Proceedings
of the Marine Safety Council

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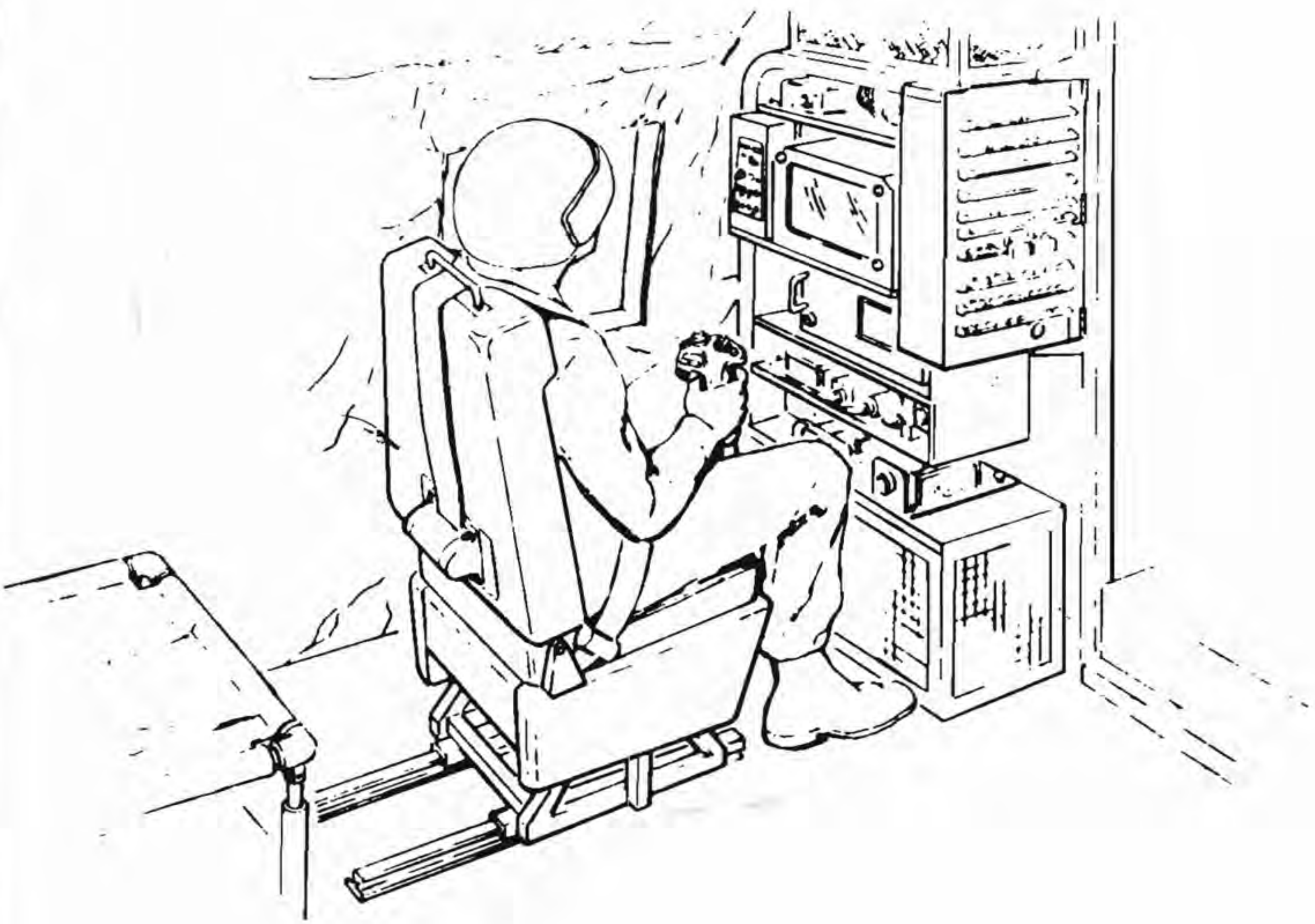
COAST GUARD SRR FLIR PROGRAM CREW STATION



Proceedings
of the Marine Safety Council

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No, this helicopter crewman isn't watching TV; he's looking for survivors of a boating accident. The Coast Guard has a new infrared sensor that creates black-and-white TV-like pictures of what it sees. For more on the "FLIR," which "sees" even at night and in conditions of poor visibility, turn to the story beginning on page 146.

Letters to the Editor

Regarding the article in the February 1982 *Proceedings*, "Retro-reflective Material Adds Extra Safety Measure to PFDs," I am in thorough agreement with Mr. Lemley's suggestion that retro-reflective material be added to the PFDs carried aboard recreational boats. It has been known for many years that reflective material increases the chances of quick rescue of individuals in the water.

I would, however, like to make a correction to the statement that "federal regulations require only Type I PFDs to be equipped with retro-reflective material." This is not quite the case, as Mr. Lemley is well aware. A quick review of the PFD requirements for uninspected commercial vessels less than 40 feet in length is in order.

Subsection (b) of Paragraph 25.25-5 of Title 46 of the Code of Federal Regulations (46 CFR 25.25-5) states that all uninspected commercial vessels not carrying passengers for hire, *less* than 40 feet in length must carry a life preserver (Type I), buoyant vest (Type II), or special purpose water safety buoyant device intended to be worn (Type III) [for every person on board].

46 CFR 25.25-15 states that all Type I, II, or III PFDs carried aboard uninspected commercial vessels must have 31 square inches of approved retro-reflective material on the front side and 31 square inches of material on the back side. If the PFD is reversible, as are Type I's, there must be 31 square inches of material on each of the reversible sides.

In short, an uninspected commercial vessel less than 40 feet in length, not carrying passengers for hire, may carry Type II or III PFDs in lieu of Type I's. But these Type II or Type III PFDs must still be equipped with retro-reflective material.

I am not aware of any Type II PFDs that are manufactured with retro-reflective material; however, some Type III's are. Apparently, manufacturers are not aware of the number of small uninspected commercial vessels, particularly fishing vessels, operating in the U.S. Nor is there published information, that I am aware of, on the proper placement of retro-reflective material on Type II PFDs (What is the "front"? What is the "back"?). An addition to Navigation and Vessel Inspection Circular No. 4-80 could correct this situation.

A further note regarding PFD lights. 46 CFR 25.25-13 requires that each PFD, except ring buoys, carried on uninspected commercial vessels engaged in ocean, coastwise, or Great Lakes voyages must be equipped with an approved PFD light, approval number 161.012.

In support of Mr. Lemley's suggestion that retro-reflective material be added to PFDs carried on board recreational boats, I would offer the following suggestion: that regulations be amended to require *all* approved PFDs manufactured after a certain date to be fitted with the required amount of approved retro-reflective material. Thus, over a period of time, as unserviceable PFDs were replaced, all vessels and boats would be carrying PFDs equipped with this proven lifesaving material.

Richard C. Hiscock
Editor-Publisher, "Safety Notes for Fishermen"
North Chatham, Mass.

Editor's note - Mr. Lemley's remarks on PFD requirements were made in the context of recreational boating. As Mr. Hiscock points out, readers should be aware that requirements are different for commercial fishing vessels.

My compliments to Mr. Daniel L. Dewell for the excellent article on the National Strike Force, "Shore Duty that Keeps You Underway," which was published in your March issue. The article not only described strike team duty but also provided good background information on NSF capabilities for use in oil spill contingency planning.

As one who spent some time in NSF coveralls "on the road again," [I was reminded by the article of] my own "sea stories," based primarily on comradeship and teamwork . . . the kind you never forget.

Hugh D. Williams
Marine Environmental Advisor
Mobil Shipping and Transportation Co.
New York

RE: "Close Encounters of a Dangerous Kind":

After reading Ron DeMello's letter reiterating the dangers of recreational boaters entering into close-quarter situations with deep-draft vessels in narrow channels or vessels unable to maneuver readily in such channels, I should like to throw in my "sea stories."

Aboard two different deep-draft ships of the same company within a year, I have also witnessed a couple of potentially disastrous situations, both of which occurred in the Elizabeth River-Norfolk area.

While standing by on the bow, we were entertained by a water skier doing figure eights just ahead of our ship, which was doing about 4 - 6 knots through the water. We all wondered if he could make 7 - 8 knots if he took a spill 50 feet or so ahead of our stem. The master and pilot of our ship at the conn must have been thinking likewise!

Then, about six months later while proceeding outbound from Norfolk, on the Elizabeth again, the classic case of a bold sailboater trying to sneak ahead of our ship (doing at least 10 knots) took place. Well, he made it! But not by much. Again, all who witnessed the event wondered how fast he could have tacked with a cockpit full of family or friends, or how soon he could have started his engine had his 5 - 10 knot breeze suddenly dropped to 0 or if he had been headed by a slight wind shift.

In both cases [it is questionable whether] any action of maneuvering by the ships would have [been effective], owing to the time lapses of only seconds in the orders given to the helmsman or engine room from the master or pilot.

I can speak from both the ship/master's side and the boater's side, as I am a keen sailboat person myself when on vacation.

The optical illusion of a large vessel moving what seems to be slowly through the water has fooled me also. With charterers aboard my 40-foot sloop during the Bicentennial tall ships parade, I was asked to maneuver as closely as possible to the Coast Guard vessel EAGLE for photos. There was plenty of sea room (between Block Island and Newport), so I figured I could get quite close. I was quite surprised to find that the EAGLE could have sailed circles around us if she had had the maneuverability. She was catching a lot of wind in her topsails on what was a light airsailing day 50 feet or so above the sea surface.

Hopefully, the public can be made aware of these situations before needless disasters occur. There is a terrible feeling of helplessness aboard the ships when these close-quarter situations occur.

Bob Damrell
Chief Mate
C/V Sea-Land Pioneer

Maritime Sidelights

IMCO Soon to Be IMO

The Inter-Governmental Maritime Consultative Organization (IMCO), a specialized agency of the United Nations dealing with world maritime affairs, is going to be renamed on May 22, 1982. On that date, IMCO will become the International Maritime Organization (IMO). This name change reflects the expanding and increasingly diverse role the agency plays. Initially, IMCO was established to consolidate the various forms of international cooperation which had developed over the years in the world of shipping. This purpose has been served well, and the organization has become a focal point for major advances in the safety of life at sea and the prevention of pollution of the world's oceans. In addition, the organization's technical cooperation program, by providing the services of numerous maritime experts, has benefited both developing and developed countries. IMCO has today evolved into an organization best described by its new name—the International Maritime Organization.

Coast Guard Personnel to Receive Humanitarian Service Medal

Coast Guard personnel, along with Navy, Army, and Air Force people, will be awarded the Humanitarian Service Medal for their efforts during rescue and recovery operations following the crash of Air Florida Flight 90 on January 13, 1982. Assisting at the Potomac River site were personnel from Coast Guard stations in the Baltimore-Washington area as well as a helicopter crew and the Atlantic Strike Team divers from Elizabeth City, North Carolina. The Coast Guard remained on the scene until January 23.

The Humanitarian Service Medal was originated in 1977 to recognize individuals who distinguished themselves by direct participation in an

Coast Guard divers search for debris following the crash of Air Florida Flight 90. Photos by Tom Gillespie, U.S. Coast Guard Photo Team

operation of a humanitarian nature. Recipients must have rendered service above and beyond normal duties to relieve human suffering. Qualifying as humanitarian operations are, for example, assistance lent following natural or man-made disasters (earthquakes, floods, hurricanes, conflagrations, etc.) or support or resettlement of refugees or evacuees. Coast Guard personnel have in the past received the medal for such efforts as their assistance following the Mount St. Helens volcano and during Operation Cuban Refugee Relief.

Fire Safety Standards for Passenger Vessels Incorporated in SOLAS 74

Section 362 (C) of Title 46 of the U.S. Code requires vessels on which U.S. nationals embark as passengers at U.S. ports to comply with the 1966 Fire Safety Standards (IMCO Resolution A.108 (ES.III)) if the vessels are over 100 gross tons and have sleeping accommodations for 50 or more passengers. The guidelines in Navigation and Vessel Inspection Circular (NVC) 1-75 directed vessel owners to submit fire control plans to the Coast Guard's Merchant Marine Technical Division before control verification examinations were conducted. The purpose of this was to permit a cursory examination of the ship's arrangement. Such a provision was necessary because the U.S. was unilaterally enforcing fire safety standards which had been adopted by IMCO but had not been ratified by a sufficient number of countries, and there was some concern that governments might not be interpreting the fire safety standards uniformly.

With the coming into force of SOLAS 1974, the 1966 Fire Safety Standards have been incorporated as Part F of Chapter II-2. Inasmuch as these standards are now part of an internationally recognized convention in force, the need for prior plan review no longer exists.

Coast Guard Headquarters will no longer conduct foreign passenger vessel plan review. Owners and operators should be advised that plan submittal is no longer required. In those cases where an application for control verification concerns a ship which does not have a valid SOLAS 1974 passenger ship safety certificate, Headquarters should be consulted on a case-by-case basis.

NVC 1-75 has been cancelled.

SNAME Sponsors Exposition

SNAME, the Society of Naval Architects and Marine Engineers, has been holding annual meetings for 89 years. Each meeting has been planned around technical sessions on the latest developments in the maritime industry.

At its 90th meeting, SNAME will be sponsoring its first "International Maritime Exposition" in conjunction with the technical program.

Further details on the meeting and exposition, which will be held November 17 - 19, 1982, at the New York Hilton Hotel, are available from the REBER-FRIEL COMPANY, 216 Goddard Boulevard, King of Prussia, PA 19406.

Petroleum/Chemical Carriers Courses Set at Maine Maritime Academy

The Maine Maritime Academy Center for Advanced Maritime Studies (CAMS) has scheduled a number of training programs of interest to petroleum and chemical carriers.

In collaboration with the College of Nautical Studies of Southhampton, England, and Wilson Walton International Limited of Croyden, England, Maine Maritime Academy will continue its series of one-week Inert Gas Systems (IGS) and Crude Oil Washing (COW) courses. The next sessions will be conducted at the Academy's new Conference Center in Castine, Maine, during the weeks of August 9 and October 18.

In collaboration with the College of Nautical Studies, the Academy will also sponsor a one-week Petroleum Tanker Safety Course during the week of August 2 and a one-week Chemical Tanker Safety Course during the week of August 16.

Additional information and registration forms are available from Mrs. Doris Ricardson, Executive Secretary and Registrar, CAMS, Maine Maritime Academy, Castine, ME 04421; (207) 326-4311, Ext. 211.

Chemsea Exhibition and Conference Scheduled

Chemsea '83 is the name that has been chosen by the General Council of British Shipping and the Chemical Industries Association for their first joint conference and exhibition.

Chemsea '83 will take place in London, England, at the Royal Lancaster Hotel from April 13 through April 15, 1983.

The purpose of the conference is to examine the present and future requirements for the safe handling and transportation of bulk liquid chemicals by sea. It will concentrate on the following broad subject areas:

- the commercial effect of national and international legislation on the chemical trade
- the maintenance of safety in onshore and on-board cargo operations; personnel safety and training
- assessement and minimization of risk
- operational pollution prevention
- contingency planning and emergency response
- the future for chemical shipping.

There will also be an exhibition of products and services connected with chemical shipping.

Further information is available from the Chemsea '83 Conference Secretariat at 30/32 St. Mary Axe, London EC3A 8ET, England.

Gastech Proceedings Available

Gastech Ltd. announces that the "Proceedings" of Gastech 81, the Eighth International LNG/LPG Conference, held in Hamburg in October 1981, are now available from its office in England. The Proceedings are an edited record of the texts of the Conference papers and some 24 hours of presentations, discussions, and panel sessions. The Conference, which drew more than 1,400 registered delegates from 52 nations, covered the main aspects of the supply, marketing, transportation, and storage technology for liquefied natural gas and liquefied petroleum gas.

Copies of the Proceedings can be ordered for £50 or the equivalent in other currencies from Gastech Ltd., 2 Station Road, Rickmansworth, Herts WD3 1QP, United Kingdom.

Gastech also announces that meeting dates have been set for the following two conferences:

Gastech 82
The Ninth International LNG/LPG Conference and Exhibition
Palais des Congrès, Paris
October 5 - 8, 1982

Ro-Ro 83
The Sixth International Conference and Exhibition on Marine Transport using Roll-on, Roll-off Methods
Svenska Mässan Stiftelse
Gothenburg, Sweden
May 17 - 19, 1983

For further information, contact the Conference Secretariat at the address for Gastech Ltd. shown above.

Coast Guard Academy to Get New Superintendent

Rear Admiral-Selectee Captain Edward Nelson, Jr., has been chosen to succeed Rear Admiral Charles E. Larkin as Superintendent of the U.S. Coast Guard Academy in New London, Connecticut.

Captain Nelson is himself a 1953 graduate of the Academy. He is presently serving as Chief of Staff in the Seventeenth Coast Guard District, Juneau, Alaska.

The change of command will take place this summer. Rear Admiral Larkin, who will be promoted to Vice Admiral, will go to San Francisco to become Commander of the Pacific Area and the Twelfth Coast Guard District. ⚓

The following items of general interest were published between February 23, 1982, and March 22, 1982:

Final rules: CGD 7-82-06 Drawbridge Operation Regulations; Broward River, Florida; Revocation, March 1, 1982. CGD 81-071 Drawbridge Operation Regulations; Little Potatoe Slough, California, March 8, 1982. CGD 5-81-09R Drawbridge Operation Regulations; Anacostia River, District of Columbia, March 11, 1982. CGD 7-82-07 Drawbridge Operation Regulations; St. Lucie Canal (Okeechobee Waterway, Florida, Ashepoo River, South Carolina, Ocowee River, Georgia), Revocation, March 15, 1982. CGD 77-028 Anchorage Grounds, Mississippi River below Baton Rouge, Louisiana, March 22, 1982.

Notices of proposed rulemaking (NPRMs): CGD 5-81-10R Drawbridge Operation Regulations; Roanoke River, North Carolina, February 25, 1982. CGD 7-82-02 Drawbridge Operation Regulations, Clearwater Harbor, Gulf Intercoastal Waterway, Pinellas County, Florida, March 1, 1982. CGD 7-82-03 Drawbridge Operation Regulations; AIWW, Palm Beach County, Florida, March 1, 1982. CGD 7-82-04 Drawbridge Operation Regulations; Hillsborough River, Tampa, Florida, March 1, 1982. CGD 2-81-04 Drawbridge Operation Regulations; Illinois Waterway, Illinois, Bridges (highway and railroad) at Pekin, Peoria, and Joliet, Illinois, March 1, 1982. CGD 82-034 Drawbridge Operation Regulations; Lagoon Pond, Martha's Vineyard, Massachusetts, March 8, 1982. CGD 13-82-01 Seattle Opening Day Yacht Parade and Crew Race, March 8, 1982. CGD 5-81-18R Drawbridge Operation Regulations; Chickahominy River, Barret's Ferry, Virginia, March 11, 1982. CGD 11-79-02 Safety Zones Around Structures on the Outer Continental Shelf, March 15, 1982. CGD 82-021 Drawbridge Operation Regulations; Genessee River, New York, March 22, 1982.

Rule extension: OST-68 Yacht Documentation Fees, March 1, 1982.

Notices: CGD 82-022 Proposed Railroad Bridge along the Bronx Shoreline of the Harlem River, New York, New York, Notice of Public Hearing, March 1, 1982. CGD 81-097 Marine Sanitation Devices, Extension of Comment Period, March 4, 1982. CGD 82-026 Notice of Qualification of Texasgulf Inc. as Citizen of the United States, March 11, 1982. CGD 82-028 Existing Tank Vessels 20,000 to 40,000 Deadweight Tons, Notice of Intent to Develop Regulations and Prepare an Environmental Impact Statement, March 18, 1982.

Questions concerning regulatory dockets should be directed to the Marine Safety Council (G-CMC), U.S. Coast Guard, Washington, DC 20593; (202) 426-1477.

* * *

Coast Guard Overseas Marine Inspection Offices to Close (CGD 82-031)

In the 1970s the Coast Guard began carrying out commercial vessel safety activities (such as inspection of new construction and conversion, as well as periodic inspection) from overseas locations. The Marine Inspection Offices in Rotterdam (the Netherlands), Kobe (Japan), and Singapore performed Coast Guard functions in Europe, Africa, and the Middle and Far East. These offices were closed April 1, 1982, and their activities reassigned as follows:

Inspection activities in the Far East, Pacific Basin, and the Indian Ocean as far as the Arabian Sea were taken over by the Marine Safety Office (MSO) Honolulu, Room 1, 433 Ala Moana Boulevard, Honolulu, HI 96813.

Inspection activities in Western Canada were taken over by MIO Seattle, 915 Second Avenue, Seattle, WA 98174.

Inspection activities in Western Mexico above 20° North latitude were taken over by MSO San Diego, 2710 Harbor Drive, San Diego, CA 92101.

Inspection activities in South and Central America, the Western Coast of Mexico below 20° North latitude, and all of the Eastern Coast of Mexico, were taken over by MIO New Orleans, F. Edward Hebert Building, 600 South Street, New Orleans, LA 70130.

Inspection activities in Europe, the Mediterranean Sea, the Red Sea, the Persian

Please enclose your mailing label when sending in a change of address.

Gulf, the Arabian Sea, and all of Africa were taken over by MIO New York, Battery Park Building, New York, NY 10004.

Inspection activities in Eastern Canada were taken over by MSO Boston, 447 Commercial Street, Boston, MA 02109.

Any company in need of overseas inspection services must apply in writing to the appropriate Officer in Charge of Marine Inspection as outlined above.

For new construction inspection overseas, the Commandant (G-MVI), U.S. Coast Guard, Washington, DC 20593, should be contacted as before.

For further information, contact LT T. P. Talbot, Jr., at the address in the preceding paragraph.

Obsolete Ring Life Buoy Specifications Revoked (CGD 80-155a, b)

Coast Guard regulations in Part 160.009 of Title 46 of the Code of Federal Regulations contain specifications for cork and balsa wood ring life buoys. Since these types of life ring buoys are no longer being manufactured, the regulations have become obsolete. In a final rule published on March 11, 1982, the Coast Guard revoked the specifications for cork and balsa wood ring life buoys and made editorial changes throughout Title 46 of the CFR to reflect this revocation. Cork and balsa wood life ring buoys may continue to be used after the revocation, as long as they are in good and serviceable condition. For further information, contact Mr. Frank K. Thompson, U.S. Coast Guard (G-MMT/12), Washington, DC 20593.

Proposed Rule on Second-class Operator Qualification Withdrawn (CGD 77-204)

In an NPRM published on May 25, 1978, the Coast Guard solicited comments on proposed regulations allowing service on vessels other than towing vessels to be credited toward qualification for the license "second-class operator on uninspected towing vessels." The proposed regulations would have allowed applicants who had experience on large ocean-going vessels to use that experience to qualify for the second-class towing license. Also, a Coast Guard-approved training course could have been used in lieu of required service on towing vessels. Comments on these proposed regulations were generally favorable.

Public Law 96-378 mandated the revision of the entire structure of merchant marine licenses. The Coast Guard felt that the project concerning second-class operators of uninspected towboats would be better handled in the overall review of licensing procedures currently underway. Thus, in a notice published March 15, 1982, CGD 77-204 was withdrawn. The comments submitted on the second-class license project will be considered in the overall review.

For further information, contact CDR Daniel E. Struck, U.S. Coast Guard (G-MVP), Washington, DC 20593.

Vessel Owners Application Requirements Eased (CGD 79-087)

In the past, vessel owners applying for a certificate of number for their vessels were required by the issuing states or the Coast Guard to furnish information on their date of birth and citizenship. The Coast Guard has now determined that the need for this information is not sufficient to justify the requirement for its disclosure and collection. States that require the information may continue to collect it. On February 25, 1982, the Coast Guard published a final rule (effective March 29, 1982) which changes regulations so that the date of birth and citizenship are no longer required information for obtaining a certificate of number.

For further information, contact Commandant (G-BEL-4), U.S. Coast Guard, Washington, DC 20593.

Outer Continental Shelf Regulations Amended (CGD 78-160)

Since the 1950s the Coast Guard has regulated fixed structures and artificial islands on the Outer Continental Shelf (OCS) of the United States. Coast Guard regulations cover inspections, construction, arrangement, equipment, operating procedures, casualty reporting, safety zones, and penalties. Their ultimate goal is to preserve life and property on the OCS. These regulations are found in Parts 140 - 147 of Title 33 of the Code of Federal Regulations (Subchapter N).

In September 1978, President Carter signed into law the OCS Lands Acts Amendment, giving the Coast Guard new responsibilities for regulating the OCS. The new law imposed requirements beyond those in Subchapter N.

On March 4, 1982, the Coast Guard published a final rule which reflects the changes mandated by the OCS Lands Act Amendment. The new regulations will ensure that foreign mobile offshore drilling units operating on the OCS meet standards comparable to those met by U.S. units. The new regulations implement provisions for the manning of OCS units by U.S. citizens and generally improving the safety of activities on the OCS.

For further information, contact LT Dennis J. Cashman, U.S. Coast Guard (G-MVI), Washington, DC 20593.

Proposals for Prevention of Oil Pollution by New and Existing Tank Barges Withdrawn (CGD 75-083 and 75-083a)

On June 14, 1979, the Coast Guard published "Proposals for Prevention of Oil Pollution on New and Existing Tank Barges." The proposals were based on a series of studies done by the Coast Guard and contained provisions for a double-hull construction standard for new tank barges designed to carry oil in bulk. Another proposal called for a phase-out of certain existing single-hull tank barges. In response to the comments submitted and the conclusions of a National Academy of Sciences study, the proposals were withdrawn on March 22, 1982. The Coast Guard will, however, continue to search for alternative methods of preventing pollution from tank barges.

For further information, contact LCDR A. Spackman, U.S. Coast Guard (G-MMT-1/12), Washington, DC 20593.

Correction

In the Keynote entitled "Is it a Bridge or a Boat?" (February 1982, page 33) concerning opening signals for drawbridges (CGD 75-237), it was incorrectly stated that the proper signal for a situation where the bridge cannot be opened or must be closed immediately is four short blasts of the whistle. The correct signal is five short blasts.

It should also be noted that a green light may be used in place of a white light for visual signaling purposes and that a long blast should be interpreted as the COLREGS "prolonged blast" (4 - 6 seconds).

Actions of the Marine Safety Council

March meeting

CGD 82-015 Casualty and Accident Reporting Thresholds

Boating accidents must currently be reported if they result in monetary damage of $200 or more. The National Boating Safety Advisory Council has recommended that the Coast Guard raise this figure. At its March meeting, the Marine Safety Council approved a work plan to increase the minimum to $500 for accidents not involving personal injury. The schedule calls for an NPRM to be submitted to the Federal Register in June. ⍊

Error in Structural Fire Protection Regulations Corrected

In 1977 the Office of the Federal Register switched from hot-metal type to a computerized printing process. In doing so, however, it inadvertently introduced numerous typographical errors throughout the Code of Federal Regulations (CFR).

Such an error was recently brought to the attention of the Coast Guard's Merchant Marine Technical Division. The headings of tables 72.05-10(f) and 72.05-10(g) in Subchapter H of Title 46 of the CFR are incorrect as they appear in the 1978 through 1981 editions of the CFR. The correct headings should be:

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The Office of the Federal Register has been requested to take appropriate corrective action. The correct headings will be restored to the tables beginning with the 1982 CFR edition.

Anyone finding a similar misprint should notify the Marine Safety Council (G-CMC), U.S. Coast Guard Headquarters, Washington, DC 20593; (202) 426-1477.

Coast Guard Testing Performance of PFD Lights

On July 2, 1979, the U.S. Coast Guard published final regulations requiring certain commercial vessels to have Coast Guard-approved PFD (personal flotation device) lights on life preservers, buoyant vests, and wearable marine buoyant devices by June 30, 1980. Navigation and Vessel Inspection Circular (NVC) 4-80 provides further information on how the lights should be used with these devices.

Before the lights are approved, they undergo a series of tests to ensure that they meet at least minimum Coast Guard requirements. In addition, a percentage of each lot of lights produced is subjected to quality control tests to determine whether the lights being produced will operate properly. Unfortunately, neither of these test programs can duplicate actual in-use conditions.

Many of these lights have now been in service for almost two years. In order to determine how well the lights withstand actual in-service conditions, the Coast Guard is instituting a voluntary program of substituting new PFD lights for PFD lights in service. Under this program, a selected vessel operator may exchange a small number of PFD lights on board for new PFD lights of the same or a similar type. The replaced lights will be forwarded to Coast Guard Headquarters, where they will be subjected to an operational test. The results of this test will be used to determine if the lights are performing adequately in service and will indicate any changes that should be made to the PFD light approval requirements.

The Coast Guard will obtain a number of approved PFD lights of various types and distribute them to certain Marine Inspection Offices (MIOs) and Marine Safety Offices (MSOs) around the country. The distribution will be made in such a way that varying climatic conditions and vessel service types will be represented.

In the course of regular vessel inspections, marine inspectors will offer to exchange new PFD lights for the old PFD lights on board the vessel. The vessels will be selected by the MIO/MSO staff in such a way that the lights replaced reasonably represent the range of inspected vessel types in that zone. The following guidelines apply to the exchange of PFD lights:

- The exchange is voluntary for the operator. The operator may decline to participate in the program without penalty.
- Both new and old lights involved in the exchange will be complete with power source.
- The operator wll not be held responsible if any of the old lights, when tested, are found to be inoperative or otherwise not in conformance with the regulations.
- If the operator agrees to the exchange, the new lights provided will be of the same type as the old lights, unless the operator agrees to accept another type of light.
- The actual selection of old lights will be made by the inspector. Selected lights and power sources should be at least one year old, but no light selected should have a power source that is more than six months past its expiration date. The selection will otherwise be random.
- The number of lights exchanged on any vessel will not normally exceed 10 percent of the number of lights on board.

When all of the new lights provided to the MIO/MSO have been exchanged for old lights, the old lights will be forwarded to Coast Guard Headquarters for examination and testing. The lights will be grouped and identified as to the inspection zone and type of vessel from which they were taken. Identification of the vessel by name is not necessary.

Any observations as to the suitability of various PFD light designs are encouraged. Comments should be directed to Commandant (G-MMT-3/12), U.S. Coast Guard, Washington, DC 20593.

A "Burning" Issue: Ocean Incineration

by Frits Wybenga
Chemical Engineering Branch
Cargo and Hazardous Materials Division

The United States currently confronts a serious hazardous wastes disposal problem. The Environmental Protection Agency (EPA) estimates that, in 1980, 57 million metric tons of industrial hazardous wastes were produced. National attention has been focused on the problems inherent in current waste disposal procedures by such cases as Love Canal in Niagara Falls and the Chemical Control Corporation fire in Elizabeth, New Jersey. At the same time, through national legislation such as the Resource Conservation and Recovery Act (RCRA), more attention is being given to the proper disposal of hazardous wastes.

Some hazardous wastes are incinerable. EPA regulations implementing RCRA requirements prohibit what was previously the most common method of disposing of such materials —putting them in landfills. High-temperature incineration with a destruction efficiency of at least 99.9 percent is one effective method of destroying hazardous wastes. The U.S. currently faces a deficiency in land-based hazardous waste incineration capacity. As public concern over potential hazards increases, creating new land-based facilities or even expanding existing ones is becoming a major problem.

Ocean incineration offers an alternative to land-based incineration. Presently, there are only two incinerator ships operating in the world. Both of these vessels operate out of Europe. U.S. experience with incinerator ships stems from the burning of U.S.-generated wastes on board the M/T VULCANUS. The VULCANUS has visited the U.S. on several occasions to burn an industrial waste, Herbicide Orange, and, most recently, PCBs.

In February 1980 an interagency work group including representatives from the Maritime Administration, the Environmental Protection Agency, the Coast Guard, and the National Bureau of Standards was convened to resolve many of the issues surrounding ocean incineration and to possibly expedite the development of U.S.-flag incineration vessels. The work group completed its report in September 1980. Among the issues considered were:

1) the environmental acceptability of ocean incineration,

2) the economic feasibility of developing U.S.-flag incinerator vessels,

3) what financial assistance the government can provide from existing Federal

programs to encourage the development of U.S-flag incinerator vessels, and

4) what regulations apply to an ocean incineration operation.

Incineration is an effective means of disposing of many ignitable wastes. Typically, these substances are predominantly made up of carbon and hydrogen and may also include such elements as sulfur, oxygen, chlorine, and nitrogen. These wastes may be burned on land or at sea. The economic advantage of ocean incineration becomes most pronounced in the burning of chlorinated hydrocarbons (carbon tetrachloride, chloroform, ethylene dichloride, PCBs, etc.). When chlorinated hydrocarbons are burned, carbon dioxide, water, and hydrogen chloride are produced. The hydrogen chloride renders the emissions from an incinerator acidic. A land-based incinerator burning chlorinated hydrocarbons would be required to "scrub," or clean, the incinerator gases in order to remove hydrogen chloride. This is a costly process requiring large quantities of an alkali material to neutralize the hydrogen chloride that is collected. The scrubbing process, in turn, also presents its own waste disposal problems.

What about the environmental consequences of ocean incineration? That question has been studied in both the U.S. and Europe. When chlorinated hydrocarbons are burned, the emissions from the incinerator may contain as much as five percent hydrogen chloride. (This figure will, of course, vary according to the amount of chlorine in the waste being burned.) The temperature of the emissions will be on the order of 1,200°C. Since the hot gases emitted by the incinerator are lighter than the surrounding air, they rise, in the form of a plume. As the plume cools, the gases become heavier and ultimately fall to sea level. In the course of rising and falling, however, the plume gases are greatly diluted by the ocean air. The plume generally touches down to sea level several kilometers away from the ship.

During a burn, an incinerator ship maintains a course which provides a relative wind which keeps the incinerator exhaust from settling on the ship. The majority of the hydrogen chloride falls into the sea within 5 to 10 miles of the incinerator ship. In the sea, the hydrogen chloride is neutralized by the buffering agents in the sea water. The hydrogen chloride is dispersed over a large area, and the effects of the hydrogen chloride entering the sea are so small they cannot be measured.

In tests with the VULCANUS in 1977, the maximum sea-level hydrogen chloride concentration measured downwind of the ship was 10 parts per million (ppm); the most frequently measured maximum values were less than 5 ppm. Concentrations of hydrogen chloride in the air more than 10 miles from the ship were reduced below detectable limits (0.005 ppm). The maximum allowable hydrogen chloride concentration for humans in a work area is 7 ppm. Short-term exposure to the low concentrations of hydrogen chloride measured at sea level poses no hazard to personnel or birds in the area.

What about the economic feasibility of developing U.S.-flag incinerator ships? Ocean incineration is an economically attractive alternative to land-based incineration because it eliminates the need to scrub incinerator emissions. A second plus is the avoidance of the costs and political difficulties involved in developing a site on land. A 1978 cost comparison between ocean and land-based incineration showed at-sea incineration to be the less costly option, at \$80 to \$91 per metric ton. Land-based incineration was shown to cost more than twice as much. Although many businesses are reluctant to divulge the volume of waste they produce, several studies have shown that there is sufficient waste to ensure the economic viability of incinerator ships devoted to U.S. service.

Although the U.S. has yet to develop an incinerator vessel of its own, the M/T VULCANUS, a European ship, has on several occasions burned U.S.-generated wastes.

Two categories of liquid waste are envisioned for disposal on board incinerator ships: the normal waste streams resulting from the production and use of organic chemicals (chemicals derived from petroleum, natural gas, etc.) and substances whose further use has been prohibited because of the potential hazard to the environment. Examples of substances in the latter category are Herbicide Orange, DDT, and PCBs. There will be a short-term need for incinerator ships for the purpose of disposing of these special chemicals; in the long run, however, the primary business of incinerator ships will be disposal of the waste streams coming from the normal production and use of organic chemicals.

Given the need for and the environmental acceptability of ocean incineration, what financial assistance is available for the development of U.S. ocean incineration vessels? The group evaluated the various Federal financial assistance programs managed by the Maritime Administration and other agencies. It was concluded that, without legislative amendments, incinerator ships were not eligible for direct subsidies; they were, however, eligible for Federal loan guarantees granted by the Maritime Administration.

Besides the financial role, what is the Federal government's role in regard to incinerator ships? The government's concerns are basically safety- and environment-related. The agencies most directly involved are the Coast Guard and EPA. The Coast Guard ensures that incinerator vessels are constructed and operated safely and in accordance with environmental requirements. It also determines whether a chemical waste can be safely carried on an incinerator ship. Since many of the liquids carried will be hazardous, the requirements applied are those for Self-Propelled Vessels Carrying Hazardous Liquids found in Title 46 of the Code of Federal Regulations, Part 153 (46 CFR 153). In some cases, however, these requirements are not relevant or do not address certain arrangements which are unique to incinerator ships. In those situations, arrangements are approved on a case-by-case basis.

Foreign incinerator ships entering U.S. waters are generally accepted on the basis of certification by the government of registry combined with Coast Guard verification of compliance with international standards. While incinerator ships are in port, the Coast Guard also has responsibility for ensuring that proper cargo transfer procedures are followed and pollution prevention requirements are adhered to. The Coast Guard is currently participating in the development of internationally recognized standards for incinerator vessels through the Inter-Governmental Maritime Consultative Organization's Subcommittee on Bulk Chemicals.

The Environmental Protection Agency has responsibility under the Marine Protection, Research and Sanctuaries Act for ensuring the acceptability of the environmental aspects of ocean incineration. Accordingly, EPA designates open ocean sites for at-sea incineration with an eye to minimizing the effects on marine life and avoiding fishery areas and regions of heavy commercial or recreational activity. A site has been designated in the Gulf of Mexico and another proposed for the North Atlantic. A third is being considered for the Pacific. For each ship, EPA approves the incinerators after monitoring test burns. It also determines the suitability of a particular waste for incineration at sea. Wastes containing radioactive materials or more than trace concentrations of heavy metals such as lead, mercury, cadmium, or arsenic are prohibited. EPA issues permits for each category of waste to be burned at sea. For certain special substances such as PCBs, the agency requires that a research burn be conducted. During a research burn, samples of the incinerator emissions are taken and analyzed for specific chemical compounds. Once it has been demonstrated that a substance can be satisfactorily destroyed, the vessel concerned is issued another permit for future burns of the special substance. The permit specifies incinerator operating requirements and a minimum destruction efficiency. EPA shares with the Coast Guard responsibility for ensuring that a burn is carried out properly. Typically, this effort might include Coast Guard overflights, ship riders, and onshore reading of data generated during the burn.

The interagency report has generated a great deal of interest in ocean incineration. Since the release of the report, a number of incinerator proposals have been brought forward. The interagency work group has since evolved into an Interagency Review Board which seeks to expedite the development of U.S.-flag incinerator vessels. The Maritime Administration is presently very close to issuing its first loan guarantee for the construction of two U.S.-flag incinerator ships. The vessels are scheduled to be completed in mid-1983 and are intended to operate out of the port of New York.

FLIR: Turning Night into Day

by LCDR Jerry L. Millsaps
Sensor Technology Branch
Systems Technology Division

"Mayday, Mayday, Mayday, this is the JOLLY ROGER. I'm taking on water! Send help fast! I'm three miles off the northeast point of Rock Island."

No more radio transmissions are heard. It is midnight. The weather is terrible—400 feet overcast, ¼-mile visibility, winds 5 to 10 knots, and seas 2 to 4 feet. The local Coast Guard radio station notifies the Rescue Coordination Center that the JOLLY ROGER is in trouble. The controller dispatches a small boat and a helicopter, but he realizes that it will be very difficult to locate a small vessel in that kind of weather. If the boat sinks, the search party will be looking for an even smaller target—people. In the cold ocean water, the boat's crew will quickly die of exposure.

But wait—there is a glimmer of hope. The helicopter has a new sensor on board. It is called "FLIR" (Forward-Looking Infrared). It is a prototype system that has been in operation only a month, and it has already located one small boat at night. There is a chance for the JOLLY ROGER. The FLIR greatly increases the probability that it will be found.

The helicopter arrives on the scene before the small boat and starts a search. The pilots are busy. One is flying the helicopter, and the other is double-checking their position. Rock Island is 1,500 feet high, 500 feet high at the shoreline. The helicopter, flying at 400 feet below the overcast, would certainly lose in a run-in with the island. When the pilots look outside, all they can see is darkness. When the searchlight is turned on, only a milky white haze is seen. But in the cabin, the crewman sits in front of a TV screen. He sees small wave action on the water. Occasionally, a sea gull lifts off from the water, frightened by the noise of the copter. The helicopter has been searching for about a half hour when, suddenly, the crewman sees an image on the TV screen. He directs the pilot to the position. The pilot flies over at 200 feet but sees nothing. The crewman sees on the FLIR monitor three persons hanging on to an overturned vessel. The pilot does a "beep," a procedure for coming to a hover over the water. The crewman directs the copter back over the capsized boat. Three lives are saved.

The scenario just described is based on an actual incident. Only the identity of the vessel and the place where the incident took place have been changed.

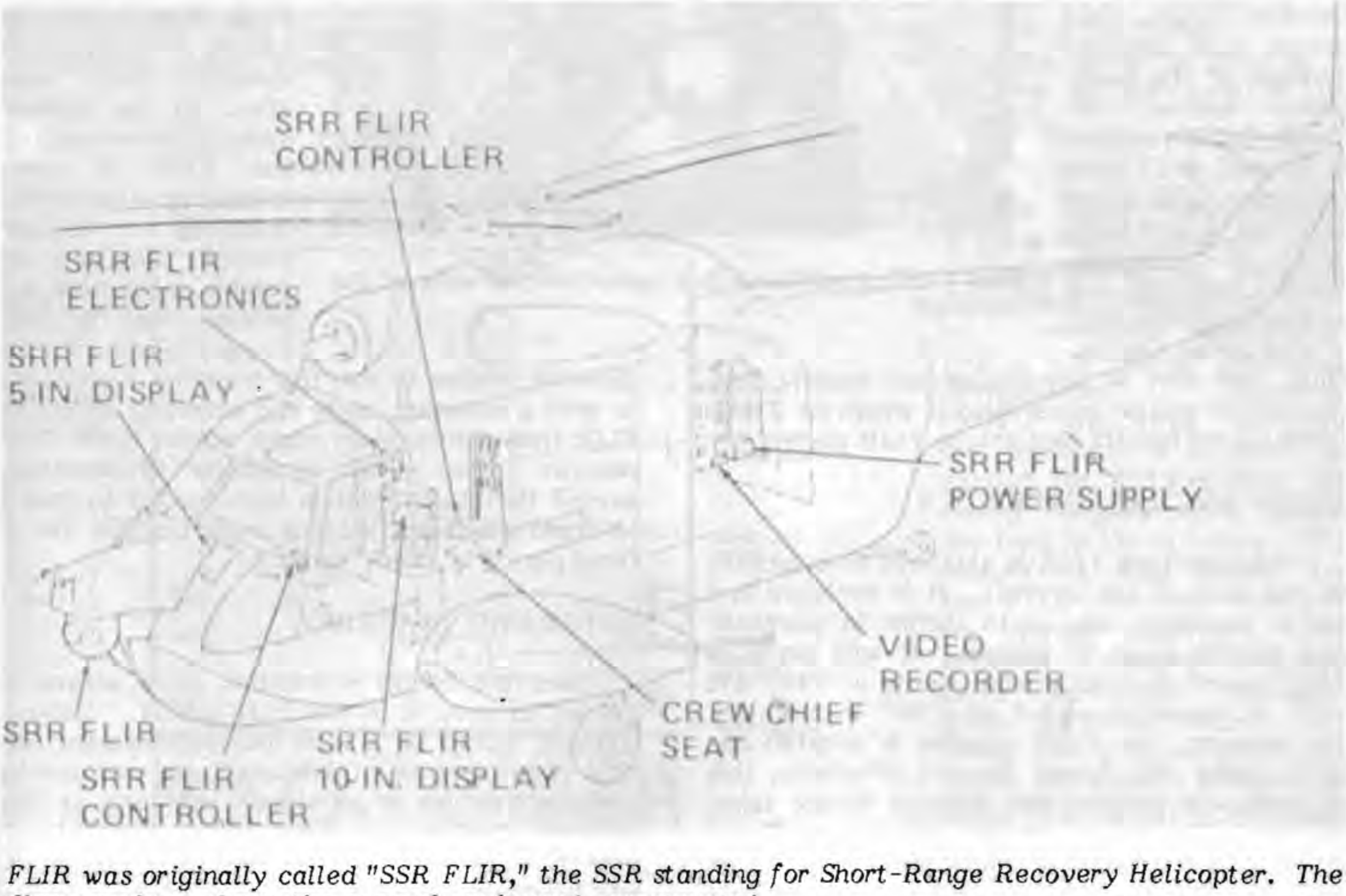
The Coast Guard has been operating a prototype FLIR since June 1981. It was installed on an HH-52A helicopter by Northrop Electro-Mechanical Division of Anaheim, California. The Coast Guard is now in the process of evaluating the FLIR to determine the feasibility of deploying it on the new HH-65A helicopter being built by Aerospatiale Helicopter Corporation of Grand Prairie, Texas.

The FLIR is an infrared sensor capable of converting what it senses into an image on a TV screen. The image is similar to a black-and-white TV picture. Because it senses heat variances in objects it sees, the FLIR "images" as well at night as during the day—sometimes better.

The Coast Guard is interested in the FLIR primarily for Search and Rescue (SAR) missions during low visibility and nighttime operations. It also plans to use the FLIR in marine environmental protection, enforcement of laws and treaties, and various other operations.

The evaluation process consists of transferring the FLIR among various Coast Guard air stations to allow the maximum number of personnel to learn of its capabilities and to determine its performance under widely varying environmental and operational conditions. The process started in June 1981 and will end in June 1982. To date, Air Stations Los Angeles and Brooklyn have tried out the FLIR. While at Los Angeles, the FLIR played a role in two rescues. One of them was the basis for the scenario depicted at the start of this article.

Air Station Brooklyn received the FLIR in October 1981. During October and November, the FLIR helicopter participated in a Probability of Detection testing program sponsored by the Coast Guard's Research and Development Center in Groton, Connecticut. The testing was designed to predict the probability of detecting objects with the FLIR in actual search conditions. The data is currently being analyzed. While using the FLIR, Brooklyn was also



FLIR was originally called "SSR FLIR," the SSR standing for Short-Range Recovery Helicopter. The diagram above shows the general equipment arrangement.

able to locate—at night—a small vessel that was overdue. In February, Brooklyn conducted cold weather and ice operations with the FLIR in the Great Lakes area, visiting Air Stations Detroit and Traverse City. Reports are that the FLIR will be valuable for finding openings in ice. Plans are to transfer the FLIR to Miami in April for evaluation in the hot and humid climate of that area.

An ideal SAR goal for the FLIR is that it search a fairly large area (10 by 20 miles) in a short period of time (2 hours) with a good probability (78 percent) of locating the target. The goal is an ambitious one and will be difficult to attain. However, the following features are designed with that end in mind:

COMMON MODULE

The Coast Guard's FLIR is a common-module design; that is to say, the main components will be the same as those in all FLIRs ordered by the Department of Defense (DOD). This design was selected because of the traditional support the Coast Guard receives in spares, etc., from its larger DOD sister services. Large numbers of common-module systems will be purchased by DOD in the near future. Thus, the cost of developing and maintaining the system will be lower than it would be if the Coast Guard had its own unique FLIR system.

The FLIR is enclosed in a turret on the nose of the aircraft.

PHYSICAL CHARACTERISTICS

The prototype FLIR is attached to a support on the nose of the aircraft. It is enclosed in a turret assembly that is 16 inches in diameter and weighs about 85 pounds. It will move at 180°/second and has gimbal limits of $+30^{\circ}$ and -80° in elevation and + or - 90° in azimuth. For stowing, the FLIR window is rotated upward under the turret support structure; this protects the optics from damage during take-offs and landings. Because most Coast Guard flying is done over the water and close to its surface, the FLIR is sealed off to guard against water damage. Complete submersion of the turret will not damage the FLIR.

FIELDS OF VIEW

Two fields of view (FOV) are provided in the Coast Guard's FLIR. The Wide Field of View (WFOV) has an elevation of 30° and an azimuth of 40°. This view is a compromise between area viewed and detail needed. The area viewed should be large enough to allow a search area to be covered in a reasonable time and still be detailed enough to show a person in the water. A second FOV is provided to give more detail. This Narrow Field of Vision (NFOV) is 10° elevation by 13.3° azimuth, which is a magnification of three and gives much better detail. The idea is to use the WFOV for location and NFOV for identification.

SEARCH TECHNIQUES

To assist the helicopter crew in locating and identifying an object, the FLIR features three different search techniques: manual, scan, and step. In the manual system, movement of the FLIR is controlled by a handgrip-mounted thumbswitch. The rate of turret movement is proportional to the force applied. If the operator wishes to use the scanning technique, he sets a scanning angle and scanning rate; the FLIR then continuously scans within these constraints. Step action is similar to scanning, except that the turret is commanded to move to fixed positions, holding each position for a fixed period of time.

AUTOMATIC TRACKING

Once the target is located, some means is needed to keep it in the FLIR's FOV. Manual tracking would be a laborious requirement for the crewmember; therefore, an automatic tracking feature is provided. As long as the selected target's contrast is 20 percent or greater than that of its background, the FLIR will maintain track.

AUTOMATIC ACQUISITION

Locating the target is the main thrust of any search. Because watching a screen can become a tedious, boring task contributing to a possible missed sighting, an automatic acquisition system is being tested. A control is provided for the selection of small to medium-sized or large targets. Once the target size is selected and the automatic acquisition is turned on, the FLIR will automatically lock on a target and track it, provided its contrast is 20 percent or greater than that of its background. This system can be used with any of the three search techniques. The results to date have been promising, but further work is needed.

POLARITY/FOCUS

Other features that the crewmember can use to assist in searching are the FLIR's ability to use either black-hot or white-hot polarity (the search objects are shown in black or white) and its ability to focus the image presented. The two polarities enable the crewmember to select the best polarity for the search conditions present. The focus mechanism provides for sharper, clearer images.

VIDEO/SOUND RECORDER

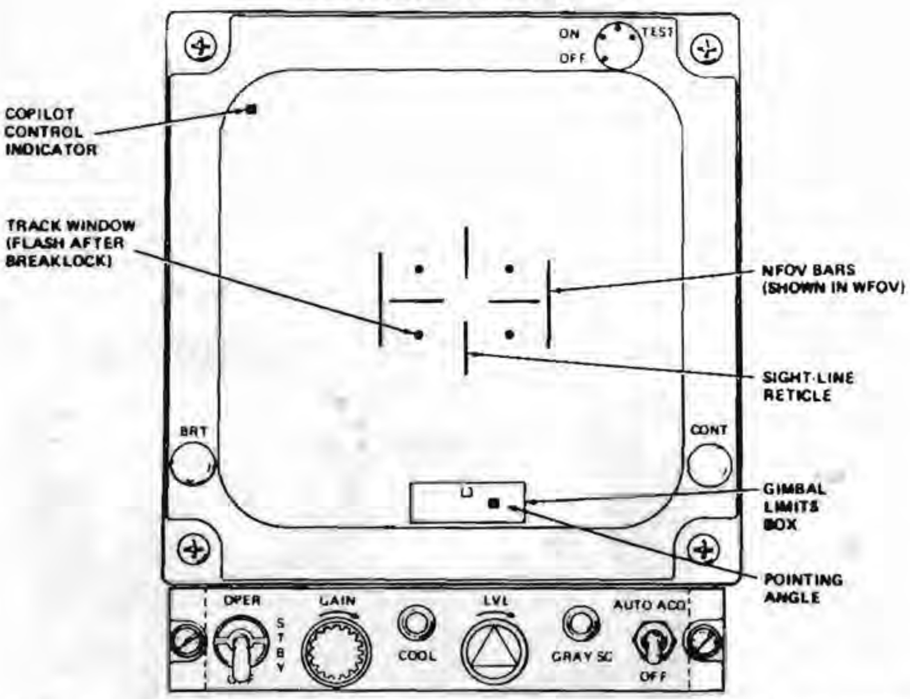
A video/sound recorder has been included to assist in the evaluation program. The tapes can be reviewed at a later time so that the quality of the FLIR can be assessed in a more relaxed, less intense environment. The tape can also be reviewed immediately on the helicopter's displays by using the playback capability of the recorder. The system provides for a signal to alert the crew to any significant sighting.

MONITORS

Two monitors are furnished for the helicopter crew. A 10-inch display is located in the cabin and a 5-inch one in the cockpit. Each monitor has its own handgrip control which enables the crewman and the copilot to manipulate the FLIR. The monitors show the following information:

1) What station has FLIR control
2) The track windows (for centering of the target)
3) NFOV limits when WFOV is selected
4) The gimbal limits of the turret
5) The direction the FLIR is pointing in relation to the nose of the aircraft.

SRR FLIR PROGRAM CONTROLS AND DISPLAY



This 10-inch monitor, located in the cabin, is one of two used by the crew to operate the FLIR.

The Coast Guard believes it has a state-of-the-art FLIR. During testing by Northrop, the values recorded for Minimum Resolvable Temperature (MRT) and Noise Equivalent Temperature Difference (NETD)—the first important for detection of targets, the second for distinguishing between targets—were among the best in the industry. This (classified) data shows that the FLIR possesses outstanding thermal sensitivity. This sensitivity, along with the features previously discussed, gives the Coast Guard confidence that a future production model will greatly enhance the chances of locating that small boat or that person in the water at night or when visibility is limited. ‡

Setting Fires for Safety

Because the Coast Guard is charged with responsiblity for the safety of life and property at sea, it has since July 1969 been conducting an active research program to determine ways of reducing the threat of fire to the marine community. The Fire and Safety Test Detachment (F&STD) in Mobile Alabama, is a unique facility dedicated solely to this purpose. As a sub-unit of the U.S. Coast Guard Research and Development Center, it supports a wide variety of Coast Guard programs, including commercial vessel safety, recreational boating safety, naval engineering, port safety and security, and marine environmental protection.

The F&STD's small size belies its impact on merchant marine safety. Consisting of an office and work and storage areas at Coast Guard Base Mobile and a field laboratory on Little Sand Island in Mobile Bay, the test facility has seen many successful research projects in its nearly 13 years of existence. The showpieces of the facility are two ships moored at the field laboratory: the A. E. WATTS, a T-2 tanker, and the MAYO LIKES, a Victory ship. These two ships are subjected to controlled destructive testing by investigators seeking ways to minimize the damaging and often fatal effects of shipboard fires.

Unlike many other engineering disciplines where small models are used to predict behavior of a prototype, fire research has not evolved to a point where an experimenter can draw reliable conclusions from small-scale modeling. Burning characteristics are difficut to model. Scaling the distances between flammable objects and the ventilation systems can result in unrealistic fire spread. It is for this reason that real vessels are used and the results of small-scale testing are used only for gross comparisons of different material and ventilation configurations.

This article will concentrate primarily on the question of how a test program is developed from conception to culmination. The impact of test programs on merchant marine safety will also be discussed.

The Fire and Safety Test Detachment has from the beginning enjoyed excellent industry-government cooperation. While research projects are *developed* by the Coast Guard, they are often *initiated* by an outside party and include several participants. Project proposals are evaluated for their value to the marine industry and the fire protection community, their completeness, and the practicability of using the full-scale facilities. The applied research involves developing, testing, and/or evaluating fire protection concepts, techniques, and equipment to assess their suitability for

An aluminum lifeboat lasted less than a minute against fire.

Before and after: a berthing compartment, complete with standard shipboard furnishings and personal effects.

marine use. All research has the objective of protecting life and property. This goal is also the basis of government and industry cooperation.

The first step in any specially designed test series is to develop a plan. A Coast Guard Research and Development Center Test Director prepares the plan, which includes a synopsis of the information leading to initiation of the project, the reasons for a particular test, project objectives, and alternative approaches to meeting project objectives. There are also sections of the test plan which describe instrumentation, test preparation, and safety precautions. If industry participates in the test, which is often the case, the test plan is prepared in conjunction with the interested parties.

Once the test plan has been approved, F&STD personnel (currently a Chief Warrant Officer and a civilian supervisor) begin the arduous task of preparing for the test. The key to successful test preparation is the teamwork of the personnel assigned to the F&STD. The storekeeper purchases the varied and unusual equipment and supplies. Typical shopping lists include thermocouples, gas analyzers, radiometers, calorimeters, and load cells. The status of contracted work is monitored to ensure compliance with the contract's specifications. When items are not readily available, the assigned damage controlman and machinery technician are called upon to display their resourcefulness. Available to them are welding, sheetmetal, machine, and woodworking shops in which they can construct innovative test fixtures and equipment. Since the test ships are moored at Little Sand Island, these items must be transported across the bay, using two of the mechanized landing craft known as "LCMs." Once the two-ship "fleet" has completed the shuttling of test material and equipment to the ship, the assembly and installment of these components, as specified by the test plan, can begin.

Probably the most important equipment installed at the test site is the instrumentation used to collect data. Transducers are calibrated and installed by the electrician's mate and are used to measure pressures, temperatures, fuel loads, weights, concentrations of oxygen, carbon dioxide and carbon monoxide, wind speed and direction, heat fluxes, relative humidity, and flow rates. The voltages generated by these transducers are centrally received in an air-conditioned instrumentation trailer which must also be transported to the island by LCM. Inside this trailer are two multiplexing scanners, six digital voltmeters, one desktop computer, a system clock, and a series of data acquisition programs. Data from the transducers is switched by the high-speed scanners, read by digital voltmeters, and recorded by the desktop computer, which is capable of receiving data from 120 transducers at a maximum rate of 40 channels per second with scan intervals as short as 2 seconds. Data in graphic or numeric form can be displayed while the test is progressing to allow researchers to monitor variables of immediate interest to them. The test director can also actuate various devices such as a sprinkler or ignitor by pressing pre-defined keys on the computer keyboard. The real power of the system is found in the software. By selecting from the options presented by the computer, the operator, typing his instructions in simple English, can create tailor-made data acquisition programs.

Test day finally arrives. The participants and other interested individuals converge on the test site. What took weeks and more often months to prepare is now subjected to destructive testing, as fires are started in different test areas: berthing compartments, cargo holds, engine rooms, machinery spaces, and tank decks. Quite often this testing results in a particular display of flames and smoke, a display which usually obscures the most significant aspect of the test—the data collection for subsequent analysis at the Coast Guard Research and Development Center.

Deck fires of up to 2,500 square feet of burning jet fuel have been set to evaluate synthetic foams, which proved to be as effective as protein foams, and to evaluate automated monitors under fire conditions which make manual monitors difficult to operate. Because of problems with the reliability of automated fire monitors identified during these tests, they are not accepted for use on merchant vessels. Lifeboats and life rafts have been exposed to fires demonstrating that the life raft's protective container is reasonably effective and that the aluminum lifeboat cannot survive even a one-minute fire exposure. During a separate test, similar results were observed when comparing aluminum and steel hatch covers. Aluminum hatch covers quickly melted, while steel covers remained intact when exposed to a 1,000-square-foot fire.

A 55-gallon drum containing ethyl ether exploded when high temperatures caused internal pressure to build up.

Explosions have been purposely initiated in the 18,000-cubic-foot pump room on the test vessel A. E. WATTS. A system has been developed to suppress these explosions before they do significant damage to the ship. Explosion suppression is effected by an ultra-violet detector which sees the incipient explosion. This activates control circuitry which fires initiators. These initiators rupture a diaphragm, releasing a suppressing agent which is ejected at the flame front.

Steel and polyethylene drums containing such flammable liquids as acetone and ethyl ether have been exposed to fires. The test showed that steel drums failed at high temperatures when increased internal pressure caused the double-rolled seam at the top or bottom to unroll, resulting in catastrophic failure of the drum by jetting and exploding.

Another research project evaluated the performance of three types of light-weight nonstructural bulkhead panels when subjected to a berthing compartment fire. Each test compartment was a simulated Coast Guard cutter berthing compartment with the standard shipboard furniture and personal effects. All panels tested maintained their structural integrity. Proper support of the panels in their joiner system was found to be a vital factor in ensuring that the compartment bulkheads retained their integrity. Future testing will determine the smoke and gas production potential of other types of panels. The objectives will be 1) to rank materials by their smoke and toxic gas production characteristics and 2) to evaluate the contribution of various bulkhead-finish materials to hazards presented by smoke and toxic gases in an escape route in a typical fire situation on board a ship.

Input for the testing program comes from all areas of industry, several Coast Guard offices, and Government agencies. A Marine Fire and Safety research project is, accordingly, a combined effort. Results of the test facility's work have been instrumental in reducing death by fire at sea, reducing fire loss to vessels and cargo, reducing marine insurance rates, improving firefighting techniques, and developing new extinguishing agents, delivery systems, and warning systems. The Coast Guard Fire and Safety Test Detachment will continue to be indispensable in the effort to ensure that marine fire safety keep pace with continuing technological advances. ‡

BWI (Boating While Intoxicated)

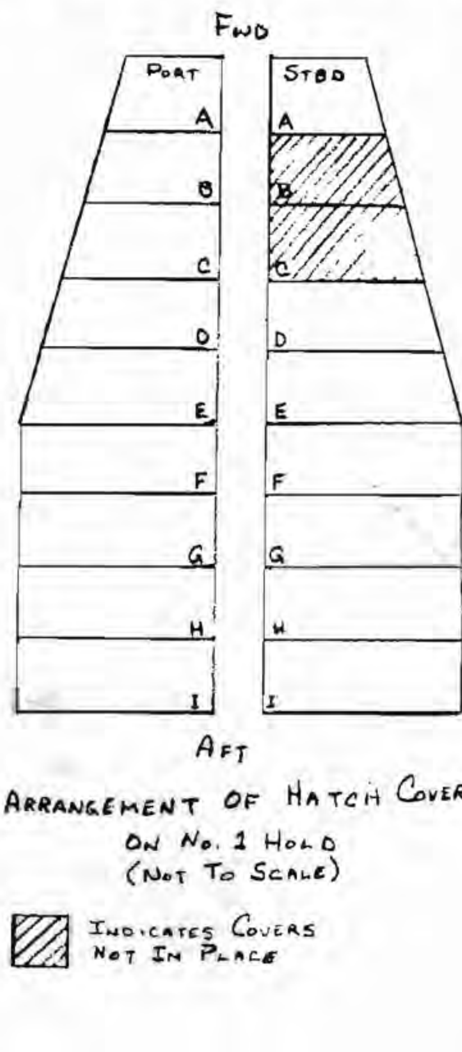
Drunk driving is a topic currently receiving broad coverage in the news media. Stories abound about the carnage on city streets and highways caused by people who attempt to drive after having had too much to drink. The following incidents do not relate to drunk drivers. They show that consumption of alcohol can be a factor in marine accidents as well.

One such incident involved a teenager whose death certificate showed that he was just a few days short of celebrating his 18th birthday. He and four friends had chartered a boat for some sport fishing. While fishing, the victim consumed a large quantity of beer and wine, as well as a half-pint of bourbon. When last seen alive, he was leaning over the starboard rail vomitting. No one actually saw him fall overboard, but his absence was discovered almost immediately thereafter. A search of the vessel failed to produce him, and an extended search of the waters the vessel was in met with the same results. The body was discovered a week later when it washed onto a beach. The autopsy report listed the boy's blood alcohol level as .35%.

Another incident occurred one night when a shore worker was helping clean a cargo vessel's hold in preparation for the loading of grain. He was standing on cover A, which was in place over the hold, while working on covers B and C, which had been moved off to the side on the main deck. The word was passed to clear the area so that cover B could be returned to place. The worker walked straight aft, falling from cover A into the hold. The cause of death listed on the death certificate was fractured skull, lacerated, contused brain, fractured ribs, and contused lungs. The coroner's report showed a blood alcohol level of .17%.

A third incident involved the master of a commercial vessel who went ashore with two crewmembers to have dinner with two local residents. The five people consumed equal portions of four bottles of wine with dinner. After dinner they stopped at a local resident's home for drinks (the master reportedly abstained during this gathering). Upon returning to the vessel, the master attempted to step onto the accommodation ladder, which was set off from the edge of the dock over a bumper cushion arrangement. He missed the ladder and fell between two black rubber fenders. An attempt was made to pass him a safety belt, but he was floating face down in the water and made no attempt to reach for the belt. The coroner's report showed drowning resulting from submersion as the cause of death. A toxicologist's report of tests on a blood sample showed a blood alcohol level of .26%.

A final incident involved a machinist aboard a commercial vessel moored at a cold-storage terminal who entered a refrigerated hold for



ARRANGEMENT OF HATCH COVERS ON NO. 1 HOLD (NOT TO SCALE) unknown reasons late one evening or early one morning. The air temperature in the hold was approximately 0°F. While he was in the hold, the machinist fell onto some boxes of meat and sustained a severe laceration of the scalp. His body was found lying on its right side in the bottom of the hold near the ladder. A flashlight was found beside the body. The steward aboard the vessel stated that the machinist had been seen in a drunken state prior to entering the hold. He died from head injuries, with exposure to the cold as a contributing factor. His blood alcohol level was .225%.

The following chart, provided by the toxicologist mentioned in one of the above incidents, shows the probable effects of various levels of alcohol in the bloodstream.

LEVEL	EFFECT
0 - 0.10%	Sub-clinical (person looks normal to casual observer). Slight changes detectable by special tests.
0.10 - 0.20%	Emotional instability--decreased inhibitions. Slight muscular incoordination. Slowing of responses to stimuli.

How much can I drink

1. and stay sober?

2. before I can expect trouble?

1. Ethyl alcohol (the kind in booze) is a depressant (a downer) and has some degree of effect in any quantity. Therefore, you can't be completely sober if you have had anything to drink recently—even though a casual observer may not be able to tell you've been drinking.

2. You are virtually guaranteed trouble if you let your blood alcohol level reach 0.08% or higher. At 0.1%, you are legally intoxicated in most states if caught operating an automobile. With good reason: your chances of being involved in an accident are 6 times greater than a sober person's. As the blood alcohol level climbs beyond this level, the probability of being involved in an accident increases very rapidly. You should definitely not operate a vessel, a vehicle, or machinery or do any dangerous work such as climbing if your blood alcohol level gets over 0.08%.

So, how many drinks is that?

This is a little tricky—it varies from one person to another. It even varies for the same person, depending on whether he is fatigued, what he has eaten, his state of health, and other factors. Generally, body weight is the best indicator. A 100-pound person can drink half as much as a 200-pound person and have just as high a blood alcohol level, which is to say the lighter person becomes intoxicated more easily.

OK, how much can I drink and not be in danger?

To count actual drinks, let's define a drink as:

1.5 ounces of 86-proof whiskey,
or 12 ounces of beer,
or 5 ounces of wine.

To reach a blood alcohol level of 0.1% (and be in legal and physical **danger**), a person need only drink the following in one hour:

100-POUND PERSON	200-POUND PERSON
3 drinks	6 drinks

Remember that the body eliminates blood alcohol slowly. Even if, in the second hour, you slow down to a third of your first-hour speed, your blood alcohol level will remain at the dangerous 0.1% level:

100-POUND PERSON	200-POUND PERSON
1 drink more	2 drinks more

In hour three, fewer drinks yet will keep the blood alcohol in the danger zone:

100-POUND PERSON	200-POUND PERSON
3/4 drink more	1 drink more

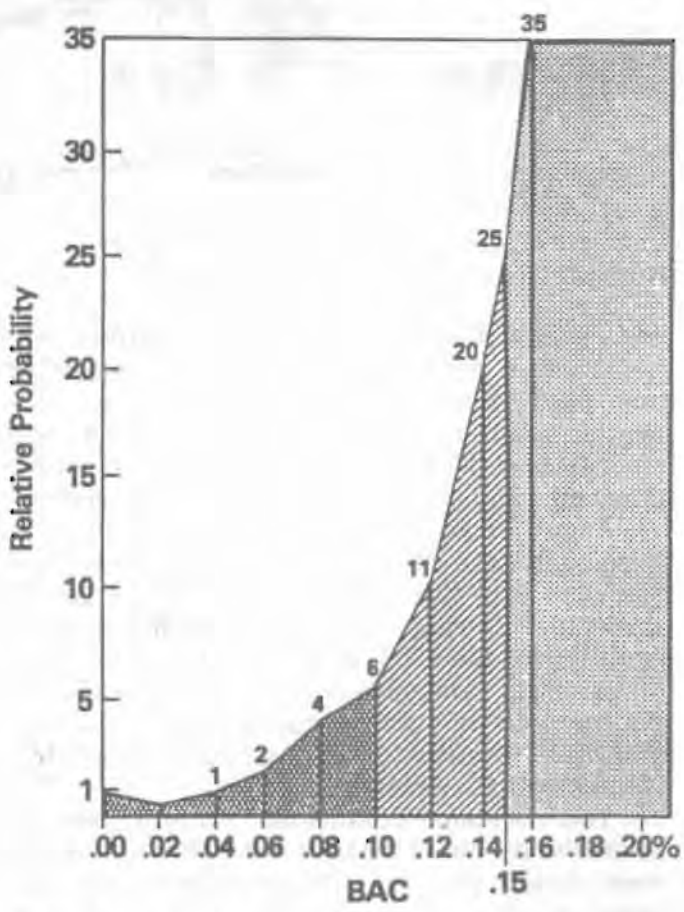
You may think you can "hold your liquor" and you may actually be better at it than some others, but don't think you are sober if you have been drinking.

0.15 - 0.30%	Confusion—disturbance of sensation. Decreased pain sense. Staggering gait, slurred speech.
0.25 - 0.40%	Stupor—marked decrease in response to stimuli. Muscular incoordination approaching paralysis. Complete unconsciousness probable at higher end of range.
0.35 - 0.50%	Coma—complete unconsciousness. Depressed reflexes. Subnormal temperature, anesthesia, impairment of circulation.
0.45% and above	Death can occur.

NOTE: Other factors can influence the effects of different blood alcohol concentrations.

The excessive use of alcohol is just as dangerous afloat as it is ashore. Impairment of one's faculties with too much alcohol can produce an extremely hazardous situation even within a relatively safe environment. Drunk boating can be as dangerous as drunk driving. ⊥

This depends on what you are doing. Anything that demands your full attention also demands that you not drink any alcohol. If you are off duty and want only to keep out of trouble, a



*This chart, put together by the National Highway Traffic Safety Administration, shows that drivers with a blood alcohol level (BAC) of .15% are **25 times** as likely to cause an accident as drivers with the a .00% BAC.*

blood alcohol level of 0.05% is a good maximum. Even this will get you arrested for driving while intoxicated in Sweden. In the State of Maryland, you can be arrested for driving with a blood alcohol level of 0.07%. It is called driving while "impaired." The following table shows the most an average person--in good health and with a full stomach, not on duty—should consider drinking (even here recognize that your chances of being involved in an automobile accident are 50 percent higher than a sober person's).

100-POUND PERSON	200-POUND PERSON
First hour:	
2 drinks	4 drinks
Second hour:	
1 drink	2 drinks
Per hour after this:	
1/2 drink	1 drink

NOTE: Never, ever mix drugs (any kind of drugs, including cold pills and doctor's prescriptions) with alcohol. Each one can multiply the dangerous effects of the other, and together they can kill you.

(The figures above were taken from "STOP DWI: New York's Response to Drunk Driving," A Report to the Senate Special Task Force on Drunk Driving, February 1982)

Rescuing a Rescue Boat

The Orleans (Massachusetts) Historical Society has had a rescue mission afoot for three years. Its mission was given a significant boost recently when an agreement was reached between the Society and the Cape Cod National Seashore. The National Seashore agreed to transfer ownership of the "rescuee" to the Society.

The "rescuee" in this case is a gold-medal-winning rescue boat, a 36-foot motor lifeboat from the Chatham Coast Guard Station known only as CG 36500.

Thirty years ago, 32 crewmembers of the T-2 Oil Tanker PENDLETON, which had broken apart in waves cresting as high as 60 feet, leapt one by one from a jacob's ladder hung over the side into the bobbing CG 36500. All 32 were brought to shore safely. So daring was the rescue that the four crewmen, Boatswain's Mate Bernard Webber, Irving Maske, Andrew Fitzgerald, and Richard P. Livesey, were awarded the gold lifesaving medal for bravery by the Federal Government. This was the first time an entire boat crew had been so honored.

The 36500 made international headlines after the rescue. It then gradually slid into obscurity, ending up abandoned and forgotten, surrounded by brush and tree growth behind the maintenance building of the National Park headquarters in South Wellfleet.

Thanks to the rescue mission, the CG 36500 is now well on its way to becoming seaworthy again. The Orleans Historical Society is restoring the boat, built by the Coast Guard in Maryland in the 1940s, to its original condition. Fred Crowell, a Harwich, Massachusetts, crane operator, lifted the boat out of the bushes onto the boat trailer of the Nauset Marine Corporation of Orleans and transported it to property belonging to the Historical Society for restoration.

One of the rescuers' first duties was to check out the diesel engine. They found that a couple of minor items (the exhaust manifold, air intake silencer, and so on) needed to be replaced, but, overall, the block, pistons, crankshaft, etc. were in very good shape. The hull was checked by a marine expert and found to be

The 36500, with the 32 survivors from the PENDLETON, returns to Chatham fish pier to meet waiting reporters and photographers on that fateful night 30 years ago. Photo by Richard C. Kelsey

surprisingly well preserved, save for the peeling paint. Now restoration of specific areas of the boat has begun. The tops of cabins, sides of the engine room hatch, and side decks are being fiberglassed with full cover from gunwale to gunwale, and certain parts are being repainted.

A projected date of completion for the mission is late May or early June of this year. The plan is to turn the CG 36500 into a floating museum. During the summer months, it will cruise in Cape Cod waters with on-board displays of its famous rescue (a large portfolio of photographs of the rescue is on file), giving visitors a chance to see a genuine fragment of Cape Cod's sea-oriented history.

The Orleans Historical Society has now launched a new campaign to build up an endowment fund. Its goal is to produce an income of about $2,000 a year for restoration, maintenance, crewing, and displaying of the famous old 36500. The fund has been named "Rescue 36500," and (tax-deductible) contributions are being accepted by the Orleans Historical Society, P.O. Box 353, Orleans, Massachusetts 02653.

Toluene Diisocyanate: $CH_3C_6H_3(NCO)_2$

synonyms:	TDI toluene-2,4-diisocyanate meta-tolylene diisocyanate
Physical Properties	
boiling point:	251°C (484°F)
freezing point:	19 - 22°C (66 - 72°F)
vapor pressure at 20°C (68°F):	0.01 mm Hg (approx.)
Threshold Limit Values (TLV)*	
time weighted average:	0.02 ppm; 0.14 mg/m^3
short term exposure limit:	none established
Flammability Limits in Air	
lower flammability limit:	0.9% vol.
upper flammability limit:	9.5% vol.
Combustion Properties	
flash point (o.c):	132°C (270°F)
autoignition temperature:	277°C (531°F)
Densities	
liquid (water = 1.0):	1.2
vapor (air = 1.0):	6
Identifiers	
U.N. Number:	2078
CHRIS Code:	TDI
Cargo Compatibility Group**	12

* The American Conference of Governmental Industrial Hygienists intends to reduce the time weighted average to 0.005 ppm/0.04 mg/m^3 and the short term exposure limit to 0.02 ppm; 0.15 mg/m^3.

** This number, found in Part 150 of Title 46 of the Code of Federal Regulations (formerly found in Navigation and Vessel Inspection Circular 4-75), tells shippers what bulk liquid cargoes can be safely carried adjacent to one another.

Diisocyanates (dye-ICE-o-SIGH-uh-nates) first became commercially important when it was discovered that combining them with polyesters yielded polyurethane, a foam that acted much like foam rubber. Polyurethanes have, in fact, essentially replaced foam rubber nowadays. Different combinations of the ingredients produce different foams with different properties. During World War II, a rigid polyurethane foam was made and used in airplanes to cut down weight and provide structural strength. Today, this same type of foam is used extensively as an insulating material because of its excellent thermoinsulating properties. Flexible polyurethane foams find wide use in such things as cushioning in furniture and car seats.

In the process originally used, the foaming action for polyurethane foam was a result of the diisocyanate's reacting with water (which was added along with the polyester) to release carbon dioxide (more on this later). Over the years, simpler and less expensive methods have been developed to produce polyurethane.

The word "isocyanate" refers to a chemical group consisting of nitrogen, carbon, and oxygen and in which there is a double bond between the nitrogen and the carbon and a second double bond between the carbon and the oxygen. The group's usefulness derives from the relative instability and hence reactive nature of the double bonds. The first organic isocyanate compounds were prepared by Charles-Adolphe Wurtz, a noted French organic chemist, in 1849. It was shortly after World War II that these organic isocyanates gained industrial popularity in a new field of plastics where they were the main starting materials. Of these isocyanates, the diisocyanates ("di" meaning two), and the triisocyanates ("tri" meaning three) are some of the most useful and versatile.

Isocyanate groups attach to many types of chemicals. When attached to toluene (TOL-yoo-een), a common chemical used as a solvent in paints and oils and a component in airplane fuel, among other things, they produce a material with the properties needed for a certain type of plastics. Toluene diisocyanate (TDI) is perhaps the most important isocyanate. Those who load packages on ships may have seen manufacturers' labels reading "2,4-TDI," "2,4-TDI (80%)/2,6-TDI (20%)," or "2,4-TDI (60%)/2,6-TDI (40%)." These denote the three general grades of TDI. The "2,4" and "2,6" are chemical shorthand used to refer to the attachment points of the isocyanate groups on the toluene.

TDI is a clear, colorless-to-pale-yellow liquid with a characteristic pungent odor. It is reactive with acids, bases (such as caustic soda, ammonia, or amines), and alcohols. It also reacts with water, as mentioned above, generating carbon dioxide. This is a slow reaction but an important one to prevent during shipping. The generation of the gas can lead to overpressurization of closed containers, such as drums. On board tank vessels this problem is avoided by requiring PV (pressure-vacuum) valves and a dry, inert atmosphere, such as a nitrogen blanket. Drums and tankcars and trucks are generally protected with a nitrogen blanket, as well.

TDI's aforementioned reactions with acids, bases, and alcohols can be violent and can generate heat. This can lead to an increase in the TDI vapors being generated. Overexposure to the vapors of TDI can result in watering of the eyes, damage to mucous membranes, and constricted breathing, similar to asthma. These effects may not be felt until several hours after exposure. In some individuals, a sensitization to TDI results from exposure. This results in increased severity of the effects felt by these people at subsequent exposures to even relatively minute amounts.

There may be no warning sign that TDI vapor is present. Although it is true that the chemical has a pungent odor, the "odor threshold," the minimum amount detectable by the human nose, is considerably higher than accepted exposure limits. If you can smell it, you are overexposed. In cases of inhalation exposure, remove the victim to fresh air. Give artificial respiration if necessary.

Contact with liquid TDI can result in serious eye irritation and transitory damage to the cornea. It also causes skin to turn a brownish color and can lead to the development of contact dermatitis. *In cases of splashes or skin* contact, remove contaminated clothing or shoes. Immediately flush the eyes, if affected, with running water for at least 15 minutes. If TDI is spilled on the skin, wash with rubbing alcohol followed by soap and water. Wash clothing and decontaminate shoes before using again.

In cases of ingestion (swallowing), do not induce vomiting. Have the victim, if conscious, drink large amounts of water to reduce the corrosive action of the ingested TDI.

In all cases of overexposure, seek medical attention immediately.

Protective equipment for workers handling TDI includes safety goggles or face shields, rubber or PVC gloves, coveralls, and fresh-air breathing apparatus.

Emergency protective equipment includes self-contained breathing apparatus, full-body water-proof suits, fitted long-sleeve rubber or PVC gloves and boots, and head protection.

The U.S. Coast Guard regulates toluene diisocyanate in Parts 151 and 153 of Subchapter O, Title 46, of the Code of Federal Regulations (CFR) and classifies it as a Cargo of Particular Hazard (COPH). The U.S. Department of Transportation, in Title 49 of the CFR, classifies TDI as a Poison B hazardous material. IMCO, the Inter-Governmental Maritime Consultative Organization, regulates TDI in its chemical code as a Chapter VI cargo and also classifies it as a Category B pollutant.

Space necessarily limits a more in-depth treatment of TDI. Those desiring more information and/or a more complete treatment of the handling of TDI are urged to contact the International Isocyanate Institute, Inc., 71 Elm Street, P.O. Box 1268, New Canaan, CT 06840, and request Brochure #1, "Technical Information—Recommendations for the Handling of Toluene Diisocyanate (TDI)."

Hazard Evaluation Branch
Cargo and Hazardous Materials Division

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. Fires of combustible metals (such as magnesium) are labeled Class

A. A.
B. B.
C. C.
D. D.

REFERENCE: MTAB Firefighting Manual

2. Which aid is NOT marked on a chart with a magenta circle?

A. Radar Station
B. Radar Beacon
C. Radio Direction Finding Station
D. Loran Station

REFERENCE: U.S. Chart No. 1

3. On stud-link anchor chain, it has been estimated that the addition of the stud increases the strength of the link by

A. 10 percent.
B. 20 percent.
C. 33 percent.
D. 50 percent.

REFERENCE: A.M.S.M.

4. The valve on the discharge side of a cargo pump on a tank vessel will usually be a

A. gate valve.
B. butterfly valve.
C. globe valve.
D. globe check valve.

REFERENCE: Marton, TANKER OPERATIONS

5. You are in charge of a power-driven vessel at night, and you sight the red, green, and white light of another vessel right ahead. You should

A. alter course to port and sound one short blast.
B. stop the engines.
C. reverse the engines and sound three short blasts.
D. alter course to starboard and sound one short blast.

REFERENCE: CG-169, RULES OF THE ROAD

ENGINEER

1. The quantity of heat that is required to raise the temperature of one pound of material $1^{o}F$ is called

A. specific heat.
B. adiabatic efficiency.
C. latent heat.
D. sensible heat.

REFERENCE: P.N.E. NAVPERS

2. Which condition could cause cylinder relief valves on a large diesel engine to lift?

A. Plugged injector nozzles
B. Excessive fuel injection
C. Very late fuel injection
D. Incorrect crankshaft clearances

REFERENCE: Eng. 3&2 NAVPERS

3. To minimize the formation of carbon deposits on fuel injection nozzles, you should

A. avoid using liquid-cooled nozzles whenever possible.
B. avoid low cooling-water temperatures.
C. avoid prolonged overloading of the engine.
D. make certain the gasket seal between the nozzle and cylinder head is tight.

REFERENCE: Stinson

4. A centrifuge can be used to remove which contaminant from lube oil?

A. Kerosene
B. Soluble acids
C. Carbon particles
D. Antioxidant additives

REFERENCE: Osbourne 1

5. Early fuel injection is indicated by which set of conditions?

A. Loss of engine power and high exhaust temperature
B. Higher than normal firing pressure and low exhaust temperature
C. High fuel consumption and high exhaust temperature
D. Lower than normal compression pressure and high exhaust temperature

REFERENCE: Maleev

ANSWERS

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

Question No. 1, DECK section, of the March issue's Nautical Queries is no longer valid, since the markings on the buoys used in traffic separation schemes now consist of horizontal orange and white bands.