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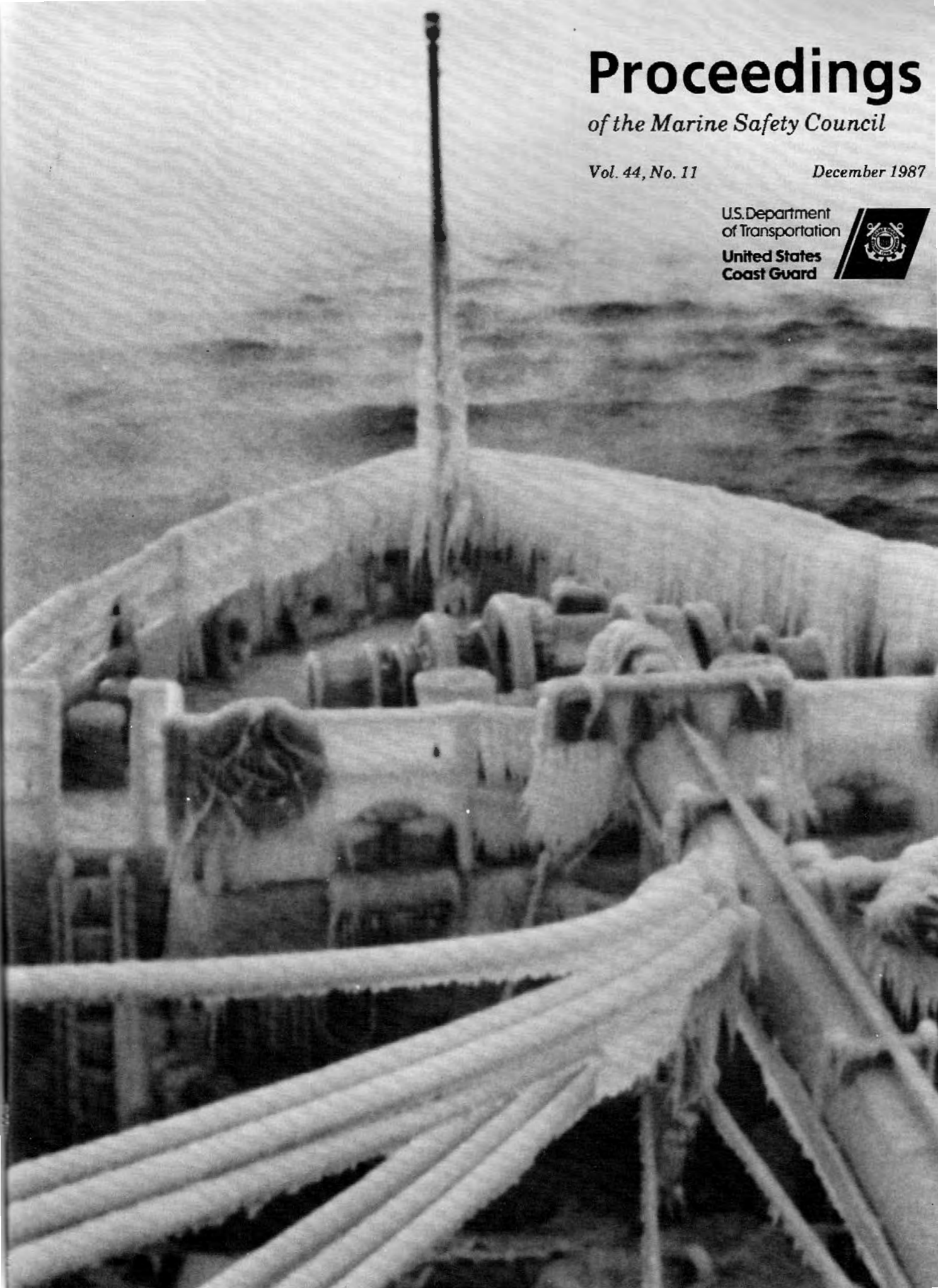

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Contents

Features

Departments

Cover

The Coast Guard cutter **Mesquite** *ices up during severe weather on Lake Michigan. Accumulating layer by layer, spray ice can quickly become a shroud heavy enough to pull a vessel into the sea. Our story about spray ice hazards in the Alaska fishing waters begins on page 279. (Photo by a member of the* **Mesquite's** *crew)*

Spray Ice: A Menace to Mariners

Kris Freeman

Radio transmissions from the trawler **Roderigo**, *riding out 90-mph winds off Iceland on January 25, 1955, 2 hours after its sister ship, the* **Lucky Lorella**, *sank under a heavy load of spray ice:*

1630 **Roderigo**: *Aerials now icing up. Will call from time to time.*
1650 **Roderigo**: *We could do with someone up here now. Having difficulty in maneuvering.*
1651 **Roderigo**: *Come to us. Position becoming serious now.*
1652 **Lancella** *to* **Roderigo**: *We are coming to you.*
1701 U.S. naval patrol aircraft 5301: **Roderigo, Roderigo,** *transmit on 500 kilocycles.*
1702 **Roderigo**: *Unable to transmit 500 kc. Listing heavily to starboard now.*
1703 aircraft 5301: **Roderigo, Roderigo,** *what are your intentions?*
1704 **Roderigo**: *No intentions. Going further over. No visibility. Still going over to starboard.*
1705 **Roderigo**: *Still going over to starboard. Cannot get her back.*

After 4 minutes of repeating "SOS, heeling right over" by Morse code, transmissions from the **Roderigo** *ceased.*

(From the book *Distant Water: The Fate of the North Atlantic Fisherman*, by William W. Warner.)

Spray ice has taken many mariners since the **Roderigo** met its cold fate. The trawler **Alert**, for instance, never even had a chance to issue a brief mayday. Caught in freezing temperatures and gale-force winds, the 100-foot boat disappeared on Valentine's Day 1985 while running across Shelikof Strait toward Kodiak, Alaska, and shelter. The only trace ever found of the vessel or its crew was a life ring that washed up on a Kodiak beach some 16 months later.

No one can be absolutely certain as to the fate of the **Alert**, but speculation centers on one factor: spray ice. Accumulating layer by layer, a sheen of spray ice can quickly become a shroud heavy enough to pull a vessel into the sea.

"There's no doubt in my mind that ice was the straw that broke the camel's back with that boat," says skipper Don Johnson of the **Margaret Lyn**, the last vessel to make radio contact with the **Alert**. "The weather was pretty severe, but she could have ridden it out without the ice."

The **Alert** and the rest of the joint-venture pollock fleet had been taking on ice for 3 days. On February 13, conditions began to deteriorate rapidly, and the boats scattered for cover. By

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Ms. Kris Freeman is a field editor for National Fisherman *magazine and writes freelance articles on a variety of fisheries topics.*

This article is reprinted with permission from the January 1987 issue of *National Fisherman*.

Barnegat Light, NJ: Captain Don Booth, at the bow of his tilefishing boat Dawn, chips away at ice that built up on a fishing trip in arctic-like temperatures. (Photo by Ray Fisk)

11:00 p.m., temperatures had dropped to below 5°F under the influence of 65-mph winds. The **Alert** and the **Margaret Lyn** ran toward one of the nearby bays along the Alaska Peninsula but were driven back by 75- to 90-mph gusts funneling through the peninsula's mountain passes from the Bering Sea. Both vessels turned back across Shelikof Strait toward Kodiak, a distance of 50 miles for the **Margaret Lyn** and 60 for the **Alert**. The **Alert** never made it.

The crew of the **Margaret Lyn** spent 2 full days chipping ice with wrecking bars and sledgehammers after reaching the shelter of Bumble Bay. The sub-zero temperatures and freezing winds had frozen the spray as hard as cement.

Spray Ice Formation

The three conditions that work together to produce spray icing -- high winds, low air temperature, and low water temperature -- are rarely combined in more deadly fashion than in the Bering Sea and Gulf of Alaska. The Northern Hemisphere's spray-icing waters run in a narrow band south of the Arctic, taking in portions of eastern Canada, New England, Scandinavia, Russia, and Japan. Farther north, pack ice keeps the waves and spray down. Farther south, temperatures are generally too warm to freeze the spray.

Fishing vessels are especially at risk from icing. Not only do they work in waters that are habitually subject to freezing temperatures and gale-force winds, but they carry relatively light, porous gear, such as crab pots and nets, which can easily accumulate many times their weight in ice.

The problem for U.S. fishermen has expanded with the joint venture fleet. Ten years ago, only king crabbers and foreign trawlers had to worry about collecting spray ice on their

rigging. However, as an indirect result of the Magnuson Act, the icing problem has been Americanized along with groundfish catches.

More and more U.S. boats are working during the winter icing months, which can run as late as April in the Bering Sea. And more and more are carrying combination gear (crab pots in addition to a gantry). This extra gear adds weight above the decks, where ice collects, and also provides more icing surface, threatening a vessel's center of gravity far more than either the gear or the ice alone.

The temperature of both water and air determines the rate at which spray freezes on a vessel's bulkheads and rigging. Wind helps determine the height and direction of the waves, and thus the amount of spray that will splash over -- and potentially freeze to -- a vessel. (Green water does not cause icing and can even warm up a deck enough to wash away spray ice.)

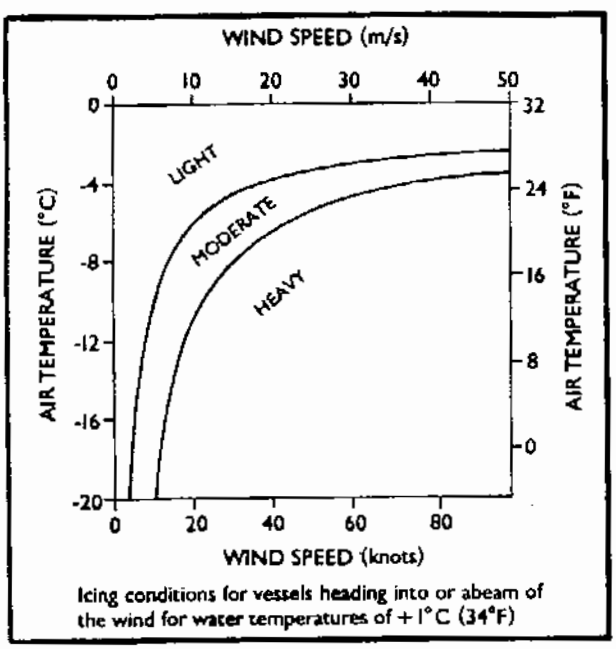
As a result, boats tend to ice up most heavily on the windward side. Some of the worst icing conditions are those in which the distance between waves equals the vessel's length, since this causes the roughest ride and produces the most spray.

Low waves will cause shelf ice to build up around a hull, while larger waves can cause icing high in a vessel's superstructure. Shelf ice can be less dangerous, as it tends to break off under its own weight. Ice in the rigging is not only more tenacious but is more damaging to a vessel's center of gravity.

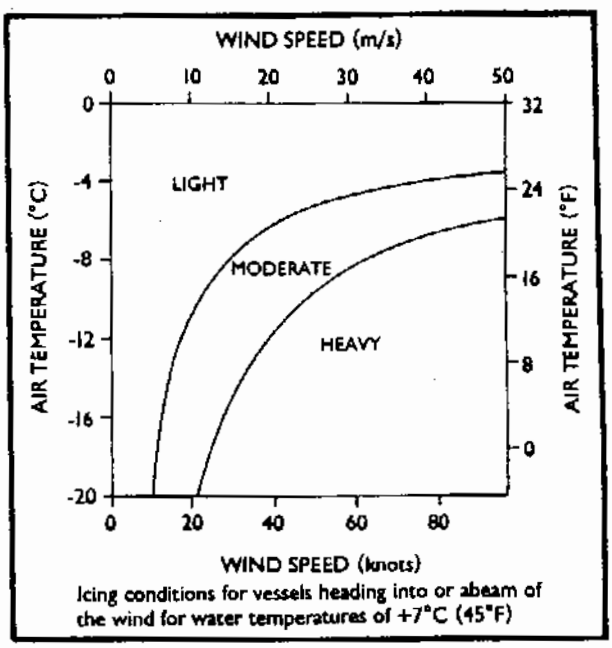
All three of these critical variables -- wind velocity, air temperature, and water temperature -- worsened dramatically the night the **Alert** was lost. However, even a minor shift in wind or vessel speed, wave height, or temperature can mean the difference between ice-free and iced-up aerials. A temperature drop of just 1 or 2 degrees can cause a dramatic difference in the rate at which a vessel takes on ice.

Updated Icing Tables

Tables are available to help skippers determine if they are approaching icing conditions. These tables, also called nomograms, show the combinations of wind velocity and water temperature that lead to light, heavy, and moderate icing. However, many of the tables now in circulation in the



Icing conditions for vessels heading into or abeam of the wind for water temperatures of +1°C (34°F)



Icing conditions for vessels heading into or abeam of the wind for water temperatures of +7°C (45°F)

Nomograms, as these tables are called, show the combination of wind velocity and water temperature leading to light, moderate, and heavy icing. Note how just a 6-degree difference in water temperature affects icing conditions. (Conditions for a range of water temperatures are charted in NOAA Data Report ERL PMEL-14, available free from NOAA/PMEL/MSRD, 7600 Sand Point Way NE, Seattle, Washington 98115-0070).

United States are outdated. Meteorologists recently discovered that icing can proceed three or even four times more quickly on "small ships" (those under 225 feet) than stated in the old tables, which were issued in 1980.

The 1980 charts included icing rate information taken from vessels with their sterns to the wind. That position generates less spray, resulting in less ice. The new charts differ because they have been calculated using data from vessels facing the heaviest icing conditions -- bow into the wind.

The revised tables, published in a booklet entitled "Vessel Icing in Alaskan Waters," are available free, and information from them is now included in National Weather Service reports.

"There's a lot of good information there [in the tables]," says Al Burch, executive director of the Alaska Draggers Association (ADA) of Kodiak. "But when it comes to ice, you really have to be cautious. You have to be aware of the weather, you have to monitor Peggy [Peggy Dyson, the radio operator for the Kodiak fleet], and pay attention to the temperature.

"If you're going into the evening hours and you start making ice, then you've got problems. The darker it gets, the colder it gets, and ice can build up real fast with just a few degrees' temperature change."

If faced with the threat of serious icing, fishermen advise putting the stern to the wind to reduce the amount of spray that hits the boat. After interviewing skippers of many vessels, NOAA meteorologists report a substantial reduction in icing when the wind shifts from 110° to 120° off the beam. However, Japanese researchers report that changing course is of little help in winds over 40 knots, when a vessel will be doused with spray from all sides regardless of its heading.

If conditions are too severe to jog out, the next step may be to set a course for shelter. In some cases, that can mean going offshore, where water and air temperatures tend to be warmer. In running from ice, a skipper has to balance the need to get to shelter quickly against the knowledge that reducing speed can also reduce spray.

Once a vessel has begun to take on ice, making a turn to shift course can be tricky, especially if the ice has begun to accumulate more heavily on one side than the other. "If you're real heavy on one side and you've got a real steep swell, or if it breaks on you while you're turning, you can flip over," says Burch.

Other steps to take while icing or anticipating icing conditions include ridding the decks of clutter and stowing gear below. While at anchor, it's a good idea to run the chain out periodically to melt off ice that could keep the anchor from being weighed in a hurry.

Some fishermen have been known to dip their crab pots over the side to melt the ice. Others advocate more wholesale use of green water to combat ice.

"One skipper recommends burying the bow in the waves," says NOAA scientist Carol Pease, co-author of the new icing tables. "That's a very dangerous game. You can add to the ice you already have. If the water is warm and the spray is light, it might be OK, but you'd have to know your boat really well."

De-icing Technology

Despite generations of icing experience and widespread technological advances in such areas as fish-finding and navigation, the world fishing fleets have yet to progress much beyond brute force and a stout stick in their battle against spray ice.

"Even in Sweden and Finland, where they're far more advanced as far as [icing] prediction, they're still using baseball bats," says Pease. "And it's a 100-percent problem for them. They face icing every year."

The Japanese have experimented with the next step, moving on to what might best be characterized as automated baseball bat technology: air hammers.

In a 1972 report translated by the Taiyou Fishery Co. of Japan for the Alert Foundation, Japanese researchers reported that air hammers can break up large quantities of ice while causing less damage to bulwarks and decks than the standard hammer-and-chisel method of ice removal, provided that the proper rounded tips are used on the air hammers. This method could work well on horizontal surfaces like decks, which are harder to de-ice than vertical surfaces, where gravity assists in ice removal.

The report also stated that the air hammers can be safely operated by a crew at sea, a claim that makes some U.S. skippers dubious, considering the pitching decks their crew must often negotiate while de-icing. Use of air hammers also requires a compressor, a piece of

Some Preventive Measures

Taiyo Fisheries Co. arranged for the translation of a comprehensive Japanese report on spray icing as a donation to the Alert Foundation, a Kodiak-based group dedicated to distributing information about icing and vessel safety. The foundation was formed shortly after the February 14, 1985 disappearance of the fishing vessel **Alert** during spray-icing conditions in the Gulf of Alaska. The vessel was working for a Taiyo joint venture at the time.

The Alert Foundation was established to honor the memory of the men lost with the Alert: owner/operator Melvin Wick, Sean T. Heaney, Ray Basel, Paul Rowe, and Svernin Ben-Adalsteinson.

Following are some excerpts from the icing recommendations in the translated report, entitled "Study on Preventive Measures Against Icing-Induced Marine Accidents of Fishing Vessels."

Preparation for Icing Conditions

To prepare for possible icing, a skipper should pay close attention to loading of fuel and water and arrangement of stowage and fishing equipment, keeping the vessel's stability document in mind. It is necessary to assume the most hazardous loading conditions while allowing for the increased weight of an ice coat.

When icing threatens, captain and crew should:

- Prepare all ice-removal equipment for instant use.
- Stop all fishing operations. Pull the fishing equipment aboard and store it below decks. If storage below is not possible, secure it at specified areas according to the degree of the stormy weather. Fishing equipment must not be hung on the bulwarks or other higher areas that are liable to become frozen.
- Secure all cargo in the hold and/or other compartments as low as possible in the ship.
- Lower and secure the cargo boom.
- Cover deck machinery, hose reel, and boats with canvas covers.
- Place lifelines over the deck.
- Keep the drain port lid operable, and remove all articles near the discharge pipe and drain port as well as those which may hinder water discharge from the deck.
- Close the hatchway and companionway, manhole covers, weather ports outside the deck house, and all portholes to ensure that the ship is weathertight. Allow passage from interior compartments to the exposed deck only through the bridge deck.
- Check to see if the amount of water ballast and its location in the ship are as recommended in the vessel stability document. If there is enough freeboard, fill with sea water all empty lower tanks equipped with ballast pipes.
- Prepare all fire detecting and extinguishing apparatus, emergency equipment, and lifesaving equipment for instant use.
- Check the effectiveness of all water drain systems.
- Check all illumination and search lights on deck.
- Carry out radio communications at predetermined times.

During Icing

Never let ice accumulate on the ship. Take immediate measures to remove ice from structures even if the ice is thin or has dropped from the upper decks.

Constantly check the ship's stability by measuring its rolling cycle as it ices. When the rolling cycle of the ship becomes extremely heavy, take all available means to increase the stability of the ship.

Make sure that each crewman working on the exposed deck wears winter clothes and that lifelines are spread over the guardrail.

Rotate the de-icing crew at predetermined intervals to avoid the possibility of frostbite.

Remove ice first from the following:

- aerial wires
- navigation lights
- drain port and discharge pipes
- liferafts
- stays, shrouds, masts, rigging
- superstructure and deck house hatch
- anchor hoist and net ports

Even a slight amount of ice may hurt the ship's stability. Start ice removal from the upper structure [bridge] and sections with large surface area.

In the event that uneven icing causes listing, remove the ice first from the lower side of the list. Note that correcting the list by transferring fuel or water from one tank to another may reduce stability, particularly when both tanks are only half full.

When the trim of the bow is changed because of a large amount of ice, remove the ice immediately. Water ballast may be rearranged to adjust the trim.

Remove ice from the drain port and discharge pipes at an early stage to allow the free discharge of water from the deck. Check the bilge regularly for an increase in the amount of water. Avoid running in rollers as this can cause stability to deteriorate.

If abandonment is necessary, issue winter clothes (or survival suits) to the crew, and prepare a sufficient number of lifelines and bailers for the lifeboat or liferaft.

--Kris Freeman

equipment that can be difficult to operate in freezing temperatures if water collects in the air lines. However, this method will soon be tested in the Gulf of Alaska by U.S. fishermen employed by Westward Trawlers, which plans to put a few air hammers on its boats this season.

The Japanese have also developed a heating-pipe system designed to melt or prevent the formation of ice. Distributed by a company named Volcano, the pipes operate like a refrigerator in reverse. A freon-like fluid recycling in the hollow pipes alternately turns to steam and condenses as it collects heat, which is transferred to the air and/or ice on the pipe's outer surface. The system can run off waste heat from the engine or electricity. The pipes have been used by the Japanese in fairly limited applications, such as replacing railings or keeping critical moving parts from freezing.

Fishermen fear that the pipes would be expensive to install and to power and doubt that they would do much good. As one fisherman puts it, "I have my hydraulic lines running along my back deck. The ice doesn't stick to them, but it still builds up around them. And after an inch of ice has built up, the heat just doesn't get through anymore. The ice is easy to break off, though, since it isn't sticking right to the pipe."

Naval architects are exploring heat tapes as an option. These tapes can be run around hatches and lifecraft releases to keep them ice-free.

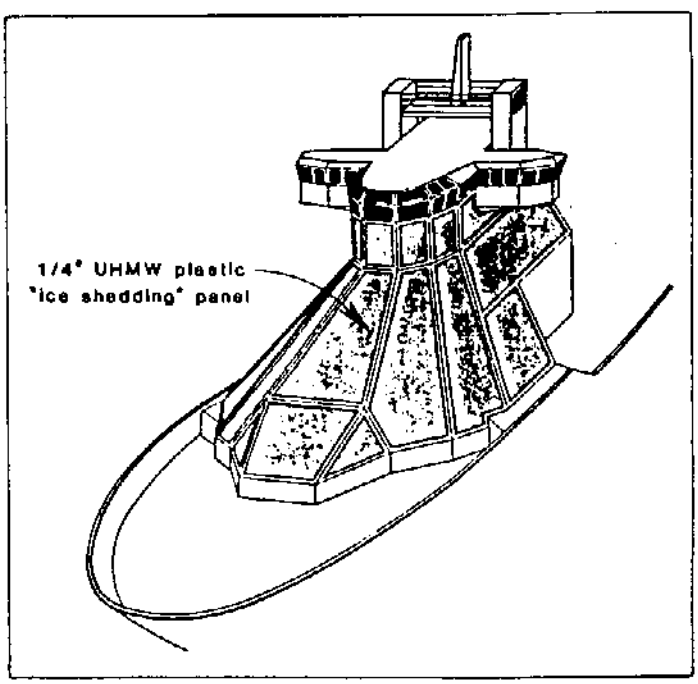
Tugboats and cargo companies have also experimented with various hot-water and steam systems for snow and ice removal. However, many are intended for use in port, since both hot water and steam can add to an icing problem if they cool too quickly.

In addition to investigating methods of ice removal, naval architects have been exploring ways to keep ice from forming in the first place, either through vessel design or through use of special coatings and textures on the boat's surface.

Design Considerations

Naval architects who have spray ice in mind while designing a vessel try to minimize the number of nooks, crannies, and horizontal surfaces to which ice can cling. This job may be as simple as eliminating odd angles in the rigging. Or, as is the case with the new generation of icebreakers being designed in Scandinavia, Canada, and the United States, it may mean eliminating forward railings, windows, and decks entirely.

Glosten Associates of Seattle has developed one such futuristic design for a study of Bering Sea supply ships. The boat's bow looks like an abstract of a mountain, with long, craggy, angular surfaces reaching in unbroken stretches from house top to lower deck. Windows are small and few, since they tend to collect ice.



In addition to various mechanical devices developed to combat ice are innovations in vessel design. This futuristic-looking ship is the creation of Glosten Associates of Seattle. The windows are few and small, and with nominal angles above deck, there are few surfaces on which ice can form. The architects have called for the bow to have an ice-resistant coating or be fitted with heat pipes. *(Drawing courtesy of Glosten Associates)*

Some Seattle skippers are also tending toward slimmer, one-reel gantries on their crabbers. "A double-reel gantry can get tremendous weight built up real fast, and if you've got a net up there, it's going to flood and you're going to have a block of ice instead of surface ice," says ADA's Al Burch.

Although retrofitting a vessel with a streamlined house or gantry is beyond the reach of most fishing operations, it is possible to make sure the liferaft is in an accessible place. "Many of the boats in the fleet can't deploy a liferaft [in an icing situation]," says Joe Gnagey, fleet manager for Westward Trawlers. "Most of the boats keep a liferaft on the top of the house. That's the first thing to ice up."

Burch says his boats simply carry a second softpack liferaft inside near a door. "We originally started that practice not because of ice but because of fire ... If there are flames shooting out of the house, you're not going to go on the roof for the liferaft."

At least one company has developed a coating that actually repels ice. As a test, Burch had a few panels installed on the bridges of ADA boats. The panels did not ice up when the bridge did, although ice built up around them. However, the product is expensive -- $24 for a 12-oz. spray can at the 1985 Fish Expo -- and it sloughs off under heavy use. In its current form, the coating may be of use in limited areas that don't get much wear, such as liferaft releases and radar domes.

Polyethylene with ultra-high molecular weight, the abrasion-resistant stuff that's laminated onto the bottom of downhill skis and is used to make ice cube trays, is another option. Products made from this material have a soapy, waxy surface that repels ice, water, and many other compounds. The substance would be too slippery for deck use, but panels of it could be fastened to horizontal surfaces such as bulkheads.

Regardless of how many coatings and pipes are developed, though, a fisherman's best defense against icing is still common sense. The best way to deal with ice is to avoid it.

Conclusion

Unfortunately, gaining the experience to make intelligent decisions about icing can a dangerous, sometimes deadly exercise. Many of the current, joint-venture and crab skippers never encountered the severe icing winters of the mid- to late-1970s. Their inexperience is compounded by the pressures of fishing in the 1980s, when joint-venture delivery schedules and 5-day crab openings can make skippers less inclined to break for weather than they were a decade ago.

Meteorologists say the Gulf of Alaska and Bering Sea are about due for another hard-icing winter. It's time, they note, for skippers to check the number of ax handles aboard, review their stability documents, check their liferafts, and perhaps check with the old-timers to see what they know about ice.

User of Forged License Convicted

LCDR Christopher Walter

The Tip

In February 1986, Marine Safety Office (MSO) Hampton Roads received a tip that a first-class pilot took the **Coastal Manatee** to Yorktown, Virginia outside the scope of his license. Charges were lodged against his license, and an Administrative Law Judge suspended it for 6 months with an additional 6 months on 12 months probation.

After the charges were served against the pilot, evidence was uncovered that he had piloted many vessels illegally and had used forged license endorsements to get a pilot's job -- his real license was limited to Norfolk's Elizabeth River. Over a 2-year period, one of which involved full-time employment as a pilot, he took 31 vessels on 97 trips outside of the scope of his real license, including 37 voyages to or from Baltimore, 130 miles to the north. He also lied to Coast Guard investigators and the Administrative Law Judge during his license hearing. This case was rapidly shaping up as a terrible flaunting of federal pilotage laws and was almost certainly the worst in the history of the United States.

Because of the seriousness of these matters, extensive criminal, civil penalty, and license revocation investigations were begun into all phases of his conduct. Evidence of state pilotage law violations was given to state investigators who obtained an arrest warrant for him and for an official in the local pilot's association. The holder of the license that this pilot photocopied to make his forgery was taken to a suspension and revocation hearing for six counts of misconduct; five of the six were found proved. In the meantime, the pilot fled the Hampton Roads area, grew a beard, and found work as a truck driver in North Carolina.

LCDR Walter is Chief of the Investgation Department, U.S. Coast Guard Marine Safety Office, Hampton Roads, Virginia.

The Indictment

The criminal case was sent to the U.S. Attorney for prosecution, and the pilot was indicted by a federal grand jury for violating 18 United States Code (USC) 1001 and 18 USC 2197.

18 USC 1001 prohibits the making of a false statement concerning a material fact in a matter within the jurisdiction of any agency of the United States and extends to concealment, covering up by any trick, scheme or device, and making written false or fictitious statements. This law carries a penalty of a $10,000 fine and/or 5 years imprisonment. The pilot was indicted for three violations of this law.

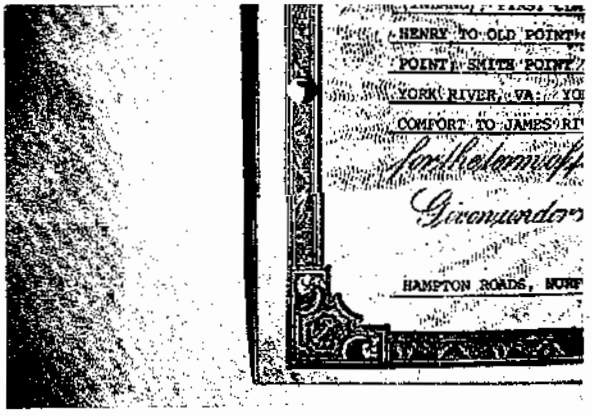
18 USC 2197 deals with misusing a federal certificate, license, or document. It prohibits altering, forging, selling, counterfeiting, stealing, printing blanks unlawfully, unlawful possession and *using a license without entitlement to it*; it is punishable by a $5,000 fine and/or 5 years in prison. He was indicted for seven violations of this law.

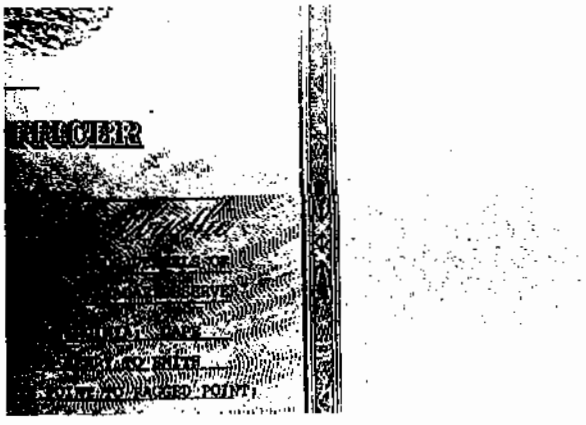
Important note for all U.S. merchant mariners: 18 USC 2197 also applies to a seaman whose license or merchant mariner's document is suspended or revoked and who, instead of surrendering the license or document, uses it to sail anyway.

A civil penalty case was prepared for his 97 violations of 46 USC 8502, a law which requires certain vessels to be directed by a pilot when underway and not on the high seas and which carries a penalty of $500 per violation or $48,500 total.

The Hunt

The hunt for this fugitive pilot involved Coast Guard Marine Safety/Marine Inspection Offices from New York to New Orleans, those in





The pilot counterfeited this license by copying his own and another pilot's license, then cutting and pasting parts of the two and photocopying the composite. Note the break line in the left border (top photo) and right border (bottom photo) and the ink darkness between the two parts. *(Photos courtesy of the author)*

the Great Lakes and most regional examination centers. When a tip was received that he was on a Great Lakes tug, a photograph and artist's conception of his suspected altered appearance were sent to each Marine Safety/Marine Inspection Office there. His name was also placed on the Coast Guard's Seaman Locator List.

Acting on another tip that he was sailing on a foreign vessel, MSO Hampton Roads used the Marine Safety Information System computer to flag the vessel when it arrived at its next U.S. port. The very next day, MSO Savannah, Georgia called -- the vessel had just arrived. The pilot's description, photograph, the artist's conception, and a National Crime Information Center computer number listing his arrest warrant were telefaxed to MSO Savannah and Coast Guard and FBI personnel searched the vessel with no success.

At the same time, Henderson, North Carolina police, acting on information from the Naval Investigative Service, surrounded a motel room used by the pilot since he fled from the Norfolk area in February 1986. A long chase, involving law enforcement officials from two states, two separate federal agencies, and dozens of Coast Guard units, ended when this 57-year-old fugitive answered a knock on his door and was taken into custody on a federal arrest warrant. He was later released on a $10,000 property bond.

The Conviction

On April 7, 1987, the pilot pleaded guilty to one count of making a false statement to an Administrative Law Judge during his license suspension and revocation hearing and to one count of misusing a federal license. In exchange, the Assistant U.S. Attorney prosecuting the case dropped the remaining eight felony charges. On June 22, 1987, he was sentenced to 2 years of imprisonment, suspended on 5 years' probation, and fined $1,200. He also surrendered his license (the equivalent of a revocation) in lieu of appearing at another suspension and revocation hearing. On September 23, 1987, the Fifth Coast Guard District hearing officer assessed a civil penalty of $3,100 against the pilot.

Prevention

How could these serious violations of law have been prevented? The pilot association that hired this man should have demanded to see his original license in lieu of accepting a photostatic copy. No one checked his real license, enabling this pilot to endanger life, property, and the environment throughout the entire Chesapeake Bay and to make a mockery of this nation's licensing laws for 2 years by piloting vessels outside the scope of his license.

Demand to see original licenses before hiring or engaging any licensed officer or pilot.

Coast Guardsman in Space

PA3 Mike Milliken

A Distinguished Flying Cross recipient who helped save 115 people from the sinking cruise ship **Prisendam** is again making history as the Coast Guard's first astronaut. On June 5, 1987, NASA named LCDR Bruce E. Melnick, 37, a helicopter pilot, to the mission specialist program. Melnick reported to the Johnson Space Center in Houston August 17 to begin a year of training and evaluation.

"I first became interested in flying while working on charter fishing boats out of Clearwater, Florida," Melnick said. "I would see Coast Guard helicopters flying by and think, 'Wow, that would be the way to go.'"

"In high school I did well enough in most of my subjects, particularly math and physics. Even though working on the boats took a lot of my time, I played football until I broke my foot in my junior year."

After high school, Melnick applied to several colleges, including three service academies. He was turned down by all three.

"I was accepted by Georgia Tech, Florida, and Florida State," Melnick said. "I figured Georgia Tech was the best academic engineering college of the three."

Melnick reapplied to the Coast Guard Academy and, during the third quarter of his first year at Georgia Tech, he was accepted.

While at the Academy, Melnick did what the doctors said he would never do because of his earlier foot injury -- he played football. His gridiron efforts earned him a place on the NCAA Academic All-American Team.

Melnick applied for flight training as a senior. Upon graduation, he was stationed aboard the Coast Guard cutter **Steadfast**.

A year went by and Melnick heard nothing about his flight training. "I started to get antsy about not getting selected for training.

After a training flight, LCDR Melnick steps from a helicopter wearing a symbol of his dream come true. *(Photo by PA3 Mike Milligan, U.S. Coast Guard)*

As it turned out, I was one of the last guys in my class to get flight training," Melnick said.

At flight training, Melnick's interest in math helped him out. "I kind of breezed through flight training," Melnick, said. In fact, after earning his wings in less than a year, Melnick also completed his masters degree.

Petty Officer Third Class Mike Milliken is a public affairs specialist in the Coast Guard's Ninth District, Cleveland, Ohio.

Since that time, Melnick has flown more than 3900 hours in support of Coast Guard missions. One of his most memorable cases was the **Prinsendam** rescue.

"We were the first helicopter on scene," Melnick said. "For the first 5 hours we provided illumination for a nearby ship to pick up people in the water. We ran out of fuel and had to return to shore. When we got back it was obvious that not all the people could be helped by the ship."

"We started to hoist people and lower them to the ship. Before it was over, we had hoisted 115 people," Melnick continued.

One position of special significance was Melnick's assignment to the H-65 test program. He was on a trip to Fort Walton Beach, Florida, to conduct atmospheric tests on the helicopter when he met his future wife, Kaye.

"It was magnetism right from the start," said Melnick. "Kaye is just the best thing that has ever happened to me. My personal life has done a flip flop since I met her."

"We went together for 3 years before getting married," Kaye Melnick added. Bruce is really a special guy. It's nice to see him reach a goal he's been after for such a long time."

"One of the toughest questions that I've been asked is why I want to be an astronaut," said Melnick. "All I can say is that I can't imagine anyone who doesn't want to be one. I can remember when the Soviets put Sputnik up and Alan Shepard, Jr., made his first suborbital flight. I like challenges. I think it would be the ultimate thing to do."

"I am a quasi-Trekkie," Melnick said. "I love watching *Star Trek* and I still watch the reruns. I'm fascinated by that sort of thing," he added.

Although many people think the memory of the Challenger shuttle disaster might deter someone from becoming an astronaut, Melnick never had a second thought. "I was in a shopping mall bookstore and someone came running in and said, 'Hey! Did you hear the shuttle just blew up?' I couldn't believe it," Melnick said. "I was shocked and thought, 'God, what a sick joke.' I walked down to a store in the mall and watched it. You know, it was kind of like getting punched in the stomach. It was a shock, a tragedy. It was like losing a member of your family.

"But it didn't affect my decision to continue. It was a tragedy, and it's a shame that something like this has to happen before improvements can be made," he said. "I feel that the shuttle is much safer now because of it. As for going up into space, I have no fear about that. There is nothing to fear. It's going to be exciting. It is the ultimate flight," he added.

"I started the application process back in '77 or '78 when the Coast Guard first participated," said Melnick. "The next time was in '85. I was selected by the Coast Guard along with five other people for consideration by NASA, and then the Challenger disaster happened. This year I resubmitted my application. The Coast Guard selected me and forwarded the application down to NASA. NASA reviewed 1,962 applications. Of those, only 117 people were asked to come to Lyndon B. Johnson Space Center in Houston for interviews. I was one of them," he said.

"There was more to the interview than just being interviewed. We were subjected to psychological, physical, and psychiatric testing. We were looked at inside and out. We were probed, jabbed, and stabbed. We gave them every sample you can think of. I don't think there is one cell in my body that hasn't been screened for this program. Even when you got in the dentist's chair, you thought you might as well take your clothes off because they were going to look at every end of you they possibly could!" he laughed.

"There was never a time that I wondered if it was all worth it. Let's face it -- the odds of any one of us getting selected were pretty slim. We knew that there were going to be a dozen to 15 people selected out of the 117 that came down for the interview. There was only a 1 in 10 chance of making it. Those aren't the best odds in Vegas," Melnick said. "The longer we were at Johnson Space Center, the more we hoped we got it."

When you look up at the night sky and see a shuttle with the familiar Coast Guard racing stripe, you'll know that LCDR Bruce Melnick is on his "ultimate flight."

Precautions When

(Reprinted with permission from Chevron Shipping Company's Safety Bulletin, *July 1987.)*

When we think of handling fuel oils, we usually think of proper operating procedures and environmental safety, but there are personal risks as well. Depending upon duration, exposure to fuels can induce short-term effects, such as an irritating rash, or more serious, long-term problems. Special precautions are therefore required to reduce the health hazards that exist when handling fuel oils.

Skin

With proper use of protective clothing on board, there is no good reason for your skin to be in direct contact with fuel oils. Even contact during maintenance of fuel systems can be reduced to a minimum by draining off and cleaning up any excess oil immediately. Bring an extra set of neoprene work gloves in case the first set becomes internally contaminated. If skin contact is unavoidable, good standards of personal hygiene must be rigorously adopted. Simply washing with soap and water and applying a skin reconditioning cream will significantly reduce inflammation and pain. Overalls and protective clothing should be changed as soon as possible after exposure, and on a regular basis. Extra care should be taken when working around heavy (heated) oils because of the possibility of burns.

Eyes

Eye contact from splashes or high vapor levels can be reduced or totally eliminated by wearing protective chemical splash goggles. However, if fuel does get in your eye(s), call for help at once. A shipmate should escort you to the nearest eye wash station and assist you in flushing out your eye(s) with water. If necessary, call for medical attention.

Using Fuel Oil

Inhalation

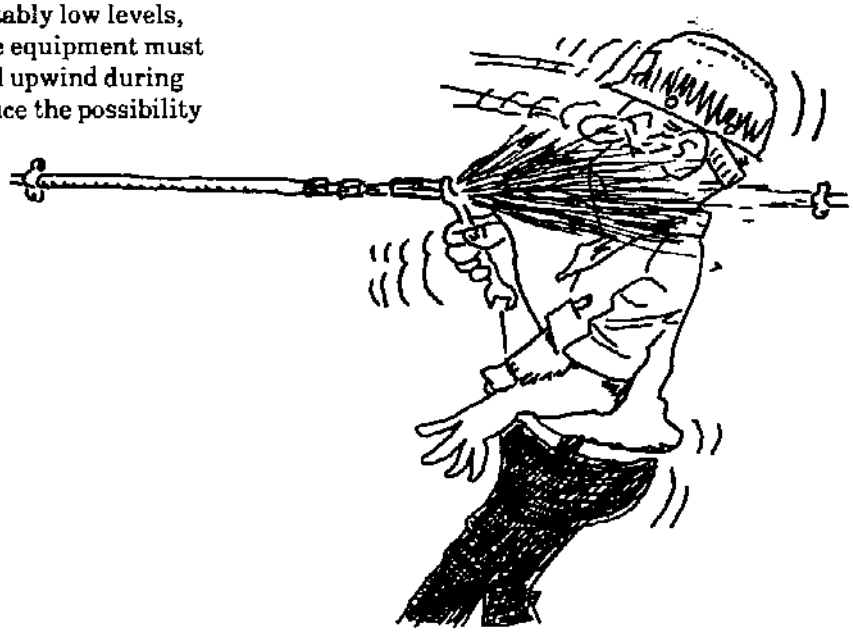
Although the adverse effects of inhaling fuel oil vapors are not fully known, there are three hazards of which you should be fully aware:

- asphyxiation, resulting from fuel oil displacement of oxygen.
- H_2S poisoning, collecting in the vapor space from heavy fuel oils.
- particle poisoning, contamination of atmosphere by fuel particles which contain harmful elements.

Most cases of vapor inhalation are due to poor ventilation in an enclosed space. Of course, all enclosed spaces, such as fuel oil tanks, must be ventilated and approved for entry in accordance with marine regulations. However, fuel oil vapor pressure will increase if the fuel is agitated or heated. Your ventilation system must account for this potential increase. Where it is not possible to maintain fuel mist and/or vapor concentrations at acceptably low levels, suitable respiratory protective equipment must be used. Finally, always stand upwind during loading of marine fuels to reduce the possibility of any contact with vapors.

Injection

Care should be taken to avoid exposing the skin or eyes to high pressure discharges of marine fuels such as those from injectors/nozzles and high pressure lines. When working on any high pressure system, be sure pressure is drained off and, if possible, isolate your work area. Pressurized marine fuel can be injected in the flesh beneath the skin or into the eyes, resulting in serious tissue destruction and blood poisoning. Wear protective clothing (boiler suit, aprons, gloves, and a face shield), and follow instructions closely, being sure that you understand the possible dangers.



Index of 1987 Proceedings Articles

ARTICLES

Vessel Names

Author Names

Chemical of the Month

Robert Kearney

Nitric Acid

In water, nitric acid (HNO_3) is one of the strongest acids. It is also known as aqua fortis, azotic acid, hydrogen nitrate, and engraver's acid. Nitric acid is transparent. It is either colorless or has a yellowish color caused by the release of nitrogen dioxide on exposure to light. Nitric acid is a fuming, caustic, and corrosive liquid. .It must be closely regulated because of its tendency to attack almost all metals.

There are two major ways of producing nitric acid. The oxidation of ammonia by either air or oxygen with a platinum catalyst creates a 60-percent nitric acid solution. The high pressure oxidation of nitrogen tetroxide, however, yields a 98-percent nitric acid solution. Either way, nitric acid is a strong oxidizing agent that is miscible with water and decomposes in alcohol.

Some common uses for nitric acid include photoengraving, steel etching, and the manufacture of ammonium nitrate for both fertilizer and explosives. The acid can be stored in bottles, carboys, and tank cars. Nitric acid is considered to be a moderate fire hazard because of the way it reacts with reducing agents. Because of this, it is recommended that nitric acid (and other strong oxidizing agents) not be stored in close proximity to reducing agents.

Nitric acid is highly toxic by inhalation. It is corrosive to the skin and mucous membranes of the eyes and the respiratory tract. It is also extremely corrosive to the teeth. Nitric acid vapor, when inhaled, will burn the nose and throat and cause breathing difficulty or loss of consciousness. The explosion hazard for nitric acid is slight. It could possibly explode on contact with a powerful reducing agent. Nitric acid is dangerous when heated to decomposition; in this state it emits fumes of NO_x and hydrogen nitrate.

In the event of a nitric acid spill, avoid contact with the liquid and vapor. *Keep people away from the area.* The discharge should be stopped as soon as possible, and anyone going near the area should be wearing a chemical protective suit with a self-contained breathing apparatus. The spilled material should be removed, and the local health and pollution control agencies should be notified as soon as possible.

On exposure to either nitric acid or nitric acid vapor, the first step is to get medical aid. Move the victim to fresh air and give oxygen if breathing is difficult. Administer artificial respiration if breathing has stopped. If the victim has come into contact with nitric acid, remove contaminated clothing and flush the affected areas with plenty of water. If nitric acid happens to splash into the eyes, hold the eyelids open and flush with as much water as possible. Should nitric acid be swallowed, have the victim drink water or milk.

In the event of a nitric acid-related fire, water should be used as the extinguishing agent. Keep in mind that nitric acid, when heated, may release toxic vapors.

For shipping, nitric acid is to be treated as both an oxidizer and a corrosive material. When it is being shipped by railway, a white label is required. By air, the container must have both an Oxidizer label and a Corrosive label. It is

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Robert Kearney was a Fourth-Class Cadet at the Coast Guard Academy when he wrote this article. It was written under the direction of LCDR J.J. Kichner for a class in hazardous materials transportation.

never acceptable to ship nitric acid on passenger planes.

Chemical Name
Nitric acid

Formula
HNO_3

Synonyms
aqua fortis
hydrogen nitrate
engraver's acid

Physical Properties
boiling point: 88.9°C (192°F)
freezing point: -45.6°C (-50°F)
vapor pressure:
20°C (68°F) 7.1 mmHg
46°C (115°F) 3.6 psia

Threshold Limit Value
time weighted average: 2 ppm
short-term exposure limit:
15 ppm for 5 minutes

Flammability Limits in Air
nonflammable

Combustion Properties
nonflammable

Densities
liquid (water = 1): 1.49
vapor (air = 1): 2.17

U.N. Number: 2031

CHRIS Code: NAC

Cargo Compatibility Group: 3 (Nitric Acid)

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:

Engineer

1. For use in boilers aboard ship, flash point of fuel oil may be exceeded when _____.

A. necessary to transfer fuel
B. firing under maximum load
C. smokeless operation is desired
D. required for proper atomization

Reference: NAVPERS 10535-F, Boiler Technician 3 & 2

2. Fire main outlet valves or hydrants shall be installed _____.

A. in screened enclosures in all passageways
B. where they are protected from the weather
C. in a protected location to prevent cargo damage
D. pointing downward or horizontal to prevent hose kinking

Reference: 46 CFR 95.10-10(f)

3. An 8-cylinder, air-started, two-stroke, direct-reversing marine diesel engine can be started from any crankshaft position only if it has _____air starting valves.

A. each upper cylinder head equipped with reversible
B. a minimum of five cylinders equipped with
C. at least three cylinders equipped with
D. the cylinders on opposite ends equipped with

Reference: Maleev, *Diesel Engine Operation and Maintenance*

4. An electrical component is connected across at 120 volt 60 hertz AC supply. What is the current drawn by the component if the impedance is 200 ohms?

A. .01 ampere
B. .06 ampere
C. 1.67 amperes
D. 100 amperes

Reference: Hubert, *Preventive Maintenance of Electrical Equipment*

5. A sudden increase in lube oil pressure for the main turbine would indicate _____.

A. a leak in the gravity tank
B. dirt clogging the system
C. a leaking lube oil cooler
D. excessively cool lube oil

Reference: NAVPERS 10524-C, Machinist's Mate 3 & 2

Deck

1. Which of the following is required to be stenciled at the heel of a cargo boom?

A. Maximum angle of elevation permitted.
B. Date of the last quadrennial test.
C. Safe working load.
D. Maximum load when doubled up.

Reference: 46 CFR 91.37-45

2. Which of the following statements concerning the carriage of containers is true?

A. The chief mate and master of a container ship should have the proposed stowage plan ready for the stevedore upon arrival in port.
B. When stowed on deck of a breakbulk ship, the bottom of the container must be evenly supported throughout.
C. With tiered containers, a 40-foot container may be stowed on top of two 20-foot containers.
D. Deck load calculations must take into account the square footage of the entire container bottom.

Reference: *Thomas' Stowage*

3. Using a safety factor of 6, determine the safe working load of manila line with a breaking stress of 8 tons.

A. .75 tons.
B. 1.25 tons.
C. 1.33 tons.
D. 8 tons.

Reference: Sauerbier, *Marine Cargo Operations*

4. Which material makes the strongest mooring line?

A. Dacron
B. Manila
C. Nylon
D. Polyethylene

Reference: *American Merchant Seaman's Manual*

5. One major advantage of the load-on-top system is that _____.

A. oil that was previously lost is recovered
B. discharge time is significantly reduced
C. corrosion within the cargo tanks is reduced
D. multiple-product ships can use it without contamination problems

Reference: Marton, *Tanker Operations*

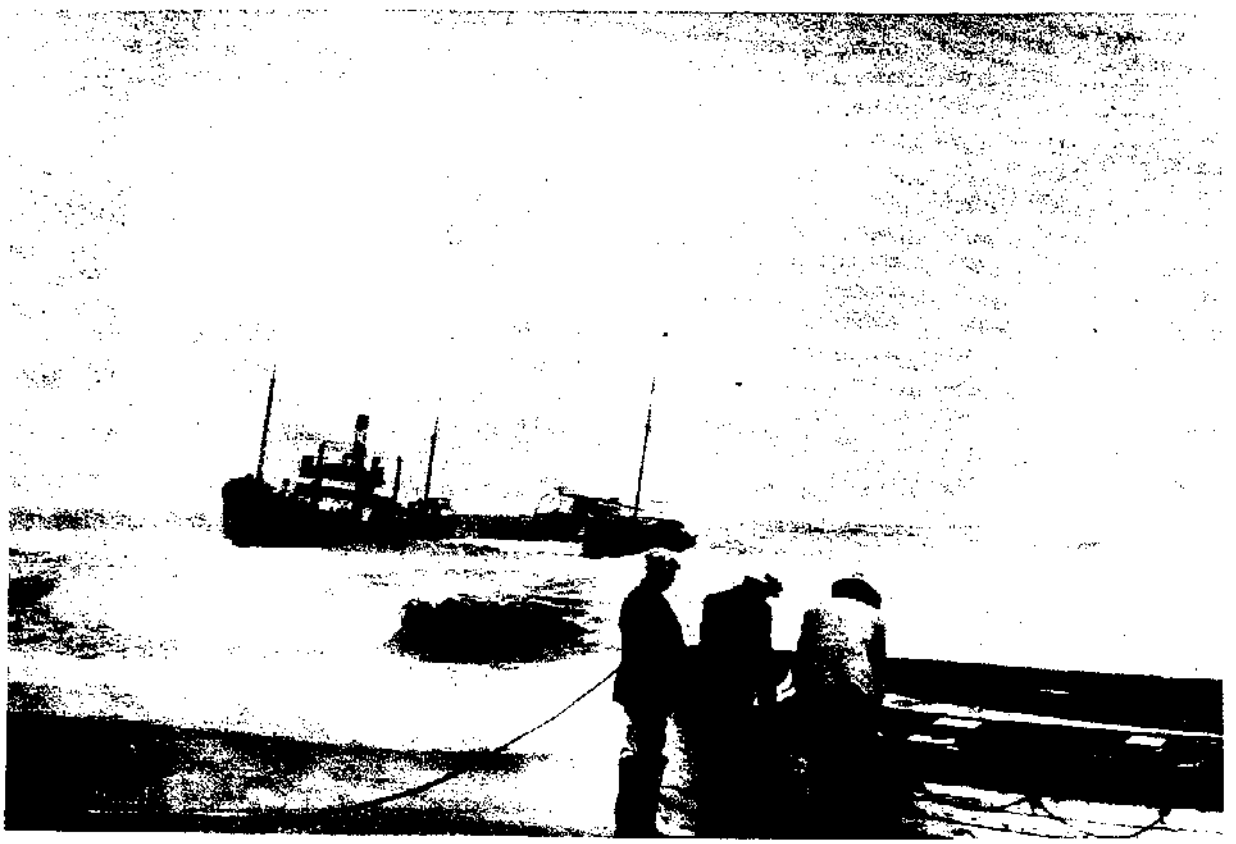
Answers

Engineer
1-D; 2-D; 3-C; 4-B; 5-B
Deck
1-C; 2-C; 3-B; 4-C; 5-A

If you have any questions concerning "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.

Shipwrecks!

The Swedish steamer **Carl Gerhard** stranded on the coast 2 miles from Kill Devil Hills station, North Carolina, on September 23, 1929. The crew of 22 was saved by Coast Guard shore units by means of a breeches buoy apparatus. The vessel became a total wreck alongside the SS **Paraguay** which had stranded about a year previously. This picture was probably taken in November 1929, 2 months after the casualty. *(From the collection of William P. Quinn)*



Keynotes

Interim Final Rules

CGD 84-024, Intervals for Drydocking and Tailshaft Examination on Inspected Vessels (Oct. 23)

The Coast Guard is amending the intervals between drydock and tailshaft examinations by extending them in most cases for certain classes of vessels. These changes will decrease the cost incurred by the marine industry in meeting these examination requirements and harmonize the intervals with those specified by the various classification societies and the intervals currently under consideration internationally. Sections 31.10-24, 71.53-1, 91.43-1, 167-15-40, 169.234, and 189.43-1 are effective on April 20, 1988. All other provisions are effective on November 23, 1987.

Comments on these interim final rules must be submitted on or before January 21, 1988 to Commandant (G-CMC/21) (CGD 84-024), U.S. Coast Guard Headquarters, Washington, DC 20593-0001. For further information, contact LCDR Geoffrey D. Powers, (202) 267-1045.

CGD 81-059, Licensing of Maritime Personnel (Oct. 16)

The Coast Guard is amending the regulations concerning the licensing of maritime personnel and the manning of vessels. This rule modifies all of the regulations contained in Parts 10, 15, 26, 157, 186 and 187 concerning the licensing of individuals, the registration of staff officers, and the manning of vessels. This rule simplifies the license structure for ocean and inland service, deletes many trade restricted licenses and examinations, simplifies the license procedure, adds tables, charts, and flow diagrams, and redesigns the format of the regulations. It also establishes new licenses by replacing many other trade restricted licenses; furthermore, this rule revises manning regulations contained in Part 157 to reflect technological developments, the recodification of Title 46, United States Code (USC), and changes in terminology associated with merchant vessel manning. Part 157 is also relocated to Part 15 for convenience. In addition to the amendments to licensing and manning regulations, many other changes have been made in Parts 175 and 185 to conform with proper terminology, e.g., master and mate versus operator of small passenger vessels. This regulation is effective on December 1, 1987, except sections 10.205(g) and 10.207(f) which will be effective December 1, 1988.

Comments must be received by January 14, 1988. Submit comments to Commandant (G-CMC/21) (CGD 87-059), U.S. Coast Guard Headquarters, Washington, DC 20593-0001. For further information, contact Mr. Gerald D. Jenkins, Project Manager, (202) 267-0224.

CGD 81-059a, Licensing of Officers and Operators for Mobile Offshore Drilling Units (Oct. 16)

This interim final rule deals solely with the licensing of officers on mobile offshore drilling units (MODUs) and the manning of these vessels. The licensing structure implements National Transportation Safety Board (NTSB) recommendations for the establishment of personnel qualifications and manning regulations for this type of vessel. Compliance with these minimum standards will ensure that qualified individuals are on board to deal with marine safety-related matters. This rule will establish three industry-restricted licenses and five subcategories within one major class of license (the offshore installation manager) and serve as a basis for establishing minimum MODU manning requirements. These regulations are necessary to address the unique characteristics, operating conditions and procedures, service, and extraordinary chain of command and authority inherent in the offshore oil drilling industry. They are being published in conjunction with the complete revision of 46

CFR Part 10 concerning the licensing of maritime personnel under docket number CGD 81-059, which appears above. This regulation is effective on April 1, 1989, except sections 15.301 and 15.520 which will be effective on October 1, 1989.

Comments must be received on or before January 14, 1988. Comments should be submitted to Commandant (G-CMC/21) (CGD 87-059a), U.S. Coast Guard Headquarters, Washington, DC 20593-0001. For further information, contact Mr. Gerald D. Jenkins, Project Manager, (202) 267-0224.

CGD 81-059b, Licensing of Pilots (Oct. 16)

The Coast Guard is republishing its rules concerning professional requirements for pilot's licenses in a revised organization and format. This is being done to make them more understandable, and compatible with the complete revision of the rules for the licensing of maritime personnel appearing above in CGD 81-059. The new format and organization is intended to make them clearer and easier to apply.

Comments must be received on this interim final rule on or before January 14, 1988. Effective December 1, 1987. Submit comments to Commandant (G-CMC/21) (CGD 87-059b), U.S. Coast Guard Headquarters, Washington, DC 20593-0001. For further information, contact Mr. John J. Hartke, (202) 267-0217.

Final Rules

CGD 84-069a, Lifesaving Equipment, Immersion Suits (Oct. 22)

This rulemaking revises the specifications for immersion suits to bring them into accord with international standards. Vessels, the construction or conversion of which started on or after July 1, 1986, will be required to carry these new immersion suits. Other vessels may continue to carry previously approved suits, called exposure suits, as long as the suits remain serviceable. These changes will conform the regulations governing United States vessels to the International Convention for Safety of Life at Sea, as amended (SOLAS 74/83) and assure international acceptance of the new immersion suits.

These rules and the rules published on January 12, 1987 (52 FR 1185) are effective on January 20, 1988. For further information, contact LCDR William M. Riley, (202) 267-1444.

Notice of Proposed Rulemaking

CGD 87-051, Annex I: Positioning and Technical Details of Lights and Shapes (Oct. 22)

The Coast Guard is proposing to amend the regulations concerning the horizontal positioning and spacing of lights in 33 CFR 84.05(b) to include certain navigable "waters specified by the Secretary." This rulemaking is necessary to extend the application of the horizontal positioning and spacing of lights regulations in the Inland Navigation Rules to the "specified waters" and will complete making all of the "Western Rivers" provisions applicable to the listed "specified waters." This rulemaking would require power-driven vessels of 50 meters but less than 60 meters in length operating on Western Rivers as well as the "specified waters" to comply with the horizontal positioning and spacing of lights provisions of the Inland Navigation Rules.

Comments are due on or before December 7, 1987. Submit comments to Commandant (G-CMC/21) (CGD 87-051), U.S. Coast Guard Headquarters, Washington, DC 20593-0001. For further information, contact Mr. Peter S. Palmer, (202) 267-0362.

Request for Comments

CGD 87-058, Bridge-to-Bridge Radiotelephone Regulations (Oct. 19)

The Coast Guard is soliciting comments from interested persons regarding the need to amend the Vessel Bridge-to-Bridge Radiotelephone Act, and implementing regulations in 33 CFR 26.03. A perceived need exists to amend the Act, and regulations, by expanding the categories of vessels required to carry a radiotelephone to include every power-driven vessel of 20 meters or more in length. The Coast Guard expects that increased availability of bridge-to-bridge communications will reduce the risks associated with navigating in congested areas.

Comments must be received on or before December 18, 1987. Submit comments to

Commandant (G-CMC/21) (CGD 87-058), U.S. Coast Guard Headquarters, Washington, DC 20593-0001. For further information, contact Mr. Peter S. Palmer, (202) 267-0362.

Maritime Notes

DOT Sends Congress Legislation To Reform Ship Subsidy Program

The U.S. Department of Transportation has submitted to the Congress legislation to implement the Administration's proposed reform of the ship operating differential subsidy (ODS) program. The reforms would enable U.S.-flag operators to compete more effectively against their foreign-flag counterparts.

Both the House and the Senate are considering bills which would reform the ODS program. The Department previously notified the chairmen and ranking minority members of the appropriate congressional committees of its policy objectives for reform of the ODS program in a July 1987 letter. The legislation implements the objectives in that letter.

The Department's bill recognizes the need to create an environment in which our merchant fleet can compete effectively by lessening federal regulatory constraints on maritime operations. The bill provides a 1-year window for presently subsidized and unsubsidized operators to enter into a revised ODS program. It would expand their operating flexibility, improve their cash flow by expediting subsidy payments, and permit worldwide acquisition of vessels.

The reform measure would result in amended ODS contracts for existing operators, while presently unsubsidized operators would be eligible for ODS under terms of grant agreements. Both would be limited to 10 years and a maximum of 20 ship-years of operation per year. The bill would limit ODS to wage subsidy only, as determined by the most economical collective bargaining or other wage agreement negotiated.

The bill would eliminate existing trade route restrictions, enabling carriers to operate in any sector of U.S. foreign trade. In order to improve the operator's cash flow, ODS would be paid semi-monthly, instead of at the end of a voyage. No subsidy would be paid for the carriage of military and civilian preference cargoes which are reserved for U.S.-flag vessels and not subject to foreign competition.

The bill would permit ODS operators to acquire their ships abroad at competitive world prices, provided that military features are included and specifications are approved by the Department of Transportation and the U.S. Navy. The current 3-year prohibition against reflagged vessels' eligibility to carry preference cargoes would be lifted. The bill would also allow subsidized operators to own and operate foreign-flag feeder vessels.

Oral History Department Releases New Catalog

The Oral History Department of the U.S. Naval Institute has released a new catalog which offers brief summaries of more than 160 volumes of oral history transcripts. The oral history collection contains firsthand accounts by the top leaders of the Navy, such as Admiral Arleigh Burke, and the oral memoirs of lesser known officers with important or unusual careers. Volumes on World War II WAVES, the Polaris program, and prisoners of war from Vietnam are available as well.

The catalog includes recent additions to the department's collection of transcripts and an outline of the lending library, which allows individuals to borrow any volume for $12. In addition, the catalog provides a list of transcripts on naval subjects available through other institutions or organizations.

The Oral History Program was founded in 1969 by Dr. John T. Mason, Jr. Before that time, Dr. Mason had interviewed naval leaders of World War II for Columbia University, while working full-time as an Episcopal parish priest. Today, under the guidance of Paul Stillwell, author of *Battleship New Jersey* and editor of the Naval Institute's new *Naval History* magazine, the program has expanded and become more effective in preserving these autobiographies.

The cost of the new oral history transcript catalog is $3, and can be ordered through the U.S. Naval Institute, Oral History Department, Annapolis, MD 21402.

U.S. Department
of Transportation

**United States
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