one Part and establishes generic definitions. It reorganizes the existing rules to allow for the addition of sections describing fairways in coastal areas other than the Gulf of Mexico. Eventually, new fairways for the coasts of California and Alaska will be proposed to be added to this Part.

The NPRM published under docket no. CGD 81-80A also

contained proposed rules concerning specific new anchorage areas in the Gulf of Mexico. These are being withheld for further review. A supplementary NPRM will be published if changes are made to the original proposal.

Rules Proposed to Implement Outstanding Provisions of MARPOL 73/78 (CGD 75-124a)

Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, commonly known as MARPOL 73/78, will enter into force on October 2, 1983. In order to comply with U.S. pollution prevention legislation, the Coast Guard must promulgate regulations implementing outstanding provisions of the Annex.

In an NPRM published on July 5, the Coast Guard proposed regulatory changes that would serve to reduce the amount of oil discharged into the sea by U.S. oceangoing ships wherever located and by foreign ships within the navigable waters of the United States. These regulations would also help ensure that U.S. ships would be able to meet the internationally agreed upon discharge of oil limitations set forth in MARPOL 73/78 and that they would be able to engage in uninterrupted international trade.

Affected by the proposed amendments would be the oil pollution prevention regulations for ships found in Parts 151 and 155 of Title 33 of the Code of Federal Regulations. The proposed changes would implement the MARPOL 73/78 provisions having to do with oily-water separating equipment requirements, requirements for the Oil Record Book and International Oil Pollution Prevention (IOPP) Certificates, survey and inspection requirements, discharge limitations, the description of special areas, reporting requirements, emergency discharge exceptions, and the enforcement of requirements concerning the prevention of pollution of the sea by oil.

Elimination of Requirements for Towing Hawser Length Proposed (CGD 83-027)

In the July 7 issue of the Federal Register the Coast Guard published a proposed rule which would allow masters of towing vessels to use their discretion to determine suitable hawser lengths for different towing situations.

Equipment, methods, and practices have changed considerably since promulgation of the original regulation governing the towing of barges by vessels navigating the harbors, rivers, and inland waters of the United States. A simple limitation of towing hawser length is thus no longer appropriate.

Clarification of Chart and Publication Requirements Proposed (CGD 82-055)

This proposed rule, published July 7, would revise the chart and publication requirements found in the Navigation Safety Regulations (Part 164 of Title 33 of the Code of Federal Regulations). These regulations are applicable to self-propelled vessels of 1600 gross tons (grt) or more operating on the navigable waters of the United States (the St. Lawrence Seaway is excepted). The proposal would modify the existing requirements for carriage of nautical charts and publications by eliminating certain ambiguities from the present regulation.

New Licensing Structure Proposed (CGD 81-059)

This item was cleared for publication as a notice of proposed rulemaking as the Proceedings *was going to press. Its projected publication date was August 4. A 120-day comment period will start on the day it is published. The advance notice of proposed rulemaking on this subject appeared in the Federal Register on October 29, 1981.*

The Coast Guard is attempting to simplify and improve its licensing regulations for commercial vessel personnel. The proposed amendments in this notice offer a license structure with career patterns for persons serving on all waters and/or all kinds of vessels, from small passenger vessels to large oceangoing vessels. The proposed regulations also incorporate the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW).

The highlights of the notice are as follows:

- For inland waters, the notice proposes a simplified two-license structure for service on any tonnage vessel and for service on vessels up to 1600 gross tons on near coastal waters (up to

200 miles offshore).

- Trade-restricted licenses would be eliminated, except for the restricted licenses established by law (i.e., those for operators of uninspected towing vessels, officers on uninspected fishing vessels, pilots, motorboat operators, and non-navigating river mates).

- Ocean operator and operator licenses would become master and mate licenses. The tonnage limitation would be raised to 200 gross tons, and the 100-mile limit would be increased to 200 miles offshore. No other geographical restrictions would apply within that zone.

- Licensed operators of uninspected towing vessels would be able to credit service toward obtaining master or mate licenses.

- Special "industrial" licenses would be established for officers who work on mobile offshore units.

- Changes to requirements for a motorboat operator license would make that license easier to obtain initially (for inland waters) and easier to use as a stepping stone to more advanced licenses.

- The written examination subjects for the licenses have been standardized and would be listed in the new regulations. Consideration is being given to removing or limiting examination items on celestial navigation. Comments are specifically invited on this topic.

- Examinations for licenses would be required only at entry and command level.

- When any license was renewed, the license holder would be required to complete an open-book exercise; the entire process could be handled through the mail.

- For persons who may have difficulty with written examinations, the new rules would provide for oral examinations administered under special circumstances.

- Present license holders could either take advantage of the new structure when they renewed their licenses or present information to the Coast Guard that justified obtaining a new license earlier. (Note: if an officer were otherwise qualified to upgrade his license to a command level, he would have to take a partial examination on "command" topics.)

- The proposed regulations would allow substitution of simulator time or special training for underway service.

- The proposed regulations would eliminate the special consideration given to former members of the armed forces regarding recency of experience.

- The proposed regulations would allow license applications to be evaluated locally, at the Regional Examination Centers (as opposed to their having to be sent to Headquarters), shaving weeks off the application process.

- Flow charts would be added to the regulations to illustrate the pattern of career advancement possible under the proposed rules.

FCC Reduces Requirements for Record Keeping (FCC 83-248, PR Docket 82-798)

(This item, published by the Federal Communications Commission, applies primarily to recreational vessels/vessels not required by law to have radio)

In a Report and Order dated May 26, the Federal Communications Commission eliminated a number of reporting, record-keeping, and record retention regulations in the Maritime Service because "they were believed to impose unnecessary burdens on the maritime community."

Changes to Part 81 of Title 47 of the Code of Federal Regulations make it unnecessary for maritime stations (except public coast stations) to maintain logs and certain documentation, since these records are rarely, if ever, used for any regulatory purpose. The commission eliminated rules requiring these stations, as well as Alaska public fixed stations, to keep Parts 81 and 83 on hand and also deleted notification requirements concerning certain changes in station location, emergency operations, discontinuance of station operations (other than public coast stations) and the cooperative use of limited coast station facilities.

In amending Part 83 (Stations on Shipboard in the Maritime Services), the FCC will no longer require ships to

maintain radio logs or specified documentation unless such record keeping is required by treaties or statutes. Recreational boaters will not have to keep a radio station log or keep Part 83 available. A number of log, documentation, and notification requirements pertaining to compulsory radio-equipped ships as well as survival craft stations and on-board stations have been simplified.

More information on the FCC action is available from Robert McNamara, tel.: (202) 632-7175.

(Reprinted from the July 1983 Newsletter of the Radio Technical Commission for Maritime Services)

Actions of the Marine Safety Council

At its July meeting, the Marine Safety Council considered the following items:

CGD 83-043 Revisions to Subchapter F to Incorporate SOLAS 74

This proposal would amend the marine engineering regulations found in Title 46 of the Code of Federal Regulations to upgrade machinery requirements. It would implement the requirements of SOLAS 74, which exceed the requirements presently prescribed in U.S. regulations in several areas. The new requirements would apply to steering gears, hydraulic systems, steam boilers, and other assorted machinery items.

The Council approved the work plan for this item, and an NPRM has been scheduled for publication in the Federal Register in April 1984.

CGD 79-023 Subdivision and Stability Regulations

An NPRM under this docket number was published in the Federal Register on August 12, 1982. CGD 79-023 consolidates regulations that have thus far been scattered throughout Titles 33 and 46 of the Code of Federal Regulations and places them in a new Subchapter S of Title 46. In addition, it codifies as regulations previously issued policy statements and interpretations.

The Council approved the final rule on this subject, and it was scheduled for publication in the Federal Register last month.

CGD 83-044 Requirement for Federal Pilots on Foreign Trade Vessels—State of Maine

This proposal would require the presence of federally licensed pilots on certain self-propelled vessels engaged in foreign trade; the requirement would apply when the vessels were operating in specified waters within the State of Maine where a pilot would otherwise not be required by state law.

The State of Maine pilotage laws cover only Portland and Penobscot Bay. Recent increases in foreign trade vessel traffic have created a perceived need for pilots in other areas as well. Accordingly, this work plan proposes a requirement for federally licensed pilots in East Port, Pembroke, and Bar Harbor as well as on the Kennebec River.

Should the State of Maine change its laws to require the presence of a state-licensed pilot on foreign trade vessels in these areas, the Federal requirement would be terminated.

The Council approved the proposal, and an NPRM should be published this month.

CGD 82-105 Vessel Documentation

This proposal deals with the question of what constitutes a controlling interest in a partnership that owns a vessel. It was originally part of a previous proposal on documentation, but the Coast Guard last year decided to treat it as a separate issue. An advance notice of proposed rulemaking on this question was published in the Federal Register on November 12, 1982. After reviewing the comments received, the project team decided that an appropriate definition of controlling interest would be a combination of equity in the vessel and business control of the partnership. Accordingly, the proposal would require that U.S. citizens have more than 50 percent of the equity in the vessel and control of 75 percent of the partnership.

The Council approved the work plan, and an NPRM was scheduled for publication in the Federal Register last month.

Anyone who wishes to obtain a copy of the NPRM issued or to be issued in connection with one of these work plans should write the Marine Safety Council at the address shown earlier in this section, specifying the docket no. of the item in which he is interested. ‡

Maritime Sidelights

Maritime Safety Bill Introduced

On June 30, 1983, Walter B. Jones (D-North Carolina), Chairman of the House Merchant Marine and Fisheries Committee, introduced legislation to enhance the safety of the American maritime community.

The bill is based on information acquired during committee hearings during the 97th Congress on the disappearance of the U.S.-flag vessel SS POET in October 1980 and the sinking of the oil rig OCEAN RANGER in February 1982 as well as investigations of other major marine casualties. An earlier version of the bill was introduced at the end of the last session of Congress and comments solicited for incorporation into this proposal.

"The intent of my legislation is to improve the maritime safety environment without imposing onerous burdens upon those in the maritime community," said Chairman Jones in his introductory remarks. "It is a bill which requires all groups—industry, shipboard personnel, and Federal agencies—to upgrade their own operations to better ensure the safety of life and property at sea."

If enacted into law, this legislation would

- increase the penalty for operating without a valid Coast Guard Certificate of Inspection from $500 per *offense* to up to $5,000 per *day*;
- require a vessel owner to report to the Coast Guard when a vessel has not been heard from in 48 hours;
- require the master of the vessel to report to the owner within every 48-hour period;
- authorize $5 million for each of fiscal years 1985 and 1986 to cover up to 50 percent of the cost of installing satellite telecommunications systems on merchant vessels; and
- permit the Coast Guard to investigate all acts of marine incompetency or misconduct committed by any person licensed by the Coast Guard.

"The importance of effective deterrents, improved communications capabilities, and proper Coast Guard oversight have all been made undeniably clear during our investigations into these maritime tragedies which have occurred in recent years," said Chairman Jones. "I am dedicated to ferreting out the weaknesses—wherever they may be—in our present system and removing them. Too many lives have already been lost for this goal to be any less." ‡

ICS Publishes Guides for Gas Carriers

A new guide for contingency planning for liquefied gas carriers has been published by the International Chamber of Shipping in conjunction with several other international maritime organizations.

Titled the "Guide to Contingency Planning for the Gas Carrier at Sea and in Port Approaches," the publication is intended to assist in the formulation of contingency plans to deal with casualties which might pose a threat to cargo containment. It contains descriptions of various emergencies in which a gas carrier may be involved and the considerations which have to go into contingency planning. The publication also outlines some precautionary measures which might be taken to minimize the threat of spillage of cargo and describes the pattern of events which could follow the rupture of a cargo tank in various circumstances.

A separate publication examining the behavior of gas carriers when disabled and freely drifting in heavy weather is also available. Included in this publication is a section on rescue towage as a means of controlling gas carrier drift.

Both publications can be obtained from Witherby and Co. Ltd., 32/36 Aylesbury Street, London EC1, England. The prices, inclusive of surface mail, are £7.50 for the "Guide to Contingency Planning for the Gas Carrier at Sea and in Port Approaches" and £2 for "Drift and Rescue of Disabled Gas Tankers." ‡

Distinguished Public Service Award Conferred

The Coast Guard has awarded Charles F. Lehman its Distinguished Public Service Award in recognition of his significant contribution to the objectives and success of the Rules of the Road Advisory Council as well as his numerous contributions over the years to the promotion of navigation safety.

Lehman is currently serving as Vice Chairman of the Council. As a member of the Council's forerunner, the Rules of the Road Advisory Committee, he personally drafted a major portion of a report which led directly to unification of the old Great Lakes, Western Rivers, and Inland Rules of the Road into a single set of Inland Navigation Rules.

An experienced pilot and master on the Western Rivers, Lehman also serves the marine industry as a dedicated member of the Coast Guard's Towing Safety Advisory Committee. In addition, he has served or is serving as a member of the Legislative Committee of the American Waterways Operators, Inc., the Water Resource Congress, the National Waterways Conference, the Permanent International Association of Navigation Congresses, the Institute of Navigation, and the Coast Guard's Chemical Transportation Advisory Committee.

Lehman is Vice President of the American Commercial Barge Line Company of Jeffersonville, Indiana. ‡

Rear Admiral Richard A. Bauman, then Chief of the Coast Guard's Office of Navigation, presents Charles F. Lehman with his medal at a meeting of the Rules of the Road Advisory Council in June 1983.

Naval and Maritime Photo Contest Announced

The 22nd Annual Naval and Maritime Photo Contest has been announced by its sponsor, the United States Naval Institute.

Awards of $100 each will be given for the top ten photographs selected by the Naval Institute as prize winners.

The winning photos will be published in the Naval Institute's monthly magazine, PROCEEDINGS,* and will be displayed at the Naval Institute's annual meeting next year.

The contest deadline is December 31, 1983. Entries must pertain to naval or maritime subjects but need not have been taken in 1983.

Entries must be either black-and-white prints, color prints, or color transparencies. Anyone is eligible to enter.

Additional information and contest rules may be obtained by contacting the Membership Services Department, U.S. Naval Institute, Annapolis, Maryland 21402, or calling (301) 268-6110. ‡

* Catchy name, don't you think?—Ed.

INTASAFCON 5 Cancelled

The International Chamber of Shipping has announced the cancellation of the Fifth International Tanker Safety Conference (INTASAFCON 5). (The conference, scheduled for October 4 - 7, 1983, in Athens, Greece, was written up in the Maritime Sidelights section of the June issue of the *Proceedings.)*

Two New Navigation and Vessel Inspection Circulars Available

The Coast Guard recently published Navigation and Vessel Inspection Circulars Nos. 6-83 and 7-83.

NVIC No. 6-83 is entitled "Admeasurement of Vessels in Accordance with the Rules of the International Convention on Tonnage Measurement of Ships, 1969."

The tonnage convention was ratified by the Senate in September 1982 and went into effect in the United States on February 10, 1983. The NVIC was written to advise persons concerned with the assignment of gross and net tonnages to ships of the Convention's requirements and their application to vessels 24 meters (79 feet) in length and larger which engage on international voyages.

NVIC No. 7-83 is entitled "Guidance for Issuing International Oil Pollution Prevention (IOPP) Certificates under the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)."

Annex I of MARPOL 73/78 will enter into force on October 2, 1983. It requires that each tanker of 150 gross tons or more and any other ship 400 gross tons or more which engages in a voyage between countries party to the Convention be surveyed and obtain an IOPP Certificate. A new ship (as defined in Regulation 1(6) of the Convention) is required by the Convention to have an IOPP Certificate on board by October 2, 1983; other ships must have IOPP Certificates by October 2, 1984.

NVIC orders should be directed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The price per copy for these two NVICs is $2.25 for 6-83 and $3.75 for 7-83. A check or money order payable to "Superintendent of Documents, Government Printing Office" should be enclosed with each order.

NVIC subscribers will receive Nos. 6-83 and 7-83 automatically. Coast Guard personnel can obtain copies from Commandant (G-MP-4). ‡

Final Volume of Light List Released

The final volume of the Coast Guard's 1983 Light List, Volume V, Mississippi River System (CG-161), is available for purchase.

Volume V covers lights and other marine aids to navigation maintained by or under the authority of the U.S. Coast Guard on the Mississippi River System. Aids to navigation are listed consecutively for each river in the system.

Volume V of the Light List can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. It can also be purchased from GPO branch bookstores in cities across the country or from GPO sales agents in principal seaports. The cost is $9; the stock no. is 050-012-00197-9. ‡

1984 Hazardous Material Spills Conference Scheduled

The seventh in a series of biennial National Conferences on Control of Hazardous Material Spills will be held April 9 - 12, 1984, at the Opryland Hotel in Nashville, Tennessee. The conference is subtitled "Prevention, Behavior, Control and Cleanup of Spills and Waste Sites."

The 1984 conference will pick up where the 1982 conference left off, focusing on broadened legislative/regulatory authority under the "Superfund" law. Papers will be presented on such topics as risk analysis, contingency planning, decontamination, community relations, and government policies and programs.

Further details are available from the conference organizers at the following address: 1984 Hazardous Material Spills Conference, 1629 K Street NW, Suite 700, Washington, DC 20006. Inquiries about exhibits should be directed to Trade Associates, 4701 Willard Avenue, Suite 105, Chevy Chase, Maryland 20815.

Films for showing at the conference (these must be timely, related to the topic of the conference, and non-sales-oriented) are being solicited from interested industry, government, and conservation groups, societies, research institutes, exhibitors, and conference participants. All films should be 16mm sound-sync and should be submitted for review by January 28, 1984, to Priscilla Perkins Moore, Chemical Manufacturers Association, 2501 M Street NW, Washington, DC 20037. ‡

Chemical of the Month

by Ron Magoon

This is the fifth in a series of five Chemicals of the Month written by guest authors--chemistry students at the Coast Guard Academy in New London, Connecticut.

Triethanolamine: $(HOCH_2CH_2)_3N$

Synonyms:	triethylolamine trihydroxy triethylamine tris-(2-hydroxy-ethyl)-amine

Physical Properties

boiling point:	343°C (650°F)
freezing point:	19°C (66°F)
vapor pressure at 20°C (68°F):	less than 0.01 mm Hg

Threshold Limit Values (TLV)

The Time Weighted Average and Short Term Exposure Limit have not been established for triethanolamine.

Flammability Limits in Air

The data for these figures are not available.

Combustion Properties

flash point (o.c.):	185°C (365°F)
autoignition temperature:	not available

Densities

liquid (water = 1.0):	1.13
vapor (air = 1.0):	5.14

Identifiers

U.N. Number:	not assigned
CHRIS Code:	TEA
Cargo Compatibility Group:	8 (Alkanol-amines)

The word "triethanolamine" (try-eth-uh-NOLE-uh-meen) may seem like quite a mouthful, but it's quite simple when you separate it into its three units: "tri," meaning three, "ethanol," meaning ethyl alcohol, and "amine," meaning a nitrogen compound based on ammonia. At room temperature, this chemical is a viscous alkaline liquid that smells slightly like ammonia.

Triethanolamine is a versatile chemical building block. It is a component in fatty-acid soaps as well as such cosmetic products as vanishing cream, cold cream, cleansing cream, hand lotion, and brushless shaving cream. At the other end of the spectrum, it is used in cement, where it reduces "pack set" tendencies, and concrete, where it shortens set time and increases strength. Triethanolamine is also found in wax emulsions, household detergents, textile antifume agents, herbicides, and the medication given to sufferers of angina.

Commercial-grade triethanolamine freezes at a relatively high temperature: 19°C (66°F). This could cause problems in handling, especially in areas with cold climates or cold winters. For that reason, when shipped, triethanolamine is usually carried at a slightly elevated temperature.

Under normal circumstances, triethanolamine produces little vapor, so problems resulting from exposure to the vapor are unlikely to arise. Overexposure to liquid triethanolamine, however, will cause irritation of the skin and eyes. Standard measures--washing affected skin areas with soap and water, flushing eyes with plenty of water--should be followed in instances of such exposure.

Triethanolamine presents a slight flammability hazard: if heated, the chemical could ignite. If it does ignite, firefighters should wear a self-contained breathing apparatus (to protect against inhalation of the poisonous fumes, such as carbon monoxide or nitrogen oxides, emitted by burning triethanolamine), rubber boots, and rubber gloves. A water stream could cause a fire to froth and should thus not be used to extinguish flames. Instead, either dry chemicals or alcohol foam should be used. Any containers exposed to the heat of the fire should be cooled down; water spray can be used for this purpose.

The fumes given off by a triethanolamine fire could cause temporary incapacitation in the form of blurred vision or dizziness. Victims should be promptly removed to fresh air, as death could result in extreme cases.

Although its toxicity and flammability hazards are not as serious as those of many of the other chemicals described in this column, triethanolamine should be handled with care. This chemical is incompatible with a number of other substances, including the majority of the non-oxidizing mineral acids, sulfuric acid, nitric acid, and organic acids (in other words, compatibility groups 1 - 4 in the Coast Guard cargo compatibility table found in Part 150 of Title 46 of the Code of Federal Regulations).

When triethanolamine is stored, the container should be kept in a cool, dry, well-vented area. This chemical should not be exposed to heat or flames. These are standard precautions that should be taken for shipping as well as long-term storage.

Triethanolamine is often shipped and stored with a nitrogen atmosphere; this is to maintain product purity. It can be shipped in bottles, cans, drums, tank cars, or tankships. Piping or tanks containing copper as a material of construction should not be used for triethanolamine, since the chemical will cause copper to corrode; this not only results in gradual deterioration of the metal but also compromises product purity.

The U.S. Coast Guard regulates triethanolamine as a Subchapter O cargo. The International Maritime Organization includes it in Chapter 6 of its Chemical Code, chemicals to which the Code applies. Triethanolamine is not included in the International Maritime Dangerous Goods (IMDG) Code.

Ron Magoon is a second-class Cadet at the Coast Guard Academy. He wrote this article in connection with a class on hazardous materials transportation taught by LCDR Thomas J. Haas. Technical assistance was provided by personnel in the Cargo and Hazards Branch at Coast Guard Headquarters.

Cargo oil as fuel

Following allegations that a number of oil tankers have used oil cargoes as bunker fuel, the International Maritime Organization has issued a warning to members about the dangers to ships' personnel and port installations inherent in this practice.

IMO points out that the transfer of low-flash-point cargo oil to bunker tanks for use as engine fuel has, in some cases, been carried out through the use of illegal piping connections, especially between the No. 1 center tank and the forward deep tank, in contravention of requirements in the 1974 SOLAS Convention and the rules of all major classification societies.

Seven Liberian-flag tankers have allegedly been found guilty of this malpractice following safety investigations carried out by Liberian authorities in 1982. The number includes two ships owned by Emmanuel Karavias, the 49,500-dwt TAXIARHIS and the 100,600-dwt YPAPANTI, the latter vessel having been involved in a precedent-setting U.S. port state enforcement incident in May 1982.

Based on these findings, Liberia is pressing for a crackdown on this illegal practice and has suggested that port states should introduce random sampling of bunker tanks as a deterrent and that surveys should be extended to include a thorough examination of cargo and bunker piping systems on tankers for evidence of unauthorized connections.

Shortly after IMO issued the cargo oil caution, it was announced that the master and chief engineer of another Karavias tanker, the 99,300-dwt HARALABOS, had been charged with knowingly permitting their ship to be operated in an unsafe manner. The 16-year-old ship had suffered an engine room fire while berthed at the Egyptian Oil Corporation Terminal at Ras Gharib last November. The hull plating in way of the tanker's No. 1 starboard cargo tank was also ripped open, and the vessel was later declared a constructive total loss. None of the crew were injured in the incident.

The charges against the two men, brought by the Liberian Bureau of Maritime Affairs, accuse them of "having fuel oil on board with a flash point under 60°C. The fuel oil sampled in some HARALABOS bunker tanks released flammable vapors at temperatures well below those experienced in the engine room."

An inquiry began at the Bureau's headquarters in Reston, Virginia, May 17. ‡

(Reprinted from the May 1983 issue of the Hazardous Cargo Bulletin)

Line Handling

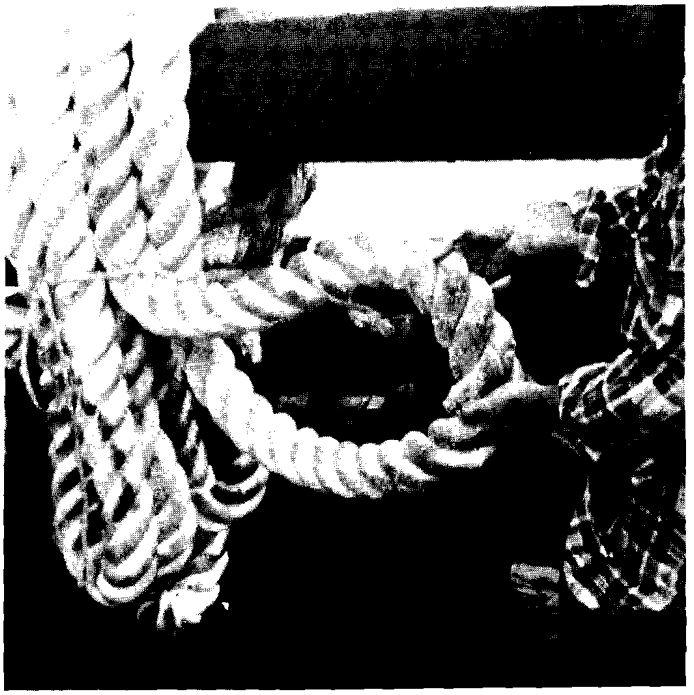
Lack of knowledge about how lines behave can prove fatal when personnel depart from standard mooring arrangements.

In the late fall of 1981 an offshore oil-field worker was killed while offloading cargo from the deck of an offshore supply vessel (OSV). His death resulted from his being struck by a three-inch nylon mooring line which slipped off a mooring cleat on the drilling platform to which the OSV was moored. This fatality could have been prevented, had the crew handling the lines been more experienced or more properly trained.

The vessel arrived at the platform at 3:55 a.m. to tie up, stern to. The platform had two permanently attached three-inch nylon mooring lines. The lines were passed to the OSV by crane, and one was secured to a bitt on the starboard quarter, while the other was similarly attached on the port quarter. The vessel's captain had voiced his concern about the sea conditions (the seas were six to eight feet) but agreed to attempt the cargo transfer when advised by rig personnel that they needed the supplies to continue drilling operations. The lines were secured, and the vessel maintained slight ahead propeller rotation to keep the lines taut.

Two roustabouts were transferred from the platform to the OSV to offload the cargo. At 5:00 a.m. one of

Roustabouts hung a replacement mooring line for the OSV over the upper horn of this cleat; it slipped off in the rough seas.



The captain thought the replacement line had broken; inspection showed that there was no part in the line and that the eye had remained intact.

them reported that the port mooring line was parting at the bitt. This information was relayed to the platform. When rig personnel responded that they had no additional mooring lines, a line was passed from the vessel to be secured to the platform.

The replacement line was attached to a vertical cleat about seven feet above the platform's "plus ten" deck, facing seaward. (The plus ten deck is a deck approximately ten feet above the water surface; it has stairs leading down to a personnel landing just off the surface and is used primarily in personnel transfers.) Once the replacement line had been hung over the upper horn of the cleat and several wraps had been taken around the bitt on the vessel to take up slack, cargo transfer resumed.

At approximately 5:10, little more than ten minutes after the original port mooring line had been reported parting, the replacement line slipped from the horn of the cleat on the platform, snapped across the cargo deck, and struck both roustabouts, who were standing about 30 feet from the port quarter bitt and were directly in line with the rig mooring cleat. One roustabout was merely thrown to the deck, his hard hat knocked off. The other died of two fractures and a massive hemorrhage of the upper and lower neck.

Aside from the surviving roustabout, only the vessel's captain witnessed the accident. The captain was fully aware of how the new line had been attached. While he felt there was no way it could slip off, because the cleat was several feet higher than the stern of the vessel, he was concerned enough to have a light placed on the line and to keep it under surveillance. He was observing the line through binoculars when he saw a flash as it whipped across the deck and struck the roustabouts. The captain thought the line had broken until inspection proved it to be intact.

This casualty probably could have been prevented, had the roustabout who attached the line to the cleat simply attached it in a "choker" configuration. The cleat was somewhat inaccessible; its positioning was such that only one man could climb onto the mooring fenders to hook the eye of the line over the upper horn of the cleat; this the roustabout did with one hand while holding on to the platform with the other. He could, however, have simply passed a loop of the line through the eye at the end of the line and placed that loop over both horns of the cleat. Then the sea conditions which caused the eye to slip off the upper horn would have tightened the "choker" around the horns of the cleat.

While nothing further can be done for the victim in this incident, perhaps additional training of roustabouts in line-handling practices could reduce the probability of similar incidents occurring. ⚓

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

DECK

1. Upon leaving port, where more than 25 percent of the crew has been replaced with new crew members, the master is required to hold a fire and boat drill within

A. 12 hours of departure.
B. 18 hours of departure.
C. 24 hours of departure.
D. 36 hours of departure.

REFERENCE: 46 CFR 97.15-35-(a)

2. A Cargo Ship Safety Construction Certificate shall be issued for a period of not more than

A. 24 months.
B. 36 months.
C. 48 months.
D. 60 months.

REFERENCE: 46 CFR 91.60-40

3. Which statement concerning maneuvering in restricted visibility is false?

A. A vessel which cannot avoid a close-quarters situation with a vessel forward of its beam shall reduce its speed to bare steerageway.

B. A vessel which hears a fog signal forward of its beam shall stop its engines.
C. A vessel which hears a fog signal forward of the beam shall navigate with caution.
D. If a vessel determines by radar that a close-quarters situation is developing, it shall take avoiding action in ample time.

REFERENCE: Commandant Instruction M16672.2, Rule 19(e)

4. In Loran-C, a time-difference reading is obtained by

A. counting the pulses per hour.
B. comparing the departure time of pulses from two transmitters.
C. counting the pulses on an electronic calculator.
D. comparing the arrival time of pulses from two transmitters.

REFERENCE: Duttons, 13th Edition

5. A tide that is characterized by a large inequality in the high water heights, low water heights, or both is called

A. semidiurnal.
B. diurnal.
C. mixed.
D. tropic.

REFERENCE: Bowditch, Vol. I/1977

ENGINEER

1. A vessel has a mean draft of 28'08". Nine hundred tons of fuel oil are loaded. If the TPI immersion is 50 and the final forward draft is 30'00", what is the after reading?

A. 30'00"
B. 30'02"
C. 30'04"
D. 30'08"

REFERENCE: La Dage

2. In a low-expansion mechanical foam system, the mixing of the solution with air to form the foam bubbles takes place in a(n)

A. proportioning device.
B. foam-concentrate pump.
C. holding tank.
D. all-purpose nozzle.

REFERENCE: MarAd

3. The flammable limits of methane by volume in air are 5 - 15%. If a combustible gas indicator gives a reading of 0.5 LEL when a compartment containing methane is sampled, the flammable vapor concentration at the sample point is

A. 0.5% by volume.
B. 2.5% by volume.
C. 7.5% by volume.
D. 50% by volume.

REFERENCE: MarAd

4. What is the main difference between a stuffing box gland and a mechanical seal for sealing the shaft of a centrifugal pump?

A. Packed stuffing box glands are subject to wear, but mechanical seals are not.
B. Packed stuffing box glands must be cooled by the liquid being pumped, but mechanical seals do not require cooling.
C. If packing fails, the pump usually can be kept running by temporary tightening of the gland, but if a mechanical seal fails, the pump must be secured and the seal replaced.
D. The sealing surface of a mechanical seal is parallel to the shaft, but the sealing surface of a packed gland is perpendicular to the shaft.

REFERENCE: Centrifugal Pumps

5. If a report of chemical analysis of an oil sample taken from main propulsion machinery indicates an increased neutralization number, you should be aware that

A. acidity has increased.
B. viscosity has increased.
C. demulsibility has improved.
D. foaming is certain to occur.

REFERENCE: Stinson

ANSWERS

1.C;2.A;3.B;4.C;5.A
ENGINEER
1.C;2.D;3.B;4.D;5.C
DECK

U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 412-796 : QL 3

U.S. Department
of Transportation

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Coast Guard**

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Washington, D.C. 20593

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