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Proceedings

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July-August, 1995 *Vol. 52, No. 4*

Special survival systems issue

Lifesaving systems . . .

We hope they are never needed.

By RADM James C. Card

"Prevention is our strategy for safety at sea." That was the first sentence of my introduction to the November-December 1994 issue of the *Proceedings*, which was dedicated to the maritime industry.

Most of our work is directed toward accident prevention. Internationally, we strive to ensure that standards for ship design, construction, equipment, management, operation and personnel will provide a safe marine transportation system. We carefully inspect the ships in the United States fleet and conduct port-state control examinations on the foreign flag ships that call at our ports to make sure that the standards are met.

Even though we are making real progress in preventing maritime accidents, it is not possible to design out every hazard or eliminate all human errors. Equipment will fail. Mistakes will be made. Weather forecasts will not always be correct. We still need to prepare for accidents and to ensure that the ship and its crew respond properly.

One way to respond to an accident at sea is to abandon ship. In this issue of *Proceedings*, we have invited manufacturers and others in the lifesaving industry to describe some of the systems that are available today to save lives when a ship is lost.

Lifesaving systems

Lifesaving systems present a special challenge for designers, operators and the Coast Guard. No one wants to believe that they will ever have to be used, and, in fact, they rarely are. Nevertheless, a new cargo ship will carry several hundred thousand dollars worth of lifesaving systems. On a large passenger ship, the investment is in the millions of dollars.

Time and money must be spent to maintain this equipment so that it is ready to use at any time. Then, when lifesaving systems are needed, we expect small boats and inflatable "rubber" rafts to survive conditions that the ship could not.

As you will see after reading the articles in this special *Proceedings* issue, innovation continues in lifesaving systems as in other ship devices and procedures.

New lifesaving systems are more effective in harsher conditions, and, in some cases, less expensive than those they replace. Research and development efforts continue to define the characteristics of free-fall lifeboats, and to create computer-aided design and evaluation tools for life jackets.

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Photo courtesy of Stearns Manufacturing Company.

While we hope they are never needed, lifesaving systems are, like the Coast Guard motto, *"Semper Paratus,"* — always ready.

And when all else fails, and it becomes necessary to abandon ship, there's comfort in knowing that lifesaving systems are better today than ever before.

Immersion suits are demonstrated.

Our business is saving lives

By Mr. Bob Alexander

There is a United States trade association whose business is to increase public awareness of marine safety standards and equipment. The United States Marine Safety Association (USMSA) consists of more than 150 member companies and individuals who design, manufacture, service or sell marine safety equipment, or train individuals to use it.

The USMSA relies on a strong committee structure, Coast Guard cooperation and industry know-how to accomplish its aims through many activities.

Safety seminar

The USMSA sponsors an annual seminar to highlight different aspects of marine safety. They include life rafts, personal flotation devices (PFDs), immersion suits, emergency position indicating radio beacons (EPIRBs), man-overboard retrieval tactics, water exercises; flare tests and survival skills training.

The 1995 seminar took place in April in Baltimore, Maryland. It was held in conjunction with the Safety at Sea and Marine Electronics Exhibition, a trade show conducted by the United Kingdom-based *Safety at Sea Magazine*.

The next seminar is scheduled for summer 1996 in Kodiak, Alaska.

Immersion suits

Why have life-saving equipment on board if it does not work? The USMSA Immersion Suit Committee perceived a lack of care and inspection for the devices, and published a ten-page public service booklet, *"Immersion Suit Care and Inspection."* It informs the maritime community how to take proper care of their suits through easy-to read instructions and diagrams.

The committee will conduct a campaign to encourage mariners to have their immersion suits inspected every two years (annually if five years old and older) by a manufacturer-certified service station.

Life rafts

Working with the Coast Guard, the Life Raft Committee has developed a stickering system to identify rafts that have gone through mandatory servicing. This will facilitate identification during inspection boardings, and also reduce pirating (raft servicing by unauthorized service stations).

This committee also works with the Coast Guard to determine which safety regulations need review, and recently submitted comments on the proposed inflatable life raft regulations. Its next project is to develop a life raft information brochure similar to that produced by the Immersion Suit Committee.

Service stations

Another USMSA committee, concerned with the quality of life raft servicing, is developing guidelines to help improve industry standards. To remain a member of the USMSA, service companies will have to follow these guidelines when they are published. They will help ensure that customers receive proper service.

Training/Medical

A Training/Medical Committee acts as a forum to develop training standards. Members worked with the Coast Guard to devise a draft national standard curriculum for training on board drill instructors. This launched courses such as those conducted by the Mid-Atlantic Safety and Survival Training Association.

Future projects include developing medical standards for ships, medicine chests and first-aid kits.

Pyrotechnics

A committee serves as a source of information for USMSA members who deal with the maze of regulations regarding the shipping, handling and storage of pryotechnics (fireworks). The committee drafted a letter for association members to give to end-users and retail customers, advising them that pyrotechnics are classified as explosives. Another letter was drafted to advise purchasers and sellers of pyrotechnical products of mandatory packing requirements for shipping.

Welcome new members

The United States Marine Safety Association is growing fast, and would like to grow faster as activities increase. New members are most welcome.

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I survived!

The author.

By Ms. Shannon K. Coghlan

On a chilly evening last February, I pulled my brand new red sports car out the driveway of my single Philadelphia suburban home and began a long journey south to Norfolk, Virginia. As executive director of the United States Marine Safety Association (USMSA), I was encouraged by my board of directors to attend a safety and survival training seminar to get a better idea of what the commercial fishing industry is all about.

I figured I was due for a change of scene. I sit behind a desk all day, when I could be challenging the fearsome sea. I tell "war stories" about my public bus rides into work, when I could be struggling to right an overturned life raft.

I arrived at a historic old hotel at about 10 pm. It was dark and windy, and the sounds of the Chesapeake waters slapping the stone walls of Fort Monroe ran shivers up my spine. I was welcomed by USMSA president and instructor for the Mid-Atlantic Safety and Survival Training Association, Bob Alexander. He said, "for the next two days you are a shipmate."

The association was formed in 1994 by members of the industry specializing in commercial fishing, tug and barge, surveyor/consultants, and marine safety. Upon completion of its 16-hour "Personal Survival and Emergency Drills" course, attendees are issued official completion cards classifying them as conductors. The course is approved by the Coast Guard as meeting the training requirements for safety drill leaders of commercial fishing vessels under 46 CFR part 28.270.

Course - day one

I was greeted early the next morning by a glorious sunrise over the Chesapeake Bay and arrived promptly at my 8 a.m. class. I was one of two females in a room of 35 captains, crew mates and commercial fishermen. They puffed on long wooden pipes while inspecting their class materials with scarred, kneaded hands. They stared at me with pale blue eyes wrinkled from countless days in the sun. They no doubt wondered what a young woman with manicured nails, make-up and a $50 pen was doing there.

The first few hours were classroom sessions dealing with the seven steps to survival, how to fight hypothermia, the different varieties of flares, emergency position indicating radio beacons (EPIRBS), immersion suits, life rafts and other critical paraphernalia which can save lives in emergencies.

I learned that the most important part of survival is simply the will to live, and I learned that anything can happen when you least expect it. I heard first-hand stories from my classmates about accidents they had experienced, for example, spending 14 days in a life raft, huddling in lonely ocean waters while sharks tickled their legs, and slamming into an iceberg off the coast of Alaska.

In the afternoon, we donned bathing suits and hit the pool. The instructors helped us put on immersion suits and personal flotation devices (PFDS), and watched as we struggled to deploy a life raft. Never before had I realized the difficulty in quickly jumping into a full-body immersion suit, throwing the hood over your head and zipping it up. Next you leap suddenly into the water, feeling the suit suction to your body in uncommon places, making it impossible to swim gracefully, let alone swim to save your life.

I tugged on the hood for more air, realizing quickly that I had made a mistake, because my suit filled with water, elongating it so that I was dragging the heavy, submerged feet behind me. As embarrassed as I was, I wondered how the experienced seamen were doing. Actually, they weren't much better off. Although they all owned immersion suits, many had never tried them on. The suits were either too big or too small, and very difficult to maneuver. They discovered that they would not have been prepared if their ships had gone down off the coast of Maine in December.

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Left to right: A classmate, Mr. Bob Alexander and Ms. Shannon Coghlan.

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Next lesson - get ten individuals into the life raft, which isn't easy. My gloves kept slipping off the grab ropes and, with my feet filled with several gallons of water, I couldn't lift myself onto the ramp. Finally, a classmate gave me a huge push onto the raft.

Once inside the tiny raft, claustrophobia set in. We couldn't move. Most of us were water-logged. It was hot and hard to catch one's breath. Thank goodness, we didn't need emergency food rations. After five minutes, we were fighting for the door, clumsily climbing over one another to GET OUT! Lesson learned - I hope I never have to get into a life raft again.

After several more lessons in the pool, darkness edged in and we headed out to test some flares. We learned that flares don't always work. And when they do work, they are so bright, they blind you. Also, the slag will burn a hole right through the raft that is keeping you alive.

After about 2100 hours (I was beginning to think in military time), the instructors took us out to dinner. They said I didn't do half bad for someone who had never been on a fishing vessel.

Course - day two

After about an hour of class the next morning, we were assigned to groups of six, called crews. Each crew picked a captain, a first mate, an engineer, a cook and two deck hands. (I was chosen cook!) The captain then assigned each member of the crew duties to perform during different emergencies, such as man overboard, flooding, fire and abandon-ship. In each case, I was the "messenger," informing the captain what was happening at every stage of the emergency. This entailed running back and forth, and across the ship to assess the situation, then tell the captain (who was on the radio with the Coast Guard), and then return to see what had transpired during the last ten seconds.

When this lesson ended, we were told that we would be putting everything we had learned in the past two days to the test on board a real, live fishing boat.

And there it loomed at the end of a pier, smelling of flounder. We toured the vessel, taking inventory: a life raft, three immersion suits, three life jackets, a fire extinguisher, a life buoy and a water pump. In next two hours, every imaginable emergency took place and we responded as if our lives were at stake.

I even forgot we were at dockside. I felt the waves swelling and the ship come close to sinking. We lost a crew member over board and our captain was killed by fire. I couldn't believe it was just an exercise.

Later, during debriefing in the classroom, I looked around the room. Were these the same people I had met the morning earlier? They looked the same, but somehow, to me, they were different.

After I received my card authorizing me as a vessel drill instructor, I jumped into my car and headed home to my cozy bed and yuppie neighbors. Only, I took the coastal highway instead of Rt. I-95, and thought about my classmates. They would perform the same exercises tomorrow, but they wouldn't be in a classroom and it wouldn't be make believe. They would be in the wide open sea, dipping their nets into the waters, watching and waiting for whatever would happen next. I wondered how they did it, but I know they would not have it any other way.

Ten students crowd into a raft.

Aftermath

I look at my job differently now. It is no longer just a paycheck and a window office. When I discuss Coast Guard regulations with association members who manufacture and service marine safety equipment, I remember the fishermen, the brave men on the sea who risk their lives every day to do a job they love, and put the shrimp, snapper and mussels on my seafood pescatore at my favorite Italian restaurant.

I think a little harder about how we can make their jobs easier, perhaps even save their lives. My job has suddenly become personal and very fulfilling.

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"Survivors" wear immersion suits with reflective tape. They are well prepared with a covered life raft, SART and VHF radio.

Prepare for the worst . . .
. . . a must for safety at sea

By Mr. Tom Thompson

A thriving maritime industry is an asset with considerable economic benefits. There is, however, a corresponding responsibility to safeguard that asset to ensure its long-term viability.

A growing industry needs capable, qualified people and an environment where they can perform efficiently. Most important in attracting and maintaining good crews is workplace safety. And this goes beyond simply assuring crew members that they have the minimal resources to return to port.

The International Maritime Organization (IMO) and its International Safety of Life at Sea (SOLAS) Convention set minimal requirements for safety and survival equipment and procedures. Also, as the North American Free Trade Agreement brings countries closer together, public opinion can be swift to condemn those who hold crew safety in less than the highest regard.

Expect the worst

The best way to prepare for potential emergencies is to expect the worst. There is no way to anticipate the exact circumstances of a disaster at sea. Therefore, multiple resources on which a crew can rely greatly improve survivability. In an emergency, there are two primary concerns — keeping crew members alive, and alerting search and rescue forces. If it becomes necessary to abandon ship, a crew must have reliable, effective gear, and know how to use it.

PFDs and immersion suits

Each crew member should be issued a personal flotation device (PFD) and be responsible for it — not just told where one can be found. There may not be time to get to it if disaster strikes suddenly.

In cold water areas, an immersion suit that protects the entire body from exposure is the only way to prevent hypothermia. At a minimum, a PFD or immersion suit should have light reflective tape to improve nighttime visibility, a sound device such as a whistle, a signaling mirror and a rescue light.

Light sources

Reflective material is effective at close range, but a self-contained light source can be seen over considerable distance. There are several types of light sources available. One battery-operated life vest light can activate automatically on contact with water, which can be crucial if the wearer is unconscious. A light with a water-activated battery requires minimal maintenance, has long storage life and is easy to operate.

Personal strobe lights provide maximum visibility distance.

EPIRBs

Every vessel should definitely be equipped with a float-free, category 1 406 MHz EPIRB (emergency position indicating radio beacon). If a vessel sinks, this unit deploys automatically, requiring no crew action whatsoever, and begins sending an emergency signal. Each 406 EPIRB transmits its own unique coded message to a satellite, which relays the information to the ground. If the unit is properly registered, search and rescue personnel can use that code to access a worldwide database with information about the size and type vessel, its home port, ownership and other data.

Ideally, each PFD should also be equipped with an (EPIRB). Small class B EPIRBs take up little space, yet can be a most cost-effective safety device. It is an excellent homing instrument that can be used by search and rescue aircraft.

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Life rafts and equipment

Every fishing vessel should have life rafts designed to automatically deploy and float free if a vessel sinks. There should be enough of these rafts to provide for everyone aboard without overcrowding. An overloaded raft can be unstable and could ultimately bring about a worse situation.

Life raft equipment should answer the two primary concerns in an emergency — survival and communication. Protection from the elements - hot and cold weather, wind and sun - is critical. Excessive cold or heat significantly reduces the chances of survival. Drinking water and food are important to prevent dehydration and maintain energy, and also to keep spirits high. There should be first-aid supplies for injuries or illnesses. Visual distress signals, such as flares, are needed for both day and night locating.

The time locating and rescuing crews can be greatly reduced with electronics. Every life raft should have an EPIRB backup to the ship-board unit. It can be a manually-operated class B, but a 406 EPIRB is better.

When deployed, a search and rescue transponder (SART) can alert any vessel operating a 9 GHz radar in the immediate vicinity of the emergency. A SART signal also provides a homing beacon to aid in locating a life raft. A VHF survival radio can be invaluable for contacting nearby craft, as well as communicating with on-scene rescue forces.

Several types of lights can be placed on a life raft. A high intensity strobe marker light will make it stand out in the darkness at a considerable distance. Automatically activating marker lights enable those in the water to locate a raft. Small utility lights help to illuminate a raft's interior at night. They can be powered by conventional long-life lithium batteries or water-activated cells.

Advantages of water-activated cells include the fact that they don't produce toxic gasses, they will not burn and they are environmentally safe.

Training and drills

Having life-saving equipment onboard will be of little use if crew members are not well versed in its operation. At least once a month, at regular intervals, ship's officers should conduct thorough drills in emergency procedures.

Crew training should cover abandoning the vessel, man-overboard recovery, fire fighting, launching survival craft, and the use of PFDs and immersion suits, as well as electronic devices. Survivability depends on being able to operate these items instinctively.

Drills also provide an opportunity to check the operational readiness of equipment. Besides regularly making sure that everything works, a record should be kept on all battery-operated items to keep track of replacement times.

"Survivor" in immersion suit holds a personal EPIRB in one hand and a VHF survival radio in the other.

Conclusion

Education, preparation and prevention can go a long way towards crew safety. Knowing what to do, having the right resources available and being aware of potential problems can help a fishing vessel - or any vessel - crew prepare for the worst.

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Making way at six knots.

Safe escapes for offshore workers

By CAPT George L. Beatty

Background

America had a 25-year head start on the North Sea in recovering oil and gas through offshore operations. A United States company, Whittaker Survival Systems Division, guided by the Coast Guard, designed the first totally enclosed motor-propelled survival craft for offshore rigs and production platforms.

The original offshore survival system consisted of a cantilevered davit and boarding platform which allowed the circular lifeboat, or capsule, to descend directly into the sea on a single wire cable.

Throughout the early 1970s, several hundred Coast Guard-approved capsule systems were installed on both drilling rigs and platforms.

Offshore workers do not regard themselves as seafarers. They go offshore on a helicopter and have every expectation of returning to the beach safely by the same transport. However, when things go wrong offshore, when flames hit the sky, and the sound of running feet are heard on deck, the workers are more than pleased to use a survival system that includes a capsule.

When evacuating a rig or platform, as opposed to a ship, there is a real danger in rough seas of a lifeboat getting swept under the offshore structure when it is launched. The unique ability of the capsule to "turn-on-a-dime" gives it the essential maneuverability.

Today

As of now, more than 2,000 Coast Guard-approved capsule systems have been installed in offshore rigs and platforms in more than 30 countries. For example, the offshore production fields of Saudi Arabia, Qatar, Malaysia and Chile chose American-designed, manufactured and Coast Guard-approved single-cable launched capsule systems as their standard.

In more than 50 emergency incidents, over 1,500 individuals have been safely evacuated using the system under conditions including fire, blowout and sinking in rough weather.

The circular capsule of the 1970s gradually evolved into the oval-shaped capsule of the 1990s. It not only meets today's regulations, but it has been designed and modified to meet human factors engineering requirements. Basically, this means making the capsule "user friendly." Space and comfort boost a person's confidence in the stress of an emergency.

Decals and gauges match those on the offshore structure. The helmsperson can easily reach all steering and engine controls, and is provided with 360-degree vision through four double-pane windows.

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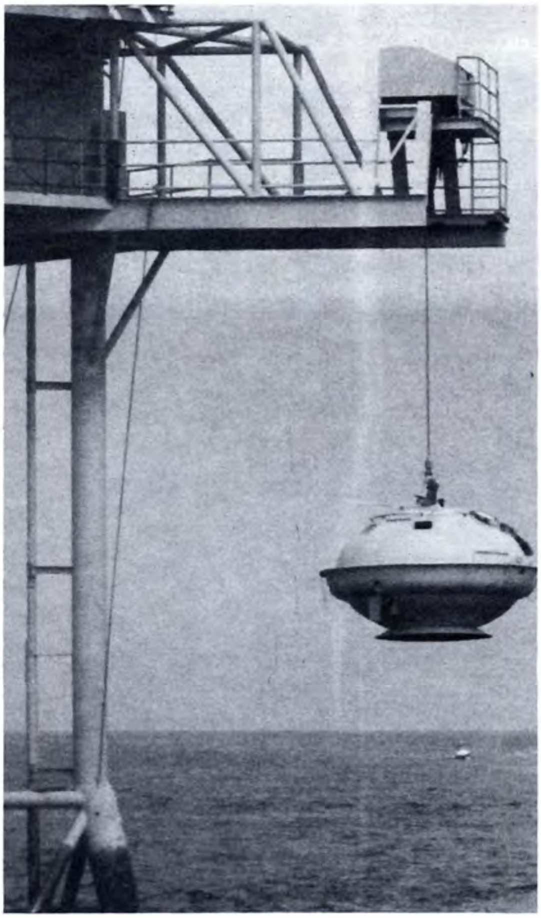
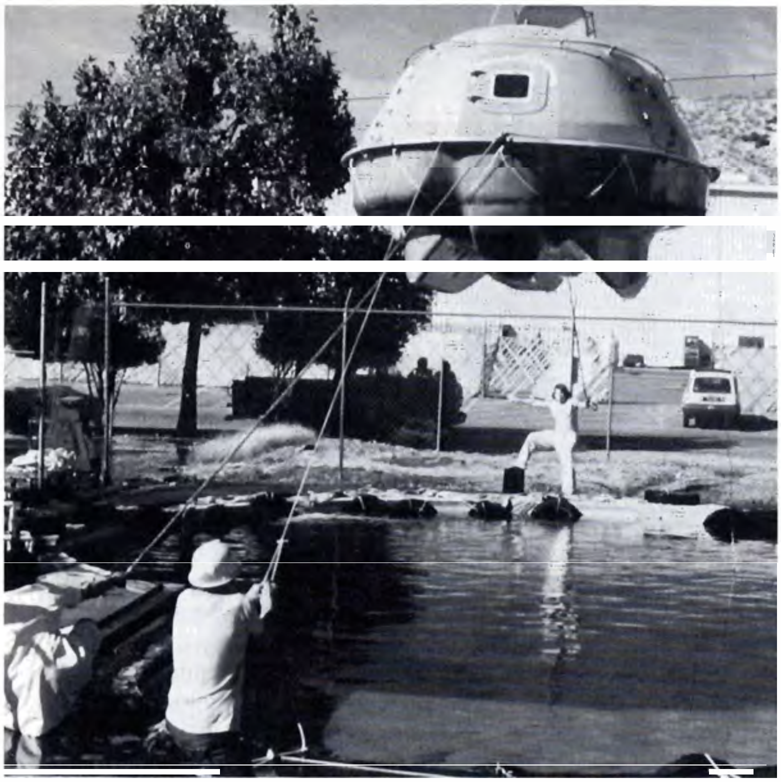

Lowered to safety in the original capsule from off-shore rig.



Capsule is readied for drop test into a pool.

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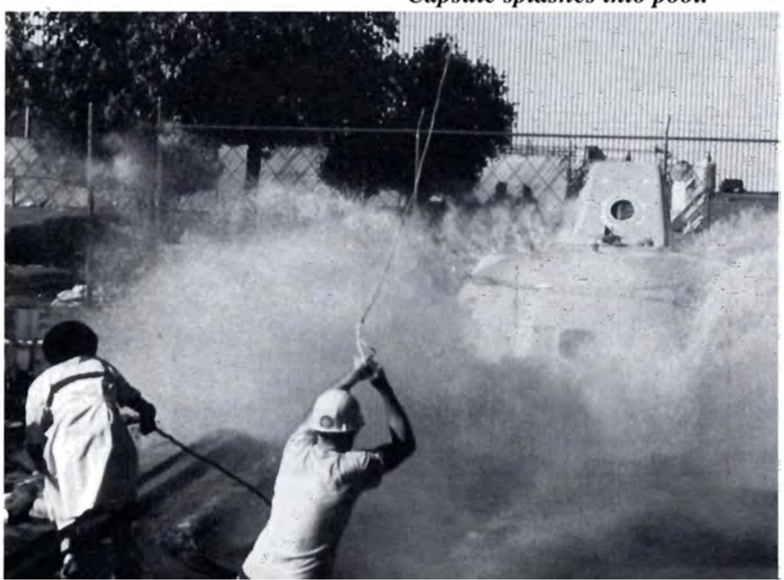
Real life test

Perhaps the most dramatic actual test of the capsule system occurred on December 15, 1988. Twenty-five men and two women onboard the drilling rig *Gorilla One* were being towed across the North Atlantic. The ninety million dollar rig sank in a storm.

This was the first time a crew had launched a capsule into seas of over 40 feet. It was also the first emergency evacuation of a crew that included women. It was also the longest period of time spent in a capsule in an emergency — 22 hours, mostly in rough weather.

They had stayed with the rig as long as possible, despite the high seas. Finally, the rig superintendent said, "That's it. Let's go." He made May Day calls to the *Smit London*, an ocean-going tow tug, and to the Canadian Coast Guard in Halifax, Nova Scotia. Within three minutes after the May Day calls, the crew was in the starboard capsule.

Capsule splashes into pool.



After launching and unhooking the capsule, the helmsman piloted the capsule away from the rig. It was tense and quiet the first few minutes.

All aboard expected a roller coaster ride on the 50- to 60-foot waves, but it wasn't. Being enclosed, the crew didn't have any frame of reference, but the capsule was stable.

A variety of communication tools allowed the crew to stay in contact with the outside world. These included a VHF walkie-talkie with spare batteries, a hand-cranked Safety of Life at Sea (SOLAS) radio and a hand-held aircraft radio.

The crew kept their spirits up by singing songs and telling jokes. By daylight on December 16, the seas had quieted to the 12-foot range, and the crew left the capsule three at a time in a small Zodiac rigid inflat-able boat. Such a transfer and other challenges faced in the experience had been covered in survival school.

It must be noted that the United States Coast Guard had insisted that the capsule should be mounted in the davits, ready for use during a North Atlantic passage under tow. The capsule could not be placed on deck for safe keeping.

Essentials for success

Equipment, no matter how well designed, is only equipment. The essential ingredients for successful evacuations under emergency conditions consist of equipment, maintenance and training. Coupled with a planned maintenance program and basic training at an onshore survival school, the likelihood of a successful evacuation using a capsule in an emergency is greatly enhanced.

Future

Two of the largest offshore structures in United States waters should be installed in the deep water of the Gulf of Mexico by 1997. They are the *Mars* and the *Ram Powell* tension leg platforms. The *Mars* will be equipped with five 54-person capsules, and the *Ram Powell* with four 54-person capsules and two 36-person capsules.

These single-cable launched systems will offer safe escape routes for individuals into the 21st century.

In the meantime, capsule, serial number 001, installed in 1970, is still working in the Cook Inlet of Alaska.

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Low-location lights

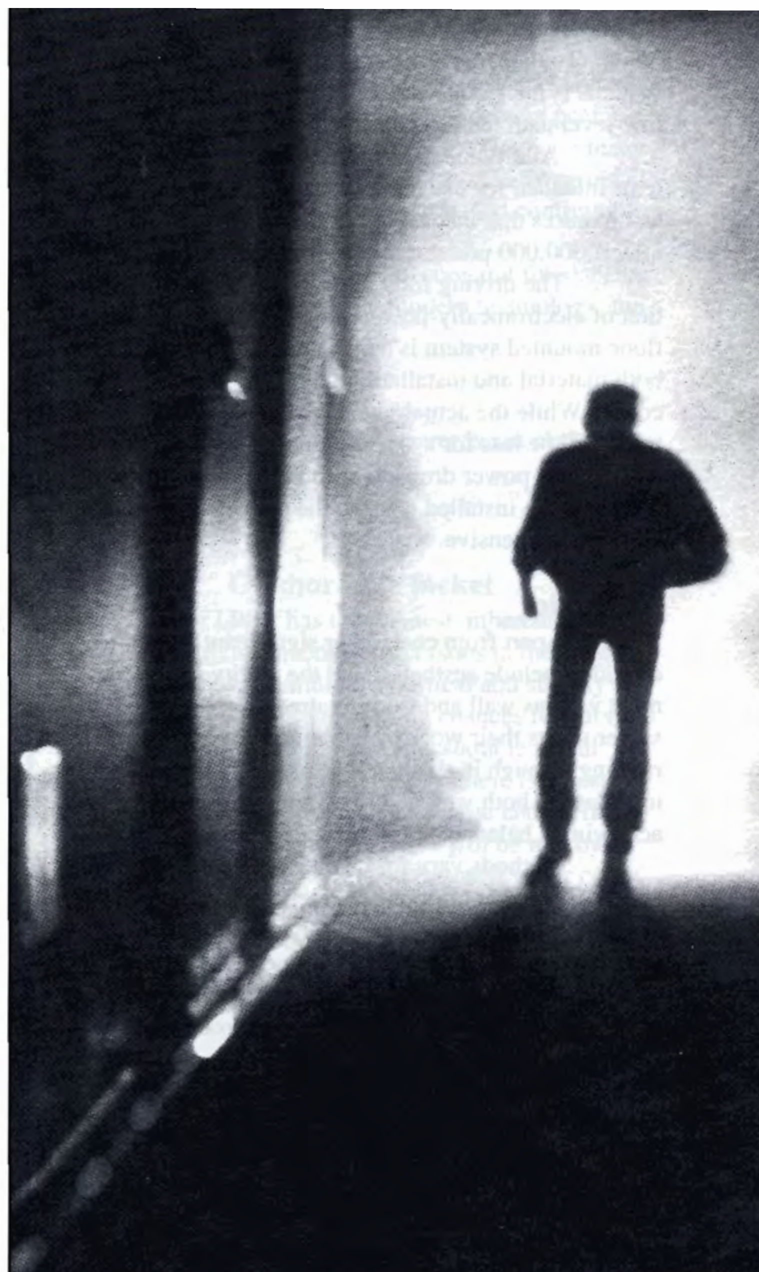
provide escape routes

By Mr. David H. Mills

A guiding light in a dark corridor can mean the difference between survival and disaster at sea. Should an emergency take place in a smoke-filled passage or a total power failure occur, passengers and crews can be easily disoriented without an illuminated escape route.

New low-location lighting systems (lighting strips placed near the floor) can light the way.

Ships and marine shore installations can be outfitted with cost-effective methods to designate es-
outfitted with cost-effective methods to designate es-
cape routes, exit doors and the location of emergency equipment. Solid state lamp cells which are completely encapsulated with polymer (plastics extrusion) for durable and watertight performance can be strategically-placed to illuminate exits and/or escape routes.



Low-location lighting

A low-location lighting system typically comprises substantially continuous linear lighting devices. They include electronically-powered (electroluminescent) or chemically-activated (photoluminescent) glow-in-the-dark elements mounted on the floor or low wall surfaces along designated exit corridors. In addition, low-level exit signs are installed at the end point of the linear lighting devices and wherever overhead exit signs are currently required.

In an emergency evacuation, panic typically ensues, creating a very confusing situation. It is the responsibility of a low-level lighting system to indicate a highly visible, and more importantly, an easily recognized exit path enabling confident and swift movement through exit corridors toward the regular exit doors.

Smoke and steam

Current emergency lighting products work well for some emergency conditions. However, in a fire there is the danger of being obscured by smoke. The light from high-mounted equipment and exit signs is weakened and diffused by layers of smoke and steam which accumulates initially near the ceiling and then expands to lower levels within the corridor, leaving a small clear zone near the floor.

The fire's smoke, hot gases and steam present the greatest hazards to the occupants, and the hazards are not just limited to the area near the fire. It is likely that these deadly by-products will travel and collect in areas remote from the fire scene and sprinkler activity.

The traveling smoke scenario was dramatically illustrated in the February 1993 World Trade Center bombing disaster in New York City.

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Additional testing

The main factor in deciding whether to mount a low-level lighting system on the floor or the wall is if a particular system is approved for wall or floor installation. To date, the only standard for low-level lighting systems is the Underwriters Laboratories Standard for low-level path marking and lighting systems.

Additional abuse testing is required of systems intended for use on floors as well as walls. The test requires that the section tested operate normally after 1,000,000 pressure/abrasion cycles.

The driving force in wall versus floor installation of electronically-powered systems is economics. A floor-mounted system is hands down the winner when both material and installation labor are taken into account. While the actual linear footage of illuminated track will be less for a wall-mounted system, the cost of labor to run power drops to each break in the system drives up the installed cost, so the wall-mount is actually more expensive.

Aesthetics

Apart from cost, other significant factors to consider include aesthetics and the ability to complement various wall and floor treatments. No interior designer wants their work of art defaced by a racing stripe running through it. It should be assumed that in any installation, both wall and floor mountings will be used, achieving a balance between appearance and function.

Methods vary for dealing with transitions between carpet, tile or other treatments depending on the brand of the system. Many installers use a secondary aluminum or plastic profile to bridge the transition between different floor surface levels. In many installations, no transitional materials are required because all surfaces are on the same level.

Photoluminescent systems are inherently reliable and have unlimited chargability. However, they rely on available light sources, such as fluorescent lamps, incandescent light and sunlight to maintain a charged standby condition. A ship with a photoluminescent system must establish a lighting fixture inspection and maintenance program.

Reliability

Within the electronically-powered category, systems which use solid state light sources would be reliable. Large structures, such as high-rise buildings, have constant vibrations which are hazardous to fragile in-candescent filaments (light bulb wires). Also incandescent systems require more battery power to operate.

While both electroluminescent and digital display systems have inherently reliable light sources, the digital systems will probably require much larger battery banks to support their high power demands.

As a general rule, the more batteries there are, the more chance there is of failure and higher maintenance costs.

Costs

When evaluating the costs of the different systems, many factors should be considered. Other than the initial investment in materials, all systems must take into account installation labor, continued maintenance and susceptibility to vandalism.

Other expenses to consider include:

- Photoluminescent: the cost of minimum light levels for maintaining a fully-charged system, and
- Electroluminescent: battery maintenance.

Photoluminescent products

Other photoluminescent products are constructed from either a rigid or self-adhesive vinyl film, which will glow in total darkness after being exposed to either artificial or natural light. The indoor life of the film is indefinite. It is resistant to foil and color separation, and keeps flexible.

Signs can be custom-designed and manufactured to meet individual specifications and applications.

Conclusion

Low-location lighting systems must be installed on all passenger vessels on international voyages. However, they can be designed for any vessel.

It is strongly recommended that some type of safety signs and directional marking be installed on all vessels, regardless of size, purpose or destination.

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PFDs

They come in many types and sizes

By Mr. Michael D. Grupa

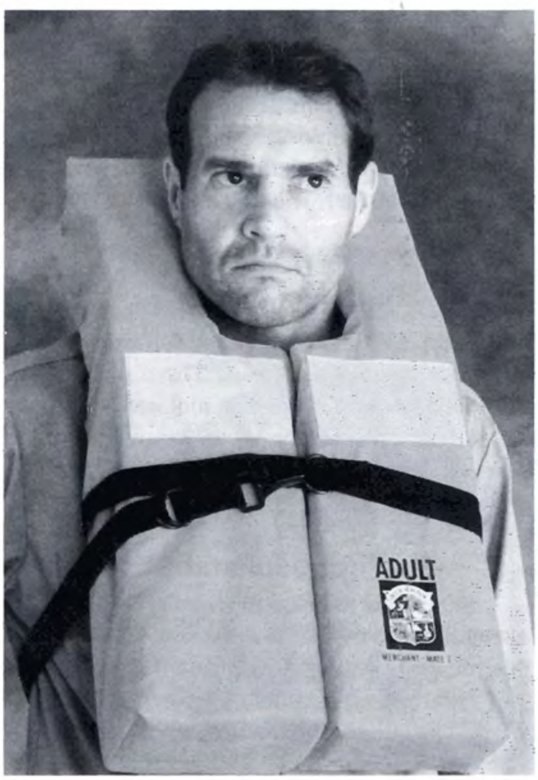
Every year, more than 75 million Americans take to the nation's waterways in 13 million vessels. Whatever the maritime activitity, knowledge and careful consideration is required in selecting proper lifesaving gear.

Of all equipment used by seafarers, flotation gear is one about which they know the least. There are many misconceptions about flotation gear and its role in safe boating. For example, many individuals avoided wearing flotation gear because they thought the devices were ugly, hot, humid, sticky, bulky, clumsy, itchy and confining. Until recently, this was correct.

Personal flotation devices (PFDs) are available today that are attractive, comfortable, cool and fitted. They allow the wearer personal freedom of action, and are wearable, smart and very safe. Using modern technology, the best PFDs provide hypothermia protection against cold water.

Five types of PFDs

The following PFDs are designed to perform as described in calm water when the wearer is not clad in any other flotation garment (such as a wet suit).



Type I PFD.

Type I
Offshore life jacket

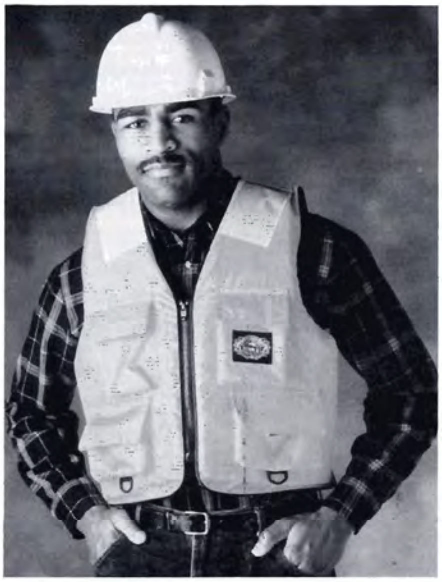
Type I PFD has the greatest inherent buoyancy. It turns most unconscious persons in the water from a face down position to a vertical and slightly backward angle, greatly increasing chances for survival.

This offshore life jacket is suitable for all waters, especially for cruising where there is a possibility for delayed rescue, such as on a large lake or river where it is unlikely that many boats will be nearby.

Type I is recommended for most water conditions. It is reversible and available in two sizes: adult's (75 pounds or more) or children's (under 75 pounds). These are universal sizes designed to fit all persons in their categories.

Continued on page 12

Type III flotation jacket.



Type III vest.

Another type III vest.

Continued from page 11

Type II
Near-shore buoyant vest

A type II PFD turns most wearers to a vertical, slightly backward position in the water. The turning action is not as pronounced as with Type I, and will not turn as many persons under the same conditions.

The near-shore vest is usually more comfortable to wear than the offshore life jacket and is available in more sizes: adult (more than 90 pounds), medium child (50 to 90 pounds) and two small child sizes (less than 50 and less than 30 pounds). Also, some models have different chest sizes.

Type II is usually more preferable in well frequented areas, affording chances for a quick rescue.

Type III
Flotation aid

The type III PFD maintains the wearer in a vertical position on the back, with no tendency for the wearer to turn face down. It is not designed to turn an unconscious wearer face up.

It is generally more comfortable than a type II, and comes in a variety of styles matched to individual uses. Often chosen for water sports, such as skiing, fishing, canoeing and kayaking, it comes in many chest sizes and weight ranges, with some universal sizes.

Type III is preferable where there is a probability of quick rescue, such as non-remote areas where many people are engaged in water activities.

Type IV
Throwable device

A type IV PFD is normally thrown or tossed to a person who has fallen overboard. It is intended to be grasped and held by the victim until rescued. It is not recommended for use by non-swimmers and children.

Type V
Special use device

A type V PFD is approved for restricted use, such as a work vest or work suit. There are many other type Vs. The label on the device indicates whether a particular design of the type V can be used in specific applications, what restrictions or limitations apply, and its performance type.

Future inflatable

Scheduled to be on the market in 1996, the newest addition to the PFD family will be a fully inflatable life vest. A light, less restrictive device, the inflatable PFD features a safety buoyancy chamber with an inflation mechanism that can be either water or manually activated.

Regulations

You are required by federal regulations to have Coast Guard-approved personal flotation devices which are in good condition and sized correctly for each person in a recreational boat. They must be near at hand when the boat is in operation, and legibly marked with a Coast Guard approval number.

Coast Guard approval of a PFD ensures that it meets or exceeds established standards, but it does not imply that it is ideal for all uses. For example, there are PFDs which are more suited for waterskiing and others for white water canoeing and kayaking. All PFDs should be labeled accordingly.

Some PFDs are more rugged and durable than others. The intended use and conditions in which it will be used should be evaluated.

Buoyancy

A PFD provides buoyancy to help keep one's face clear of the water. The average weight of an adult is only seven to ten pounds in the water, and a PFD's buoyancy will support that weight. One's body weight does not determine how much one will weigh in the water. The device should be tested in the water by the user to determine if it supports his or her mouth out of the water. It should support the wearer, so that he or she can breathe comfortably.

A PFD's main function is to float an individual on the water. Physical shape and disposition of weight about the body, along with clothing and its contents are some of the variables which influence a person's weight in the water. These and other conditions must be considered to determine the buoyancy needed to float.

Children and PFDs

Children are difficult to float in a safe position because of the distribution of their body weight and because they tend to panic when suddenly placed in an unfamiliar environment. The violent movement of arms and legs attempted to "climb out" of the water tends to disrupt the stability of the PFD.

An approved device will keep a child afloat, but not always in a face up position. A child should be taught how to put on the device and try it out in the water. It is important that a child feels comfortable and knows what the PFD is for and how it functions. (For children weighing less than 30 pounds, type II is required.) Parents should note, however, that PFDs are not substitutes for adult supervision.

Continued on page 14

Type IV ring buoy

Continued from page 13

Hypothermia

The loss of body heat to the water is a major cause of deaths in boating accidents. Often the cause of death is listed as drowning, but most often the primary cause may be hypothermia, with the secondary cause drowning. An individual who has become hypothermic may lose consciousness and then drown.

This chart shows the effects of hypothermia.

This data for human subjects is variable. For example, North Sea experience has demonstrated that individuals became exhausted in under 15 minutes at water temperatures in the 40 to 50° F range.

PFDs can increase survival time because they allow the victim to float without expending energy treading water, and because of the insulation they may provide. Naturally, the warmer the water, the less insulation required. When in cold waters (below 40° F), a suit or jacket style PFD should be worn instead of a vest to cover more of the body.

HYPOTHERMIA CHART

WATER TEMP. (DEGREES F.)	EXHAUSTION OR UNCONSCIOUSNESS	EXPECTED TIME OF SURVIVAL
32.5	Under 10 minutes	Under 15-45 minutes
32.5 - 40.0	15-30 minutes	30-90 minutes
40 - 50	30-60 minutes	1-3 hours
50 - 60	1-2 hours	1-6 hours
60 - 70	2-7 hours	2-40 hours
70 - 80	3-12 hours	3 hours - indefinite
over 80	indefinite	indefinite

Hypothermia protection points

- While afloat, do not try to swim unless it is to reach a nearby craft, fellow survivor or a floating object on which you can lean or climb. Swimming increases the rate of body heat loss. In cold water, old drown-proofing methods that require putting your head in the water are not recommended. Keep your head out of the water. This will greatly lessen heat loss and increase your survival time.

- Keep a positive attitude about your survival and rescue. This will improve your chances of extending your survival time until rescue. A will-to-live does make a difference.

- If there is more than one person in the water, huddling is recommended while waiting for rescue. This tends to reduce the rate of heat loss, thus increasing survival time.

It is strongly recommended that victims exert every effort toward rescue and survival. Stay in the swamped boat . .. or if the boat capsizes, climb on top. The greater the portion of the body that is out of the water, the slower the heat loss and the longer the survival time.

Survival time is influenced by body type, size and attitude, along with physical condition, amount of subcutaneous fat and the will to survive. As with children, small body size is associated with faster cooling rates.

ALWAYS WEAR YOUR PFD.

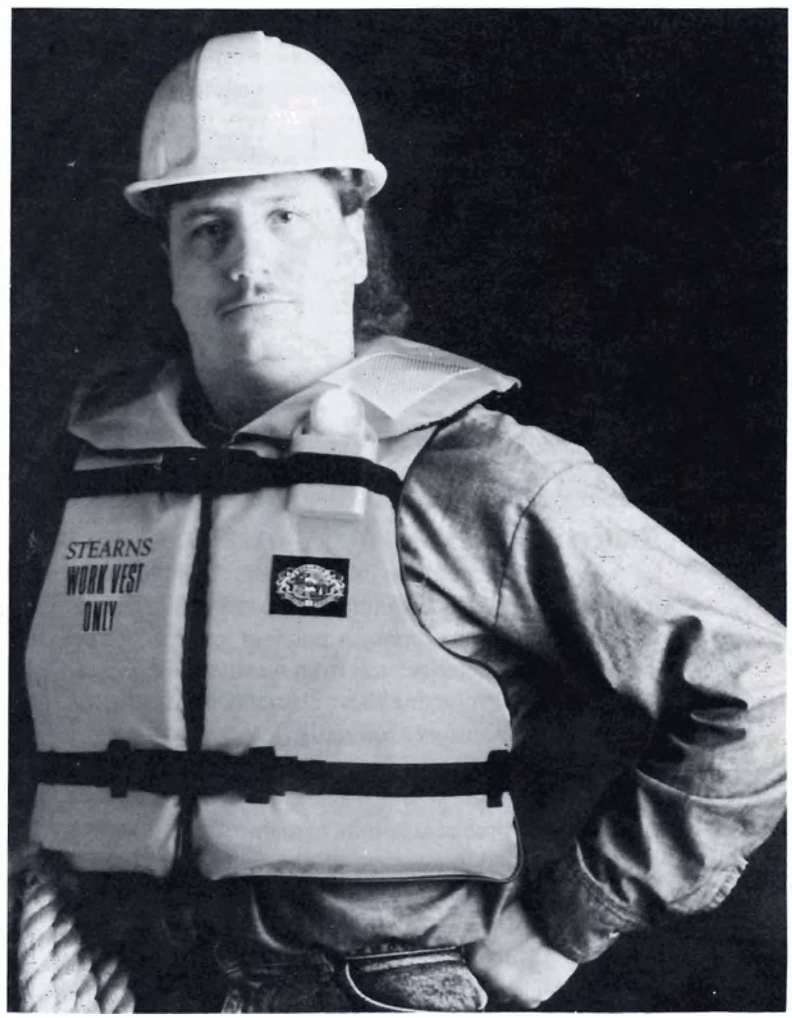
It won't help you fight off the effects of hypothermia if you don't have it on when you hit the water.

Of great importance is the survival time provided by a foam-insulated suit or jacket PFD. Survival time can double because of the insulation, which contains the body's core temperature and affords protection against the chilling air and water.

Your personal flotation device won't help you if you don't have it on.

Wear it . . . don't stow it!™

Left: Type V anti-exposure coverall.
Below: Type V work vest.



PFDs are like seat belts. Unless you wear them, they won't help you survive an emergency. Every recreational boater and seafarer should don their PFDs when they obtain them, and test them in shallow water to determine their buoyancy and that of the PFDs.

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Telephone (612) 252-1642.

One bright flash can make all the difference

By Mr. Charles I. Mundale

The ocean is an unforgiving adversary. From Odysseus to the Ancient Mariner, from Columbus to Admiral Byrd, respect for this adversary has been a major tool in every seafarer's mental kit.

That's why the International Maritime Organization (IMO) and the Coast Guard are especially particular about equipment and materials used in safety programs and rescue missions at sea. Every material, every piece of equipment is carefully "spec'ed" to ensure they are of the highest quality. All such products must pass a battery of tests to prove they can take what the ocean can dish out.

Because a survivor's chances literally plunge with the setting sun, the standards for equipment to help with night searches are particularly high. In some cases, searches have to be suspended until the sun returns. However, when it is feasible to continue a search in spite of darkness, the role of one rescue product becomes crucial. That is reflective sheeting.

Reflective sheeting

The secret to the brilliance of reflective sheeting is in millions of tiny optical elements imbedded in the thin, film-like material. A polymer top film protects the optics from deterioration from weather, ultraviolet light and dirt. Protecting these elements is crucial. While ordinary surfaces normally reflect light away from a source, reflective sheeting optics bounce light directly back to the source, instead of away from it.

Maritime regulations require reflective sheeting to be applied to a variety of objects, such as life jackets and other personal buoyancy aids, immersion suits, inflatable rafts, life buoys and other survival gear. The reasons are obvious.

Objects marked with reflective sheeting pop out of the darkness when struck by the beam of a search light. In fact, the sheeting can reflect light some 1,000 times brighter than plain white fabric. Thus, when search lights scan the sea during night rescues, anything marked with reflective material — people, distressed vessels, life rafts or lost equipment — all have an excellent chance of being spotted.

Background

Reflective sheeting was first developed in the 1930s — admittedly as an afterthought. Actually, researchers were attempting to produce a reflective pavement marking tape that could be used instead of paint for marking road lanes.

Just as that project was about to be scrapped because the tape wouldn't stick, someone suggested transferring the concept to a vertical surface to try to make a reflective road sign. It worked and the first fully reflective sign was erected at an intersection on the outskirts of Minneapolis, Minnesota, in 1939. (Pavement marking tape was successfully developed nearly 30 years later.)

Reflective sheeting quickly became the highway sign material of choice for traffic engineers. Soon road signs all over the world became dramatically more visible at night. As research advanced, greater brightness, durability and angular performance (the ability to reflect brightly even at severe angles to an oncoming light beam) were achieved.

As good as early reflective sheeting performed on land, however, the concept could not automatically be applied to safety operations at sea. Adapting a product designed for flat, stiff highway signs to the rugged environs of the sea has been a long arduous process.

One of the biggest advances came in the 1940s with the invention of a means to "enclose" the optical elements beneath a protective top film. This proved to be a crucial development, because, for the first time, it allowed the material to continue to reflect when wet, which the first product generation didn't do because of the "exposed" nature of the optics.

For a product to meet the standards of the IMO's International Convention for the Safety of Life at Sea (SOLAS), it must be flexible and strong enough to achieve its purpose. In the case of reflective sheeting, it must work on the array of maritime equipment to which it must be applied.

Advances in adhesive technology finally assured that the sheeting, once attached to clothing and maritime equipment, would stay put, even during long exposure to water and the elements.

In June 1989, the Maxim Gorki, a Russian cruise ship, hit an iceberg off the coast of Norway and began taking on water. All 575 passengers were rescued by lifeboat and helicopter. Here, evacuees wear life-saving devices with SOLAS-grade reflective material during their rescue.

Today's testing

Tests and retests of the sheeting are conducted by research facilities to make sure it meets all standards for immersion, flexibility, temperature, humidity and ultraviolet light. Salt- and fresh-water tests, tests for fungus and heat resistance, and flexibility tests are run over and over again. Reflectivity and weathering are constantly monitored. (One machine accelerates weathering by manipulating humidity and temperatures, emulating rain and sunlight, and generally raising havoc with the materials.)

Improvements in brightness and angularity - the two performance criteria most important to the person in water - are constantly under development. Because many objects are curved or rounded, and may find themselves bobbing in rough seas, optimum reflective performance at extreme angles is crucial.

Conclusion

No Coast Guard officer likes to give the order, "Suspend search until daylight," although sometimes it is unavoidable. However, when it is possible to conduct a rescue mission in darkness, reflective sheeting has a huge role to play. Radios, flares and other "active aids" can locate a general search area, but only direct eye contact can spot a specific survivor.

Reflective sheeting can send back the one bright, life-saving flash that means the difference between a successful or failed search and rescue mission.

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See at night on the water

By Mr. Ken Delegan

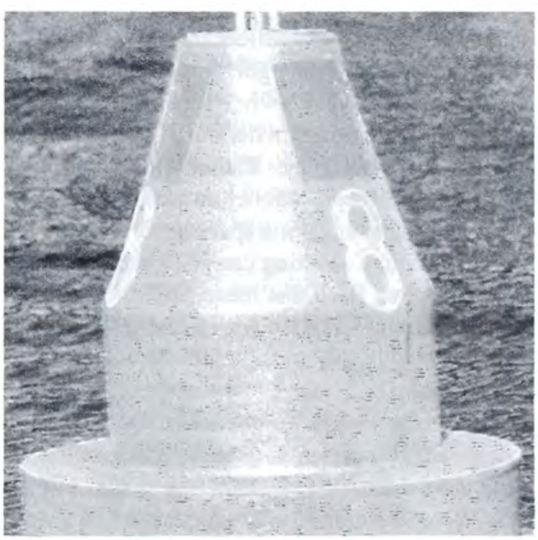
Both day and night, long-range visibility is extremely crucial for ships at sea. It is vital to the safety of passengers and crew that day board and channel markers be readily discernible at reasonable distances, regardless of the time of day or climate. This is also critical in search and rescue missions.

Retroreflection returns incoming light back to its source. In the form of armbands, vests and headbands, it improves the personal safety of joggers running at night. As sheeting, it makes objects, such as highway signs, aids-to-navigation — day boards, buoys and channel markers — and life-saving equipment more visible in low-light conditions.

Background

The first items produced by reflective technologies were large, bulky reflectors developed in the mid-1930s. About ten years later, glass bead reflective products introduced thin-gauge, easy-to-use sheeting.

In the late 1960s, the microprism technology was developed, using tiny cube cornerprism elements to produce thin, high-performance sheeting the thickness of a calling card.



This technology revolutionized the reflective products industry by providing an alternative to glass bead-based retroreflective products.

Reflective products.

Safety of Life at Sea Convention (SOLAS) grade microprism retroreflective material is used for life jackets and personal flotation devices, such as ring buoys, life floats and rafts, and life boats. This material is available with either a tough, flexible backing for sew-on application or with a pressure-sensitive adhesive for stick-on use. It is produced in a variety of sizes in precut ready-to use patches or continuous roll tape in one- to 18-inch widths.

The marine grade polyester material meets Coast Guard specifications for high intensity reflective sheeting for use on aids-to-navigation, such as day boards and buoys and channel markers. (The Coast Guard maintains more than 50,000 aids-to-navigation in United States territorial waters and inland waterways. There are probably 47,000 additional devices that are privately maintained.)

Applied in the manner recommended by the United States Coast Guard on life vests, life buoys, life rafts and life boats; retroflective materials greatly improve the chances of being seen in the water at night.

Reflectivity

SOLAS grade microprismatic sheeting has been tested in accordance with the Department of Transportation specification: USCG 46 CFR section 164.018-11(a)(5), "Reflective intensity." It has also been tested under the technical specifications approved by the International Maritime Organization (IMO) assembly resolution A.658(16).

A typical photometric reading of the material at an observation angle of .1 degree and an entrance angle of +5 degrees would be 1200 foot candles (a measure of the amount of light that falls on a one-square-foot surface, one foot away from a candle.) The Coast Guard's minimum requirement is 180.

The marine environment poses special challenges for retroreflective materials. Critical requirements include nighttime conspicuousness, daytime visibility, and resistance to impact and weathering in extreme climates.

Again, long-distance visibility, particularly at night, is crucial for maritime safety. The vividness of the new retroreflective products makes them stand out for up to a half mile.

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Rafts of life rafts

By Mr. Poul V. Jensen

On March 4, 1994, the Finnish ferry Sally Albatross was on its way to Helsinki from Tallinn, when it ran aground in the ice-bound Gulf of Finland. The navigation route had been blocked by heavy ice,

Despite taking on considerable water and listing about 13 degrees, the vessel was successfully evacuated. All 1,100 passengers and 158 crew members were safely rescued in less than two hours by marine evacuation systems. No injuries were reported.

Evacuation equipment

On each side of the ferry, a dual-track evacuation slide led to an embarkation platform and ten 50-person throw-overboard life rafts. Another 20 25-person davit-launched life rafts were also installed.

This equipment is easy to operate. By pulling one handle, the stowage box placed at the ship's side becomes accessible and inflation of the slide begins. The two slides enable 400 passengers to be evacuated in under 30 minutes.

The embarkation platform holds up to 100 passengers and inflates within four minutes. As soon as the first life raft is being boarded, a second one is moved into position by the platform, then the third, until all needed rafts are boarded.

"Man overboard" boat

A new fiberglass lifesaving boat has recently been designed for use by the shipping and offshore industry. The bright orange "man overboard" boat is made out of fire-retardant polyester fiberglass-reinforced materials. Because of built-in polyurethane buoyancy, the boat is unsinkable.

The boat seats five people with a sixth person lying down. It can accommodate diesel outboard motors with up to 36 horsepower, or gas engines from 25 to 60 horsepower.

Standard equipment for the man overboard boat includes paddles, compass, sea-anchors, painter and towing lines, first-aid kits, spare batteries, radar reflector, thermal protective aid, a safety knife and boat hook, a four-step ladder, fire extinguisher, tarp, small seats, hand flares and parachute signals.

Coast Guard approval is pending, although the Danish Maritime Authority has approved the craft.

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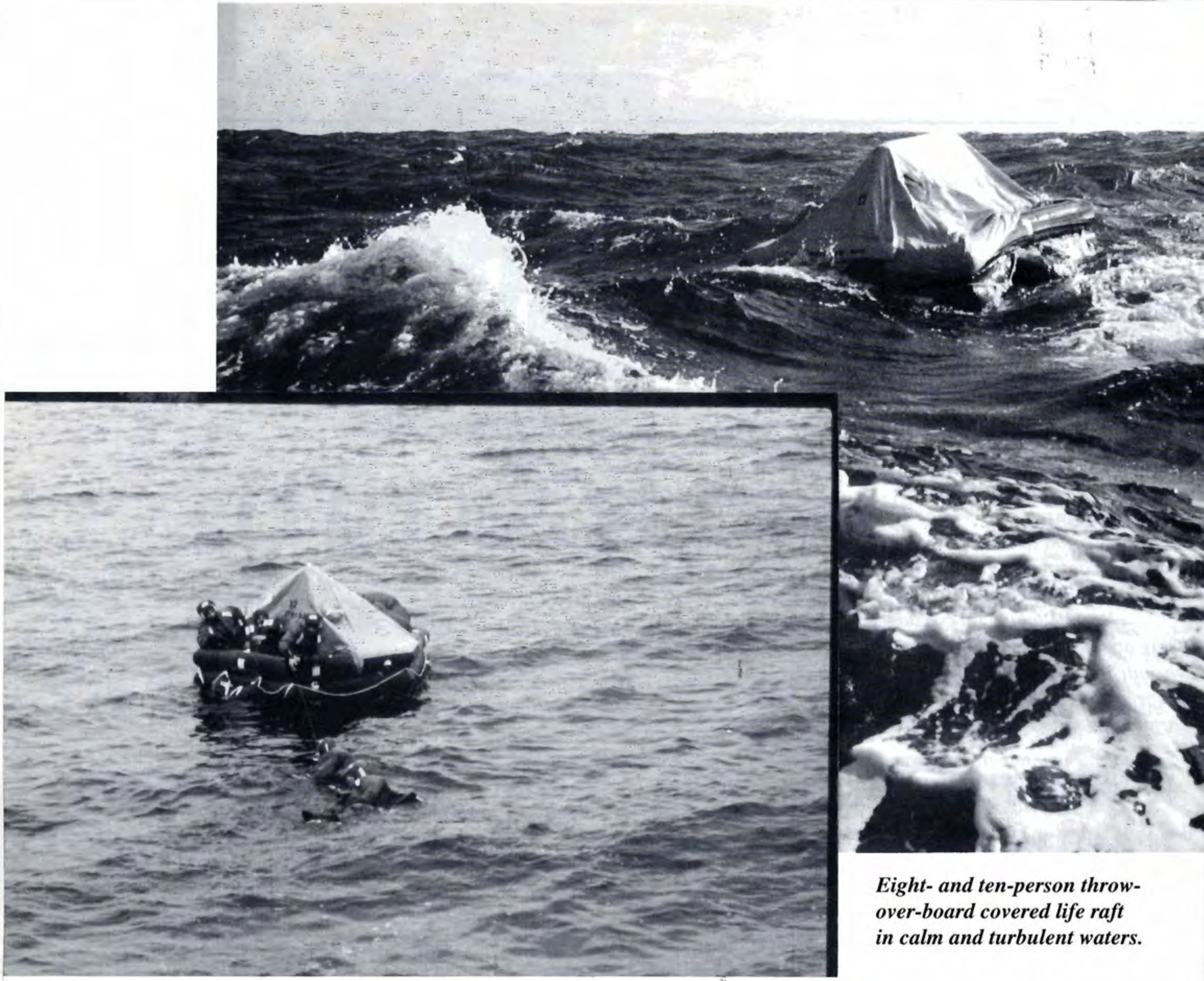
"Man overboard" boat



Eight- and ten-person throw-over-board covered life raft in calm and turbulent waters.

Continued from page 19

Four-person raft

A new life raft has been approved by the Coast Guard, specifically for commercial fishing vessels. It has two individually inflatable buoyancy chambers, either of which can support four crew members. The raft is pre-packaged in a compact, water-tight container that is easily stored aboard ship. A hydrostatic release device or an aluminum, float-free cradle allows it to be released automatically if a vessel should suddenly sink.

The material used to construct the raft's inflatable chamber provides insulation against frigid water temperatures. The gap between the double-layered floor can be inflated for additional warmth.

The canopy's outer surface is bright orange for high visibility, but the inside is a duller color to protect against eye irritation. With the raft completely enclosed, no water can enter, yet sufficient ventilation is provided to the occupants.

Two 50-person apparatus

Operators of large passenger vessels are always seeking ways to provide more deck space for passengers. Newer vessels are lighter and have greater weight restrictions. A new life-saving system has been developed that addresses both concerns.

The system contains two 50-person inflatable buoyant apparatus in one container. They are inflated simultaneously with no entanglement of the lines.

Having two units in one container means weight reduction and much less demand for deck space.

The floor of the apparatus is positioned between two buoyancy chambers, making it reversible. The units can be boarded as soon as they are deployed and inflated, regardless of which side surfaces first.

The rip-stop nylon fabric of the floor and walls of the buoyancy chambers is coated on both sides with natural rubber, which insulates the raft against the low ocean water temperatures and the compressed CO_2 gas that inflates the device.

A life raft or any other survival gear is only as reliable as its operators. Survival training is essential.

T-boat regulations

The Coast Guard recently issued a proposed list of changes to regulations to improve the life-saving equipment carried by T-boats (passenger vessels less than 100 tons operating in coastal waters). These changes were prompted by technological advances, including lighter construction materials resulting in larger craft that can carry more passengers than when the present regulations were developed.

Some of the proposed changes to title 46, CFR part 170, containing subchapter T, include:

- All vessels must carry a first-aid kit.
- Float-free stowage arrangements must be made for all survival craft (primarily life-saving equipment).
- Survival craft weighing over 200 pounds must be capable of launching without lifting by hand. They must be davit-launched or arranged to free fall.
- Inflatable life rafts or buoyant apparatus would be required by the following vessels in the following categories when operating in waters during the time of year when the average water temperature is under 59°F:

  A) all vessels on oceans, coastwise or Great Lakes routes;

  B) vessels carrying more than 150 passengers and operating more than one mile from shore on lakes, bays and sounds routes; and

  C) vessels carrying more than 150 passengers and operating more than one mile from shore on river routes.

The proposed rules state, generally, that all other vessels would have to comply with existing survival craft requirements, except that a vessel carrying more than 150 passengers on lakes, bays and sounds routes within one mile of land in cold water, must have 100 percent (non-inflatable) buoyant apparatus.

Reversible life raft.

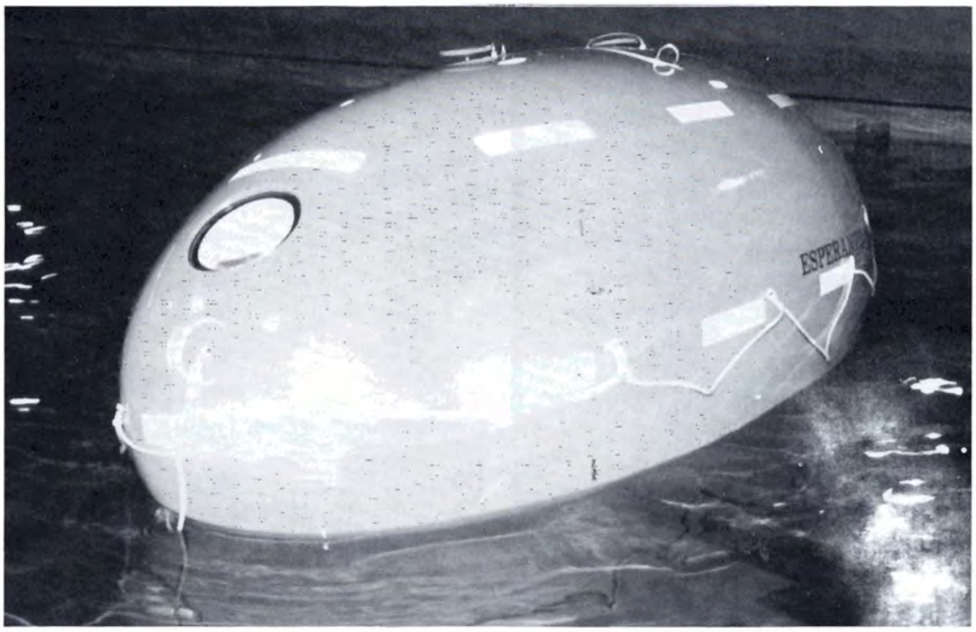
A special manual release is achieved by a slip-hook. The container is placed on a stand, causing the raft to roll in the water when the slip-hook is activated. In a sudden vessel sinking, a semi-automatic cradle arrangement can release and deploy the units. A hydrostatic release device automatically deploys the rafts.

Conclusion

A successful evacuation at sea depends on a reliable life-saving appliance/system that the crew of the distressed vessel knows how to operate. It is vitally important for crew members to make themselves thoroughly familiar with all survival equipment through regular practice and drills.

Mr. Poul V. Jensen is general manager of Viking Life Saving Equipment (America), Inc., 1625 North Miami Avenue, Miami, Florida 33136-2016. Telephone: (305) 374-5115.

Closed egg-shaped capsule can mean survival at sea



By Mr. Jean-Marc Chiasson

Since the disastrous *Titanic* sinking in April 1912, marine rescue techniques have been carefully reviewed. It is now mandatory that every person aboard a ship is entitled to have efficient rescue equipment in threatening situations.

In February 1982, the petroleum and marine communities were appalled by the loss of the *Ocean Ranger* oil drill rig which capsized in a few seconds during a violent storm off Newfoundland, Canada. There were no survivors. A life boat was severely damaged during launching. The liferafts were not used.

Marine rescue specialists were convinced that a safer survival device had to be developed to save seafarers and passengers in endangered vessels. The risk of hypothermia, which can kill in minutes, as well as drowning had to be considered in designing the device.

A survival craft research team based in New Brunswick, Canada, determined that the craft required four major factors to achieve its objective of saving lives at sea.

Esperanto 6

In November 1992, after ten years in development, a commercially viable version of the *"Esperanto 6"* survival capsule was completed.

The capsule is 9'3" long and 4'3" wide, and can accommodate six adults in survival suits. Weighing 580 pounds, the capsule is fitted with a retractable center keel which can be easily released when in the water. In addition, the keel is fitted with a system than can propel the capsule manually at about 1.8 knots. Free flooding water ballast tanks are built low in the structure, giving it adequate righting levers to maintain it upright with comfortable motions even in rough seas.

The capsule is easily boarded by a rigid access ladder from the sea or from the deck of a ship, thus avoiding the risk of hypothermia or injury by jumping into the sea.

Synthetic resins, kevlar and balsa (a very light wood) combined with the egg shape produce a hull shell with high impact resistance. All surfaces are treated with fire retardant materials.

The craft should:

1. **be closeable and watertight when closed,**
2. **be able to withstand high impact loads,**
3. **be capable of being boarded from the vessel and the sea, and**
4. **ensure sufficient thermal insulation to avoid hypothermia in low temperatures.**

Rigid access ladder permits easy boarding.

Performance tests

After a series of tests conducted by the Canadian National Research Center, the *Esperanto 6* capsule was approved by the Canadian Coast Guard as a safety rescue vehicle. Additional tests were performed and witnessed by the United States Coast Guard in August 1994. The capsule passed the tests, which covered:

a. seaway towing;
b. lifting with a weight of 4,000 pounds inside;
c. speed and maneuverability attained by manual paddling and drop keel propulsion;
d. water tightness and absorption;
e. acceleration and deceleration when dropped into the water from 15 to 65 feet above the surface;
f. boarding trials, including handling of an injured person from the sea; and
g. impact measurements when simulating the striking of the capsule against the ship's side when davit launched.

The capsule is also approved by the United States Coast Guard and meets Safety of Life at Sea (SOLAS) Convention requirements as a six-person rigid liferaft.

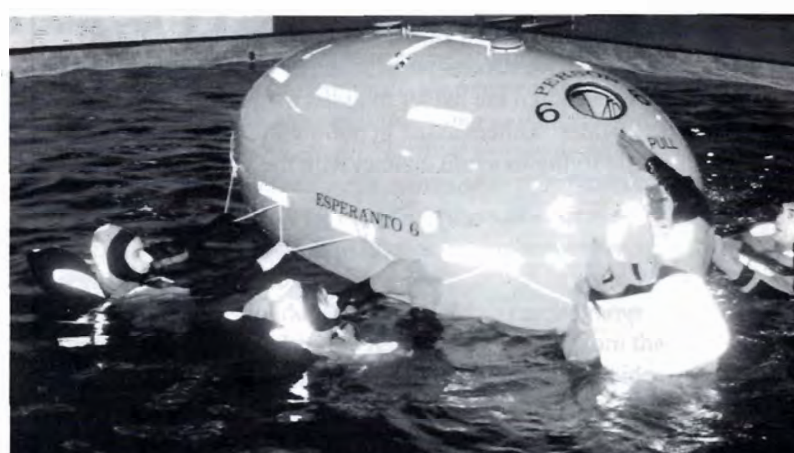
Experienced seafarers volunteered to participate in both sets of tests. They concluded that the capsule was easy to board from the sea, easy to propel and steer, and comfortable and secure when in a seaway. They also found that the capsule afforded protection from the elements and hypothermia.

Uses

Radio locator beacons, VHF and other apparatus can be installed in the survival capsule, which can be adapted for use by marine cargo and passenger vessels, commercial fishing boats, offshore oil platforms and vessels, private yachts, as well as marine education and training centers.

Survival craft are vital safety equipment, particularly in cold waters far from rescuers, and in adverse weather and sea conditions. However, like any other safety device, the craft may not be able to save lives if the ship's crew does not know how to operate it.

Safety drills and training in survival craft operation are essential for every crew member on board the vessel.



"Survivors" hang on to capsule from external life lines.

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Telephone: (506) 727-5039.

MAN OVERBOARD!

Retrieval is a matter of time

By Mr. William R. Kuenzel

Today's technology has greatly improved response time in locating survivors. But once on the scene, a whole new life-threatening situation arises: getting those survivors out of the water. Retrieval now becomes the real matter of time.

Over the past decades, the Coast Guard has responded to countless sinkings, groundings and other mishaps that involved getting survivors out of the water quickly when the objects they clung to were sinking. Many of these incidents involved more survivors than first anticipated, rough weather and various conditions that could be hazardous to the rescue craft and crew.

Today's devices

Current devices for rescuing individuals from the sea are not satisfactory in many circumstances.

One of the simplest items is a rope-like ladder which is attached to the boat at its hatch or portal, and merely thrown in the water so that a survivor might climb into the boat. While it might be satisfactory in calm seas, in turbulent weather, it is not only difficult to climb the undulating ladder, it is also highly likely that the person could be injured, as by striking his or her head on the gunwale or ledge below the latch. Moreover, the ladder is useless if the person is injured or unconscious. In such situations, the rescue boat must be manned with several people, one or two of whom must traverse down the ladder to assist the person to and up the ladder. Others assist in pulling the person on board while trying to avoid contact with the vessel in trouble.

Another device is a net-like structure which is thrown toward a person to be rescued. If conscious, he or she may then either hold onto or lay on the net while being pulled into the rescue craft. Such a device suffers from the same disadvantages as the ladder. It is simply not a convenient nor safe manner in which to rescue a panicked, unconscious or injured survivor.

A variety of this net-like structure involves a slat-like runner which is thrown into the water. The way it operates is that the person is positioned on it and essentially rolled up into the craft. However, it is almost always mandatory that a rescuer be in the water to use this system.

Therefore, a system is needed which will allow the conscious person to easily enter the rescue craft on his or her own power. Another system is needed to easily assist an unconscious or injured person to enter the craft .

Incidents

The National Transportation Safety Board (NTSB) recently reported on the sinking of the passenger vessels *El Toro II* on December 3, 1993, and the *Bronx Queen* on December 11, 1990.

El Toro II

The small passenger vessel *El Toro II* took on water through sprung bottom planks and sank in the Chesapeake Bay about five miles from Point Lookout, Maryland.

***El Toro II* after salvaging.**

Inflatable rescue ramp eases and speeds up survivor retrieval.

All 23 persons on board the 32-year-old vessel were recovered by Coast Guard and Navy helicopters and a Coast Guard 41-foot utility boat. Two passengers and one crew member died as a result of injuries suffered in the casualty. All of the persons on board and three Coast Guard personnel suffered varying degrees of hypothermia.

Even though the Coast Guard utility boat that was used during the *El Toro II* rescue operation has a high freeboard, most survivors were retrieved without difficulty because, at the time, the Coast Guard crew on the utility boat was about three times the usual complement. Had it carried the smaller crew, as it usually does, the rescue operations would probably have been less successful. The utility boat did not have retrieval equipment to help pull survivors on board.

During the *El Toro* rescue, one survivor's life preserver ripped as two Coast Guard officers grabbed it to retrieve the individual from the water. Fortunately, the survivor was not injured.

Bronx Queen.

While returning from a fishing trip, the small passenger vessel *Bronx Queen* suddenly began taking on water in its after portion and sank just north of Ambrose Channel, New York Harbor.

The 19 persons on board the 47-year-old vessel entered the water as rescue resources including two 41-foot Coast Guard utility boats arrived on scene. Everyone was recovered, but two were pronounced dead at area medical facilities.

It was concluded that the methods required to be employed by the personnel on the Coast Guard utility boats to recover people out of the water are extremely difficult. While probably acceptable for rescuing one or two individuals, when a large number of people are involved in a cold water rescue, pulling people up over the transom is impractical.

Following its investigation of the sinking of the *Bronx Queen*, the NTSB asked the Coast Guard to develop new methods of equipment for use aboard the 41-foot utility boats to retrieve survivors from the water during search and rescue operations.

Inflatable rescue ramp

The Coast Guard responded to the NTSB's recommendations on March 23, 1994, as follows:

"The Coast Guard researched several methods of recovering survivors from the water during search and rescue operations. It was determined that personnel recovery could be greatly improved with the development of an inflatable rescue ramp that would eliminate the need to lift personnel over the sides of rescue boats. The Coast Guard purchased and tested four different inflatable rescue ramp prototypes.

"Minor modifications have been completed on the latest version of the inflatable ramp and additional testing has been conducted. The final prototype has been approved and funding is provided to purchase this inflatable unit for every Coast Guard small boat station. The Coast Guard anticipates no further action regarding this recommendation."

This newly developed inflatable rescue ramp should ease and quicken the retrieval of people from the water because it reduces the lifting height over the side of a rescue boat.

The NTSB found that the Coast Guard met the intent of their recommendations and classifies Safety Recommendations M-90-110 and -111:

"CLOSED — Acceptable Action."

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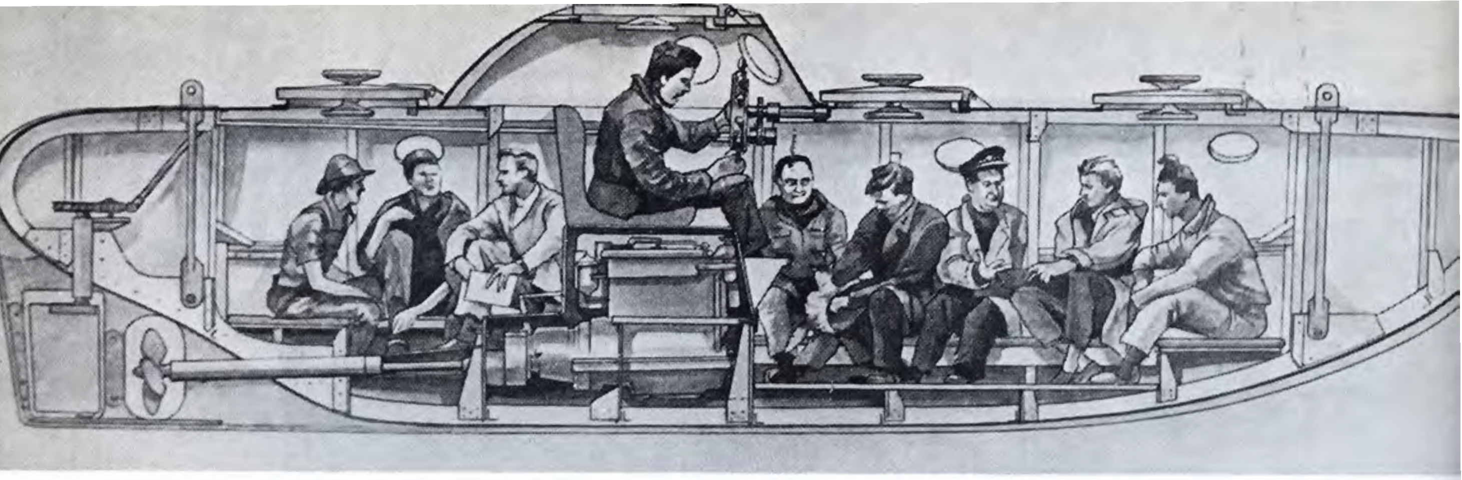


This submarine-like aluminum lifeboat was designed by Joost Verhoef in Aalsmeer, Holland, in 1959.

Free fall from danger

By Dr. James K. Nelson, Jr.

The free-fall lifeboat is quickly becoming a common lifesaving appliance for cargo ships, tankships and offshore facilities. These systems slide down a short inclined ramp and fall freely into the sea with all the occupants on board.

Because of the increase in safety they represent compared to conventional lifeboats, the free-fall boats are accepted by most maritime regulatory authorities, who have developed design and certification criteria for them.

Origin

The first reference to a free-fall lifeboat was an 1897 patent issued to A.E. Falk of Sweden. The patent drawing depicts an enclosed lifeboat that slides off the stern of a ship. The free-fall height was about three meters.

Very little was done with the idea during the next 40 years. In 1939, CAPT White of the Bay and River Navigation Company arrived at a concept of a free-fall lifeboat called a "non-sinkable submarine lifeboat." He proposed his idea to the Bureau of Marine Inspection and Navigation of the United States Department of Commerce, and conducted tests with a model to demonstrate that it was possible. The bureau reviewed his concept and concluded:

"His means of launching lifeboats appears to be inadequate and dangerous, and can, in no respect, be considered equivalent to the present method of launching such boats. (The lifeboat) would strike the water at a terrific speed and would cause considerable shock to the passengers."

It is interesting to note from a historical perspective that White's justification for the ability of a human to be uninjured during the free fall was the girls who jumped from a tower on the back of horses at Atlantic City in the early 20th century.

The concept was dormant again for another 20 years. In 1959, a Dutch sea captain concerned about safety on board his ship approached a yacht builder, Joost Verhoef, about the possibility of building a safer lifeboat for evacuating ships. The founder of Verhoef Aluminum Scheepsbouw Industrie in Aalsmeer, Holland, Verhoef designed and tested a free-fall lifeboat that looked very much like a submarine. This aluminum lifeboat, which had a free-fall height of about six meters, went into service on a ship in 1961.

The concept again lay idle until 1973, when in the wake of two serious ship disasters, the Nordic maritime authorities commissioned the Norwegian Ship Research Institute to develop an improved lifeboat launching system. The result of this effort was a 34-foot-long free-fall lifeboat tested in Hardanger Fjord in 1976 at heights of up to 20 meters.

A modern free-fall lifeboat is poised on its launch ramp.

The first manned lifeboat was launched in 1977 from the stern of a Norwegian ship, the *M/S Tarcoola*, in Oresundsvarvet shipyard. The installation was formally approved in 1978.

Today, free-fall lifeboats are being produced in several countries by many manufacturers. The materials used in the hulls and canopies include fiberglass, steel and aluminum. These boats are actively marketed and are gaining universal acceptance very quickly. Since 1983, a German manufacturer has delivered about 600 free-fall lifeboats throughout the world.

Currently, they are used on cargo ships, tankers, semi-submersible drilling platforms and fixed-productions platforms. Free-fall heights range from about six meters on small ships to over 30 meters on fixed offshore oil production platforms in the North Sea. Because of operational considerations, they have not yet been used on passenger ships.

The first launch of a free-fall lifeboat in emergency conditions occurred very recently when a ship was grounded and the crew evacuated by free-fall. Although the accident report has not been finalized, the launch was said to have been successfully completed.

Continued on page 28

Free-fall lifeboat waits for launch on ramp.

Headway and protection

Two considerations in free-fall lifeboat design are of paramount importance. They are:

1) the lifeboat must make speed during the launch and immediately after water entry, an

2) the occupants must be protected from injury during the launch and water entry.

Continued from page 27

Launch

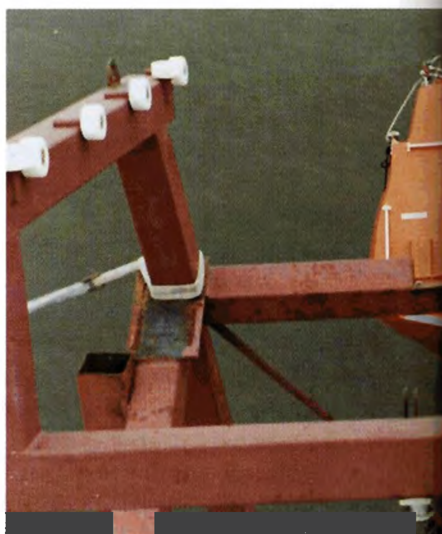
A free-fall lifeboat launch can be divided into four distinct phases: **ramp, rotation, free-fall and water-entry.**

The **ramp** phase is when the lifeboat slides along the launch ramp. It ends when the center of gravity passes over the end of the launch ramp and the lifeboat begins to rotate.

This **rotation** marks the beginning of phase two, which ends when the lifeboat is no longer in contact with the launch ramp.

Then the **free-fall** phase begins with the lifeboat falling freely through the air.

The **water-entry** phase begins when the lifeboat first contacts the surface of the water and continues until it returns to the surface and behaves as a boat.



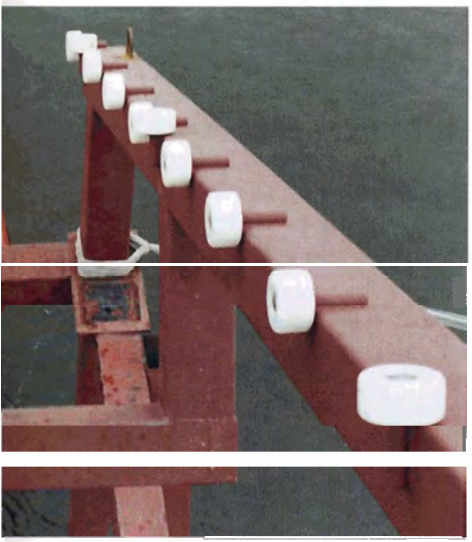
Stern view of lifeboat in free fall.

During the ramp phase, the only forces acting upon the lifeboat are its weight and friction between the boat's launch rail and the launch ramp. When the lifeboat is released, it begins to accelerate from rest along the ramp. During this time, it does not rotate, but only gains speed along the ramp. Its velocity at the end of the ramp depends on the ramp's length.

After its center of gravity has moved past the end of the ramp, the lifeboat begins to rotate. This is caused by a couple formed by the weight of the boat and the reaction force between it and the ramp. This couple imparts angular momentum to the lifeboat which makes it rotate. After leaving the ramp, the lifeboat rotates at constant angular velocity until it hits the water.

As the lifeboat hits the water, a couple formed by the fluid forces and its weight causes the angular momentum to be reversed, and the boat to return to even keel.

These considerations are affected by the hull shape, length and angle of the launch ramp, location of the center of gravity, and the inertial characteristics of the lifeboat. No one parameter is more important than another. The observed behavior of a particular free-fall lifeboat design is caused by the interaction of all these parameters.



The ride

Riding in a free-fall lifeboat for the first time can be rather frightening and, at the same time, very exhilarating. One individual describes his first experience as follows:

"As I climbed the tower at a training center for the first ride, I had no idea of what to expect. The only thing I knew as I fastened the seat harness was that I was about to be dropped 20 meters — the height of a six-story building.

"The lifeboat began rumbling down the ramp, and then there was an eerie silence. All I remember thinking was 'when am I going to hit the water and how bad will it hurt?' It is amazing how much one can think about in a second and a half.

"The impact with the water was really anticlimatic. I could feel a little acceleration force, but everything happened so quickly that I have little recollection of the water impact. For me, the most disconcerting part of the launch was the free-fall — being weightless is unusual. But after riding free-falls from as high as 28 meters, it has simply become, 'here we go again.'"

Future free-fall

Because free-fall is a relatively new concept for lifeboats, it is continually being refined. Manufacturers are always looking for ways to improve the performance and safety of these lifeboats. Changes have been made in the trackway and launch rail to reduce acceleration forces on the occupants and achieve acceptable performance.

A very promising application of free-fall is a rigid life raft developed by a manufacturer in Canada. (See page 22.) A model with a capacity for six persons has already been prototype tested successfully. During trials, free-fall tests were conducted from a height of three meters.

This type of lifesaving appliance would be a significant improvement over the rafts now carried on small vessels, including fishing boats. Its free-fall height is adequate for many fishing vessels and weighing only about 600 pounds, it will not significantly affect the harvest capacity of the vessel.

This type capsule will afford crews a drier, more protected environment during an evacuation than inflatable rafts currently carried. That is what we are after — a safe, dry and comfortable get-away.

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Water entry.

Today's life jackets come in a wide variety of styles and sizes.

Evolution of the "life jacket"

By Mr. Victor M. Baca

Life jackets, now known as personal flotation devices (PFDs), have been part of the mariner's life almost as long as ships themselves. Although they were once bulky and uncomfortable, the seafarer learned to live with various types of life jackets, because they were the only thing between him and the deep blue sea in an emergency. When a ship was in peril, the ubiquitous orange life jacket became the most desired object on earth.

Advances

Within the past 20 years, PFDs have made amazing advances in comfort, ease of movement, performance and their ability to protect users from hypothermia (loss of body heat) after immersion.

Flotation materials derived from plant and animal matter have given way to high performance flotation foams and life jackets featuring automatic carbon dioxide inflation systems.

Designers have developed flotation devices with many purposes. They provide cold weather clothing, waterproofing, flame retardance and flotation — all in one garment.

PFDs are intended to temporarily replace the ships on which they travel. Their development takes into consideration freeboard, in-water stability, carrying capacity and self-righting ability.

The new life jackets go beyond something that simply floats the average person in water.

Flotation angle of anti-exposure coverall is measured in a test tank.

Deck coats

A new PFD changed the way seafarers view personal flotation devices. Combining buoyancy with a traditional deck coat gives the seafarer the best of both worlds. The garment is no longer something that takes up valuable shipboard space until needed. The mariner can use a constant wear coat or jacket, stay warm on deck and also have an approved PFD in the event of an accident or emergency.

This innovation has been instrumental in saving the lives of many boaters and professional mariners. The styling of new flotation coats compares with that of dry land counterparts so closely that one can walk into a shoreside restaurant without anyone noticing that he or she is wearing a lifesaving device.

Type III PFDs come in many styles, and are typically light-weight and comfortable to wear.

Hypothermia protection

With the introduction of the new flotation coats and full suits known as anti-exposure coveralls, PFD manufacturers took a close look at improving cold-water hypothermia protection. The greatest danger of the sea is its ability to pull heat from a survivor's body, eventually leading to hypothermia and death.

The flotation foam used in anti-hypothermia garments is an excellent insulator. By exploiting this feature and providing good closures to minimize cold water flushing into the garment, these devices can be designed to protect the survivor almost like a wet suit. Water is trapped between the foam and the wearer's body, which maintains body core temperature, prolonging survival time in the water.

The ideal cold-water flotation coat has a secure closure at the bottom hem to minimize water flushing into the garment. A beaver tail similar to that found in diver's wet suit jackets serves this purpose in some thermofloat-style coats. A well-designed float coat beaver tail seals the bottom of the garment by closing securely around the upper thigh area.

Immersion suits

Commonly referred to as a "survival suit," the immersion suit goes a step further by keeping the wearer totally dry, providing flotation and insulation from cold sea water. Because the water's ability to draw away body heat is blunted, very long survival times can be achieved.

Immersion suits were first developed in the Pacific Northwest to protect mariners going to sea from the cold waters in that area, as well as off Alaska and Canada. The suits have since been accepted internationally as the ultimate in cold-water protection, and can be found aboard most ships plying the oceans. Newer versions are being developed to solve traditional maintenance cost and storage problems.

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Right: Anti-exposure coveralls worn by individuals in raft. Below: Full immersion "survival suit."

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Trade-offs

Because flotation devices, like ships, are by necessity designed as compromises between a number of sometimes contradictory parameters, there are trade-offs involved.

For example, survival suits offer almost unlimited protection in cold water. The trade-off is that they are heavy and cumbersome, and would soon overheat the user if worn on deck or while working. The anti-exposure flotation coverall, on the other hand, allows the user to work, and stay warm and dry on deck. However, it does not offer the wearer the same level of protection in the water as an immersion suit.

Buoyancy

Buoyancy is also related to hypothermia protection, primarily as a function of freeboard. By lifting the body as much as possible out of the water, freeboard becomes an important consideration for a PFD's seakeeping qualities. The more of the torso that is out of the water, the less the effects of immersion on hypothermia. A general rule of thumb is that an immersed survivor will lose body heat 25 times as fast in the water than in air of the same ambient temperature.

For years, scientists and engineers who design PFDs have known that the most efficient and readily available flotation materials are air and carbon dioxide (CO_2).

The inflatable life jacket is lighter in weight and, when inflated, offers more flotation than a traditional foam vest of similar dimensions. A well designed inflatable is more comfortable and less bulky than the vest-style foam PFD, increasing the likelihood of its being worn at all times on deck, ready for immediate use in an emergency.

Inflatable life jacket

Wide use

Inflatable life jackets have proven reliability in some of the most demanding maritime professions, and have earned a reputation of being ready to operate on a moment's notice.

Inflatables can be found on flight decks of aircraft carriers, on search and rescue vessels, as standard equipment for special operations' units such as the Navy SEAL teams and even aboard the space shuttle in the most unforgiving environment of all - the vacuum of outer space.

Flotation/anti-hypothermia bib pants and bomber jacket.

Space applications

A special inflatable life preserver unit (LPU) is being developed for the National Aeronautics and Space Administration (NASA) space shuttle astronauts as part of the advanced crew escape suit worn during the launch and re-entry phases of a mission. This inflatable, known as the "crew escape LPU" in NASA parlance, is expected to withstand high velocity forces involved in emergency bail-out procedures by space shuttle crews.

Once in the water, the LPU will fully support the helmeted astronaut in a face-up position for at least 24 hours. Should the survivor enter the water in an unconscious state, the crew escape LPU will automatically inflate without any action by the astronaut.

New technology

There are heavy investments in research and development to boost inflatable life jacket technology to a state-of-the-art unheard of only a few years ago.

Old-style glued seams in the heart of the life jacket, the inflation cell, have been replaced with heat-sealed seams using radio frequency welding technology with microwave heat to weld seams together.

Uncomfortable crotch straps have given way to cells engineered to fully support the body in concert with easily donned harnesses.

Inflatable cell design was improved with an innovation called "Air Support," which conforms the cells to the body's curves when inflated. This brought about a good fit that did not constrict the survivor. Air Support enhanced in-water stability by floating the wearer almost as a one-piece unit with the PFD.

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Anti-exposure coveralls.

No, they are not Coast Guard-approved, but flotation devices for four-legged crew members are available too.

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Design

A major design consideration with inflatables is the ability of the cell to totally support the wearer. A poorly-designed life jacket tends to float off the user at worst or allow him or her to sink into the unit at best. In any event, a badly-designed life jacket wastes much lifesaving potential and buoyancy in the inflated cell.

Because inflatable life jackets are soon expected to be a major type PFD in recreational boating, their design must also allow ease of maintenance and simple utility. New inflatable life jacket designs incorporate easy-to-use features, allowing minimally trained wearers to operate and repack them.

Specifications

To assure that inflatable PFDs for recreational boats sold in the marketplace meet minimum approved standards, the Coast Guard, working with Underwriters Laboratories and the flotation device industry, has developed material and performance specifications published as UL Standard 1180. The Coast Guard completed a study of inflatable life jacket technology last year, and published standards for their approval in June. The first evaluations for approval are now underway.

The future

These are exciting times for the PFD industry. With the advent of Coast Guard approvals for inflatable life jackets for recreational boats, more mariners in the commercial and recreational boating world are expected to wear PFDs. This should increase the number of lives saved on our waterways every year.

Previously unanswerable questions such as, "Can you make a PFD stop a bullet?" and "How can closed-cell foam breathe on a hot day?" are being answered in surprising ways.

Research projects are underway that offer hope to future survivors of disasters at sea. There will come a time when the sinking of a cruise ship or ferry need not result in a heavy loss of life.

Lifesaving devices are being developed that reach high performance in easy-to-use products that will allow minimally trained persons to survive at sea for long periods of time.

The task ahead for regulatory agencies will be to develop approval specifications that are flexible and foster innovation without undue restrictions. There also must be a high level of assurance that the professional mariner and boating public will be well served.

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Chute to safety

By Mr. Mark Hansen

A reliable, dry evacuation system with some advantages over davit life rafts and slides has been designed and manufactured. It is a covered chute allowing passengers and crews of distressed vessels to descend to water level for dry transfer to waiting life rafts.

Developed for quick escapes for large numbers of passengers off vessels, particularly ones with high freeboard, marine evacuation chutes are compact and simple to operate. They can be operated by as few as three crew members and are cost-efficient to maintain.

The chutes are ideal for evacuating passengers off ferries and cruise ships because:

- **the crew is in full control at all times;**
- **passengers have a passive role of following simple instructions;**
- **elderly, disabled and young passengers can be easily evacuated;**
- **passengers are totally protected from the environment; and**
- **up to 400 passengers can be safely evacuated within 30 minutes.**

Continued on page 36

Mock-up of ferry boat shows chute descending into covered life rafts.

Below: Chute is deployed. Right: Upon descent, chute deploys inflatable boarding platform.

Continued from page 35

Entrance to the chute can be easily controlled in emergency situations, and automatically limits the rate of access and descent. Due to its fully-enclosed design, it is impossible for panicked passengers to fall or slide off during evacuation.

Passengers do not have to be trained or know how to handle themselves during evacuations. Also, the chance of panicky passengers slowing down the process or risking the safety of others is minimal.

Systems

Besides chutes, life rafts and remote-release life-raft racks are also part of complete marine evacuation systems. Simple mechanical operation relies on natural forces of gravity and friction. No external power source is required.

There are six basic components:

(1) Housing

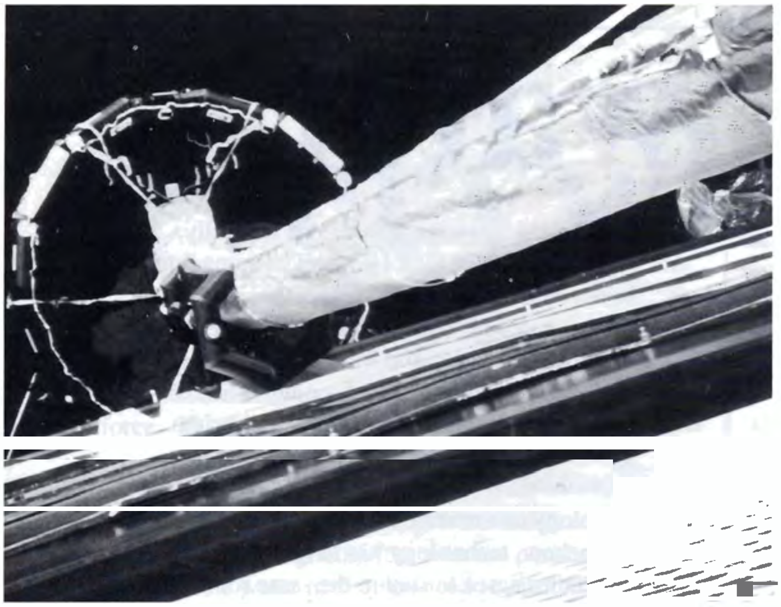
Stainless steel-clad housing is designed in two forms. The "N" type mounts on the same deck as the evacuation station and forms the entranceway to the chute after it is deployed. The "O" type is mounted one or two decks above the evacuation station, but the entrance is level with the evacuation deck after deployment. The packed chute and its entrance are enclosed within the housing.

(2) Slide-way

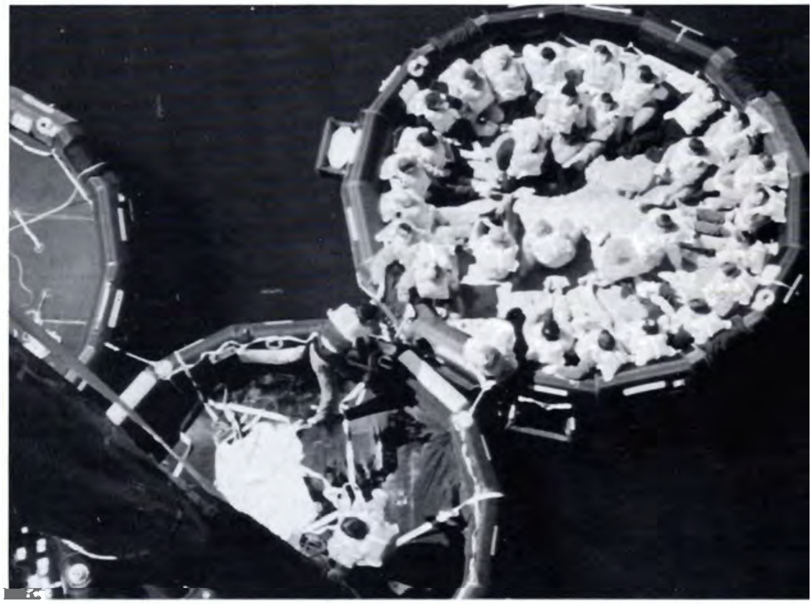
The principal component of the systems is the slide-way, which is manufactured from heavy canvas cloth with a zigzag lining designed to control descent. A tube is created with closures that can be opened at any point down the slide-way to adjust for changes in freeboard. The slide-way is connected to a protective cover by a series of rubberized cords attached to the reinforced seam.

(3) Protective cover

A cover protects the slide-way and its occupants from fire, heat and abrasion. A series of suspension straps are attached to the cover to support the suspended systems and to withstand wind and sea stresses.



Left: Chute and boarding platform are ready for evacuees to disembark. Below: Second life raft is readied alongside boarding platform, as first life raft is filled.



(4) Platform

An inflatable platform with a self-draining floor is attached to the bottom of the chute. This platform automatically inflates upon release from the housing, and forms a stable base from which passengers are transferred to waiting life rafts.

Stay-wires attached to a winch at the evacuation station keep the platform in position and allow for adjustments due to wind and sea conditions.

The platform acts as a loading and transfer area for passengers boarding life rafts. It can also be used as an auxiliary life raft.

(5) Life rafts

Conventional life rafts with protective canopies, or open reversible life rafts (called inflatable buoyant apparatus in the United States) are adapted for use with the system. The 50-person size is standard for marine evacuation systems.

(6) Life-raft racks

Specially designed racks allow for remote release of the life rafts from the system's control station. Crew requirements are therefore minimized and evacuations made safer by enabling all functions to be centrally controlled at each station. The racks can also be used as stand-alone stowage and deployment devices, independent of the marine evacuation system.

Operation

The method of operation requires only three trained crew members. A single lever action releases the housing, which slides along its rails and the operating door opens, deploying the chute. The housing is prepared as the entrance way into the chute. Stay wires are adjusted with the deck winch to stabilize the chute.

Two crew members descend down the chute to prepare for the evacuation of passengers. Life rafts are deployed via a remote release control, inflated and attached to the platform.

Passengers are instructed by a third crew member to descend down the chute in an orderly and efficient manner. The passengers are then transferred to life rafts. Rescue boats stand by for assistance and tow the loaded rafts away from the ship.

The flexible design of the system means that it can be configured for any type of vessel to safely evacuate virtually unlimited numbers of passengers from freeboards from 4.5 to 18 meters.

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Water, water

By Mr. Bill Kuehn

Water, water everywhere, and not a drop to drink. A major complaint of blue water sailors is that there is so much water, but none of it is any good to drink. Well, not anymore!

Drinking seawater is not a good idea, but drinking desalinated seawater is just fine. Recent technology makes it possible to drink the sea. Here's how.

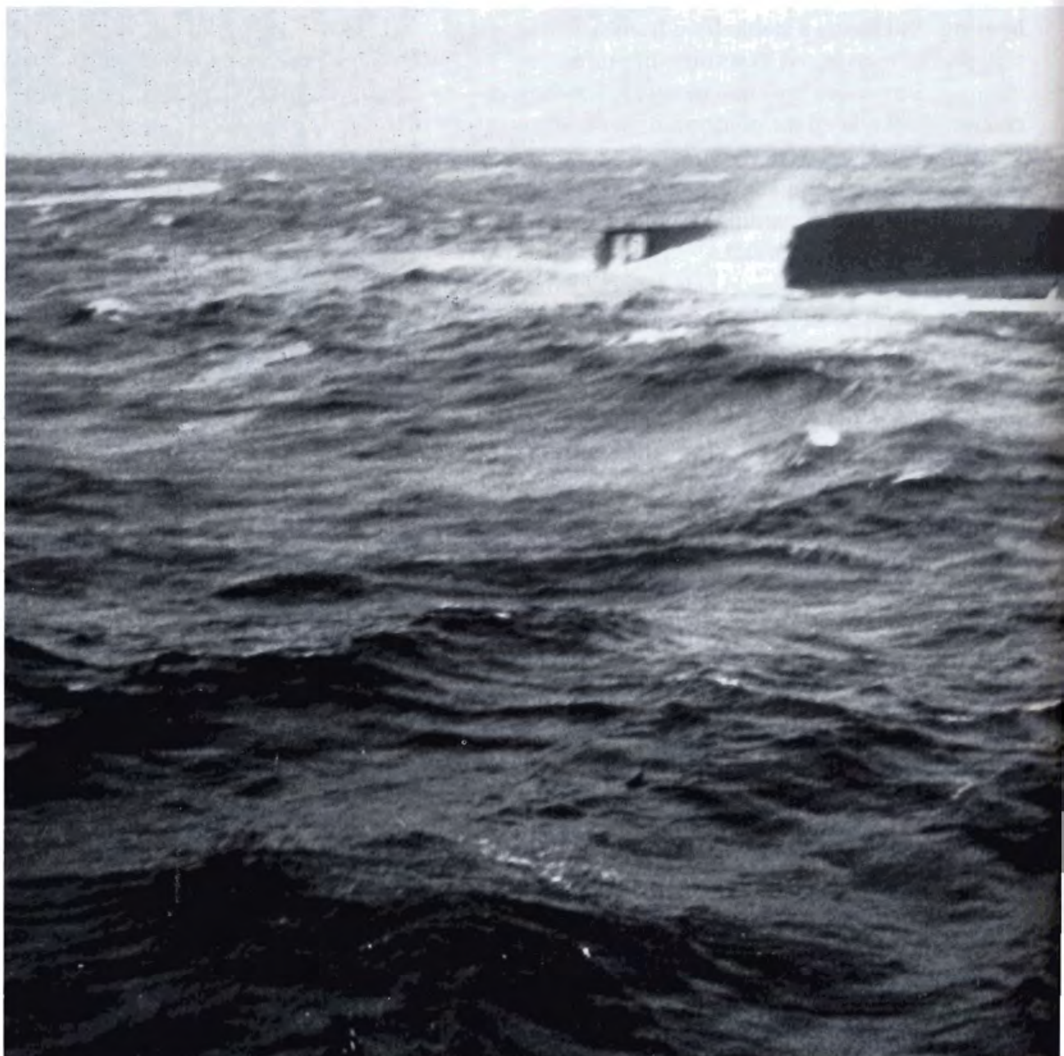
Reverse osmosis

Seawater goes through a process called "reverse osmosis" to make it drinkable. Osmosis is the natural tendency for molecules in areas of high concentration to cross a membrane and mix with areas of lower concentration.

In plain language, this means basically, "you've got more room than I do, so I'm spreading out." In seawater lingo, water molecules are the things that don't have enough space. The membrane is the "door" between saltwater and freshwater "rooms." The water molecules go through the door and dilute the saltwater until the rooms reach a nice equilibrium.

That's all well and good, but it still doesn't help sailors drink freshwater from the sea. However, new technology can reverse osmosis, but not without a price. Somehow, technology has to make the crowded water molecules agree to stay in the same room and let more of them in. That is not easy.

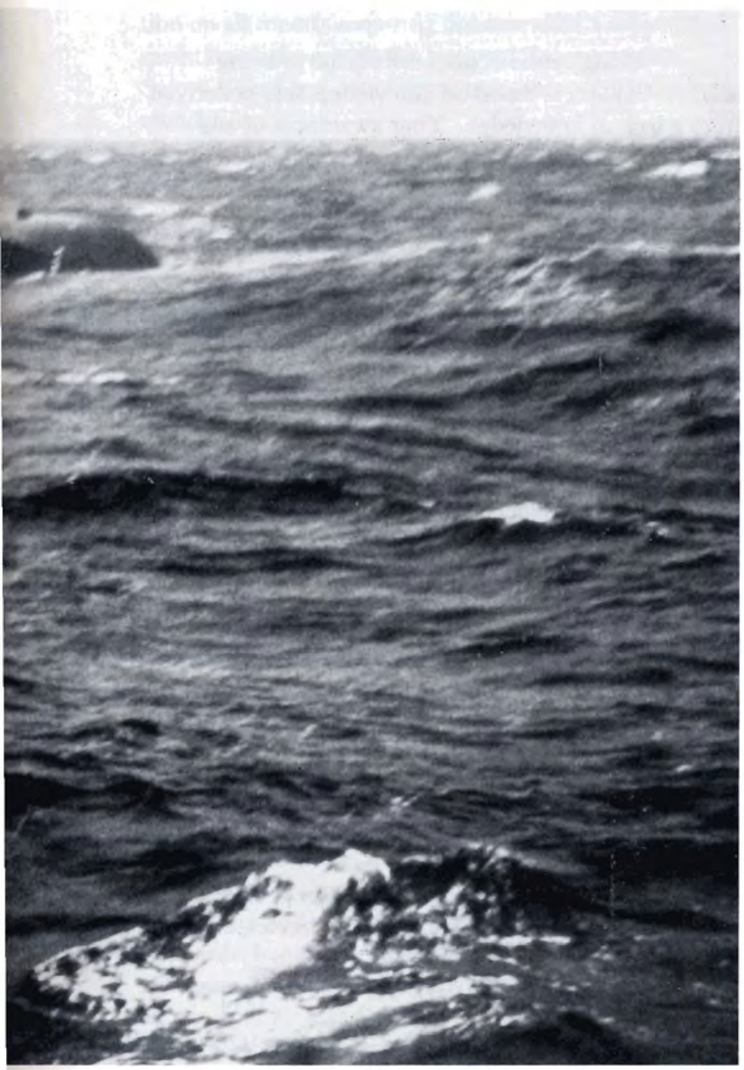
In addition, salt molecules will get through the door if we don't put a special screen in place to let only water molecules through. That is the membrane or "door," which is like a cellophane material.



everywhere . . .

The door is in place and the two molecules (water and salt) are ready to move. The water molecules in the saltwater room need a push by an outside force. They've got to push against all their neighbors trying to get into the room as well. (Remember that osmosis is making those crowded water molecules try and get into the room with less water molecules.)

Their neighbors (the salt) are pushing pretty hard and the water molecules need to push 400 psi (pounds per square inch) just to make their neighbors stop their advance. They need more pressure to send them back into the room - about another 400 psi. Together, a system pushing the water molecules needs about 800 psi. That's a lot of pressure.



What pushes the water and where does the energy come from to produce the pressure? Frequently, big pumps and lots of power are used to desalinate seawater. The purpose is to force all the water molecules through the door to become freshwater, leaving their salt molecules behind. The door can't let them all through, however, or it would clog up the entrance. Thus, some water molecules still attached to their salt companions go around the door to the outside. Salt molecules that have separated from the water molecules also leave in the same manner.

The problem is that the extra salt and seawater is leaving very quickly — pushed by 800 psi. And when they leave, they are gone. Their energy is wasted by letting the stream of "reject" brine water out the side of the system.

Solution

A new method has been devised that makes use of the wasted energy stream of brine water. A special valve shoots the reject water back into the piston pump. This energy stream then pushes the pump forward, reducing the power needed to run the desalinator (or watermaker).

Back to the analogy, all the rushing molecules heading outside are redirected to the back of the room to push their counterparts through the door. Then, when they run out of energy, they leave the room again out the side entrance.

Watermakers using this new method come in a variety of sizes, from hand-operated to a 12-volt device. They are designed for smaller boats without huge engines or room to spare. They can also be used in boats with auxiliary power and in life rafts where the only power is you.

Bottom line

The bottom line is that sailors, fishermen and sea lovers everywhere can look at the ocean and finally say, "water, water everywhere, and I can drink it all!"

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SAFETY

IT'S AN ATTITUDE

By Mr. Richard L. Halferty II

Attitude is everything when it comes to safety. It is your job to have and promote a positive attitude about safety in your organization. It must permeate all the way down to the ordinary seaman in the crew. Lead by example and expect diligence in safety by all workers every day - not just during training. Management must constantly seek ways to integrate safety in all aspects of its operation.

All the safety training and equipment in the world cannot ensure safe operation without the proper safety attitude. Negative attitudes concerning safety lead to negative results — accidents.

The supervisor has a vital responsibility to teach his or her team to beware of those who think they are immune to injury and believe that safety guidelines are for other people. If a worker violates safety policies, he or she must be disciplined. Giving someone a break when breaking safety rules will eventually lead to casualties.

Your personnel must believe in Murphy's law, "When something can go wrong, it will go wrong." Each worker must expect the worst. Safety devices will fail. Information or advice will be misunderstood, poorly defined or just plain wrong. Constant vigilance and caution are principles to live by. The best way to ensure safety is to create a work environment where it is practiced in day-to-day activities through the vigilance of each and every employee.

Being cautious does not equate to being scared. Caution is based on knowledge, fear is derived from a lack of knowledge. Your awareness of and caution concerning potential hazards around you provide tools to ensure safety. When everyone thinks safety - it happens.

Safety should come from positive reinforcement in a climate of respect. The company should be proactive in its approach to safety rather than reactive. Negative reinforcement and heavy-handed policies do not reinforce positive attitudes.

Rewards and positive reinforcement are key elements in any successful safety program. Rewards do not always have to be cash incentives. Promotions, certificates of achievement and involvement of all personnel in the safety process help create the safety attitude.

Conduct highly visible programs that utilize displays, posters and handouts. Make the safety program attainable and fun.

Management must make a conscious effort and commit the necessary resources to conduct an effective safety program. It will pay dividends in lives, and a more efficient, productive operation. Unsafe operations are based on false economics. A positive corporate environment fosters positive attitudes and behavior.

Mr. Richard L. Halferty II is the president of H.M.S. Marine Services, Inc., 9894 Bissonnet, Suite 775, Houston, Texas 77036-8829, Telephone: (713) 272-6691.

ATTITUDE IS EVERYTHING WHEN IT COMES TO SAFETY. IT SAVES LIVES.

Introducing Investigator's Corner

Do you ever wonder where the rules, regulations and policies concerning maritime safety come from?

Those involving marine casualty investigations and personnel action against documents and licenses held by merchant seamen originate in the Marine Investigation Division (G-MMI) of the Office of Marine Safety, Security and Environmental Protection.

How is G-MMI organized?

The Casualty Review Branch (G-MMI-1) investigates and reviews marine casualties involving commercial vessels; coordinates all marine boards of investigation; prepares the Coast Guard's official position on all reports requiring commandant's action; and maintains liaison with the National Transportation Safety Board and coordinates responses to their recommendations.

The Personnel Action Branch (G-MMI-2) takes remedial action against documents and licenses held by merchant seamen and other commercial vessel personnel; reviews all decisions and orders of the administrative law judges to monitor the effectiveness of investigation officer training; maintains disciplinary records of merchant seamen; distributes to field offices a " Seamen Locator List," containing names of seamen wanted for service of decisions and orders and/or for surrender of licenses and/or documents; reviews suspension and revocation appeals before forwarding to the Maritime and International Law Division (G-LMI), Coast Guard's Office of the Chief Council, for the commandant's decision; reviews applications for administrative clemency; administers a civil penalty program for violations of laws and regulations; and develops chemical drug and alcohol testing regulations for merchant mariners.

The Marine Safety Evaluation Branch (G-MMI-3) evaluates causal factors related to marine casualties involving commercial vessels; initiates statistical analyses of marine accident reports to use in developing and improving commercial vessel safety standards; helps develop field reporting procedures; maintains a continuing review of casualties to evaluate human factors; and develops a risk-management program related to maritime casualties.

Research and Development

A research and development project was initiated in the fall of 1992 to evaluate the human factors classifications in marine investigations. Four marine safety offices: MSO Puget Sound, MSO Hampton Roads, MSO Morgan City and MSO San Francisco, have been selected to gather data for the Research and Development Center in Groton, Connecticut.

This project includes a study of how fatigue may contribute to marine casualties. The information collected will improve field investigation and data collection processes required for statistical analysis.

The study is a building block for the Office of Marine Safety, Security and Environmental Protection's "Prevention through People" initiative to reduce marine casualties and pollution caused by human error.

The G-MMI will undergo changes this summer during a reorganization of the Office of Marine Safety, Security and Environmental Protection. Some branch duties will be combined and additional responsibilities will be added. G-MMI will also have a new division chief and two new branch chiefs. You will be informed of the details of these changes in future Investigator's Corners.

G-MMI encourages the readers of Proceedings to comment on this new column and to suggest topics they would like to have covered.

Contact LT Shelley Atkinson with comments and suggestions at (202) 267-1418.

The following deck questions should be answered using chart number 12221TR, Chesapeake Bay Entrance.

Deck

Your vessel has a draft of 8.0 feet (2.4 meters). Use 10° W variation. The gyro error is 2° W. The deviation table is:

HDG. MAG	DEV.	HDG. MAG	DEV.
000°	0°	180°	1° E
030°	1° W	210°	2° E
060°	2° W	240°	3° E
090°	4° W	270°	3° E
120°	2° W	300°	2° E
150°	1° W	330°	1° E

1. At 1730, your position is LAT 37° 13.9' N, LONG 76°26.4' W. You are steering course 088° per standard magnetic compass (psc) at an engine speed of 8.0 knots. What is your distance off Tue Marshes Light at 1730?

A. 2.6 miles.
B. 2.8 miles.
C. 3.0 miles.
D. 3.2 miles.

2. What is the maximum allowable speed of vessels underway up river from Tue Marshes Light?

A. 6 knots.
B. 8 knots.
C. 10 knots.
D. 12 knots.

3. At 1750, your position is LAT 37° 14.5' N, LONG 76°22.9' W. What was the course made good between 1730 and 1750?

A. 072°T.
B. 075°T.
C. 077°T.
D. 080°T.

4. At 1800, Tue Marshes Light bears 264.5° pgc, York Spit Swash Channel Light "3" bears 007° pgc. Your position is ____________________.

A. LAT 37°15.5' N, LONG 76°19.8' W.
B. LAT 37°15.2' N, LONG 76°20.3' W.
C. LAT 37°15.0' N, LONG 76°20.0' W.
D. LAT 37°14.5' N, LONG 76°20.1' W.

5. What course should you steer per standard magnetic compass to navigate down the center of York River Entrance Channel (ignore set and drift)?

A. 139° psc.
B. 141° psc.
C. 147° psc.
D. 149° psc.

6. You have just passed York River Entrance Channel Lighted Buoys "13" and "14." The chart shows a light approximately 1.0 mile off your port beam with a light characteristic "F1 6 sec." What is the name of this light?

A. Mobjack Bay Entrance Light.
B. New Point Comfort Shoal Light.
C. York Spit Light.
D. York River Entrance Channel Light "1."

7. At 1930, your vessel is between York River Entrance Channel Lighted Buoys "1YR" and "2." From this position, you change course to 142° pgc at an engine speed of 8.0 knots. At 2001, you obtain the following information:

Chesapeake Channel Tunnel North Light - 131° pgc;
Thimble Shoal Light - 248° pgc.

What were the set and drift between 1930 and 2001?

A. 079° at 1.1 knots.
B. 127° at 0.5 knot.
C. 290° at 1.2 knots.
D. 298° at 0.4 knot.

8. At 2015, your vessel is at the Chesapeake Bay Bridge and Tunnel midway between buoys "13" and "14." If the height of tide is -1 foot (-0.3 meters), what is the approximate depth of water?

A. 53 feet (15.5 meters).
B. 46 feet (13.9 meters).
C. 40 feet (12.1 meters).
D. 35 feet (10.6 meters).

9. If you steer 143° pgc from your 2015 position at an engine speed of 8.0 knots, at what time would you reach a point midway between buoys "11" and "12" (ignore set and drift)?

A. 2023.
B. 2029.
C. 2032.
D. 2037.

10. At 2015, you alter course to 154° pgc. What is the course per standard magnetic compass?

A. 162° psc.
B. 157° psc.
C. 152° psc.
D. 142° psc.

11. Which of the following concerning Thimble Shoal Channel is TRUE?

Only deep-draft passenger ships and large naval vessels may use the main channel.
B. The channel is 14.5 miles in length.
C. A tow drawing 20 feet is excluded from the main channel.
D. Thimble Shoal Channel is in international waters.

12. At 2118, you obtain the following bearings:

Cape Henry Light - 148° pgc;
Cape Charles Light - 033° pgc;
Thimble Shoal Light - 291° pgc.

From this position, you proceed to Norfolk, VA, a distance of approximately 26.0 miles. To arrive at Norfolk by 0200 the next day, what is the minimum speed to make good from your 2118 position to arrive at this time?

A. 5.0 knots.
B. 5.5 knots.
C. 6.0 knots.
D. 6.5 knots.

13. What is your 2118 position?

A.	LAT 36°57.0' N,	LONG 76°01.5' W.
B.	LAT 36°57.4' N,	LONG 76°01.9' W.
C.	LAT 36°57.8' N,	LONG 76°01.5' W.
D.	LAT 36°58.2' N,	LONG 76°02.4' W.

14. From your 2118 position, you steer a course of 288°T at an engine speed of 7.0 knots. Visibility is suddenly reduced to 2 miles. At what time can you expect to see Old Point Comfort Light?

A. The light is visible at 2118.
B. 2143.
C. 2202.
D. 2228.

15. If the Old Point Comfort main light was inoperative, what emergency light would be shown?

A. Flashing yellow.
B. Alternating red and white.
C. Light of reduced intensity.
D. Strobe light.

ANSWERS

1-A, 2-D, 3-C, 4-D, 5-B, 6-C, 7-B, 8-A, 9-B, 10-A, 11-C, 12-B, 13-B, 14-D, 15-C

If you have any questions concerning Nautical Queries, please contact G-MVP-5 Telephone: (202) 267-0707.

Final rule

CGD 84-060, Licensing of pilots; manning of vessels by pilots (46 CFR part 15) RIN 2115-AB67 (April 27).

The Coast Guard is amending the regulations concerning the licensing of pilots and the manning of vessels by pilots. This final rule: defines "coastwise seagoing vessel" for pilotage purposes; describes first class pilotage areas where local pilotage expertise is warranted; allows licensed individuals to serve as pilots in areas not identified as first class pilotage areas on vessels that they are otherwise qualified to control; requires a federal pilot for vessels in excess of 1,600 gross tons, propelled by machinery and subject to inspection under 46 U.S.C. chapter 33, that are not authorized by their certificate of inspection to proceed beyond the boundary line; and provides quick reference tables for federal pilotage requirements. These changes are necessary to eliminate confusion over where and on what vessels pilotage expertise is required.

DATE: This rule was effective May 30, 1995.

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

For further information, contact: Mr. John R. Bennet, Merchant Vessel Personnel Division (G-MVP/12). Telephone: (202) 267-6102.

Final rule

CGD 91-063, Alteration of obstructive bridges (33 CFR part 4 and 116) RIN 2115-AE15 (April 28).

The Coast Guard is amending the regulations which set out and describe the procedures for determining whether a bridge unreasonably obstructs the free navigation of navigable waters of the United States and, if it does, the procedures for ordering its alteration. The amendments clarify and provide additional details to the description of these procedures.

DATE: This rule was effective May 30. 1995.

Addresses: Documents referenced in this preamble are available for inspection or copying at the office of the executive secretary, Marine Safety Council (G-LRA), Room 3406, Coast Guard headquarters, between 8 a.m. and 3 p.m., workdays. Telephone: (202) 267-1477.

For further information, contact: Mr. Larry Tyssens, Office of Navigation Safety and Waterway Services. Telephone: (202) 267-0376.

Notice of proposed rulemaking

CGD 95-012, Removal of obsolete and unnecessary regulations (46 CFR parts 25, 28, 30, 31, 35, 37, 40, 54, 55, 56, 61, 70, 71, 72, 76, 78, 79, 90, 91, 95, 97, 99, 106, 150, 154, 174, 188 and 189) RIN 2115-AF03 (May 9).

The Coast Guard proposes to amend its regulations for all commercial vessels by removing and revising obsolete and unnecessary provisions. The Coast Guard expects that these amendments will reduce burdens to government and industry, reduce costs and provide a more concise, useful title 46, CFR.

DATE: Comments must be received by July 10, 1995.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CCD 95-012), Coast Guard headquarters, or delivered to room 3406 between 8 a.m. and 3 p.m., workdays. Telephone: (202) 267-1477. The executive secretary of the Marine Safety Council maintains the public docket for this rulemaking. Comments will be part of this docket and available for inspection or copying at room 3406, workdays, between 8 a.m. and 3 p.m.

For further information, contact: LCDR R. K. Butterini, Engineering Branch, Marine Technical and Hazardous Materials Division. Telephone: (202) 267-2206.

Request for comments

CGD 95-037, Adequacy of barge and tug navigation lights (33 CFR part 84) (May 9).

Concern has been expressed that current lighting requirements are not adequate for towing vessels and vessels under tow. The Coast Guard also receives frequent requests for clarification of lighting requirements. It has asked the Navigation Safety Advisory Council to review the issue and solicits public comment on the need for possible changes to or clarification of lighting requirements.

DATE: Written comments must be received by September 6, 1995.

Addresses: Written comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CCD 95-037), Coast Guard headquarters, or delivered to room 3406 between 8 a.m. and 3 p.m., workdays. Telephone: (202) 267-1477.

The executive secretary of the Marine Safety Council maintains the public docket for this rulemaking. Comments will be part of this docket and available for inspection or copying at room 3406, workdays, between 8 a.m. and 3 p.m.

For further information, contact: Ms. Margie G. Hegy, executive director, Navigation Safety Advisory Council. Telephone: (202) 267-0415. The phone takes messages 24 hours a day.

Final rule

CGD 83-043, Incorporation of amendments to the International Convention for Safety of Life at Sea (46 CFR parts 50, 52, 56, 58, 61 and 111) RIN 2115-AB41 (May 10).

The Coast Guard is modifying its regulations on navigational safety and marine engineering to harmonize them with the International Convention for the Safety of Life at Sea, 1974 (SOLAS 74), as amended, and to allow the use of current technology. This final rule is necessary because changes have been made to SOLAS 74 and new technology has become available. The incorporation of SOLAS 74, as amended, will enhance the safety of personnel and vessels, protect the natural environment and contribute to domestic carriers' improved competitiveness in the global market.

DATE: This rule was effective June 9, 1995.

For further information, contact: LCDR R. K. Butterini, Engineering Branch, Marine Technical and Hazardous Materials Division. Telephone: (202) 267-2206.

Final rule

CGD 92-061, Federal pilotage requirement for foreign trade vessels (46 CFR part 15) RIN 2115-AE28 (May 10).

The Coast Guard is amending the regulations to require federal pilots for foreign trade vessels: navigating certain offshore marine oil terminals located within the United States navigable waters of the states of California and Hawaii; making intra-port transits within certain designated waters in the states of New York and New Jersey; and transiting certain designated waters of the state of Massachusetts. This action is necessary to ensure that vessels are navigated by competent, qualified individuals, who are knowledgeable of the local area. The Coast Guard believes this requirement will promote navigational safety, increase the level of accountability, and reduce the risk of an accident and the discharge of oil or other hazardous substances into these waters.

DATE: The final rule was effective June 9, 1995.

Addresses: Unless otherwise indicated, documents referenced in this preamble are available for inspection or copying at the office of the executive secretary, Marine Safety Council (G-LRA/3406), Coast Guard headquarters, between 8 a.m. and 3 p.m., workdays.
Telephone: (202) 267-1477.

For further information, contact: Mr. John R. Bennett, Merchant Vessel Personnel Division (G-MVP/12). Telephone: (202) 267-6102.

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Notice, request for comments

CGD 95-041, Propeller accidents involving houseboats and other displacement-type recreational vessels (33 CFR part 183) (May 11).

Boating accidents involving propeller strikes often generate a great deal of interest and concern. As a result of a serious accident involving a rented houseboat which occurred in 1993, for example, the Coast Guard received considerable correspondence seeking the initiation of a rulemaking project to establish mandatory requirements for propeller guards on recreational houseboats and other displacement-type (non-planing) vessels, including those leased by livery operations. The Coast Guard wants to get an understanding of the public's present feelings about the use of propeller guards or possible alternatives to propeller guards on these vessels. In order to identify and consider the potential impacts such a requirement may have on the boating public, boat owners and operators, manufacturers and livery companies leasing such vessels, the Coast Guard is requesting comments from interested parties.

DATES: Comments must be received by July 10, 1995.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CCD 95-041), Coast Guard headquarters, or delivered to room 3406 between 8 a.m. and 3 p.m., workdays. Telephone: (202) 267-1477).

The executive secretary maintains the public docket for this rulemaking. Comments will be part of this docket and will be available for inspection or copying in room 3406, workdays between 8 a.m. and 3 p.m.

For further information, contact: Mr. Alston Colihan, project manager, Auxiliary, Boating and Consumer Affairs Division, Office of Navigation Safety and Waterway Services Telephone: (202) 267-0981.

Request for applications

CGD 95-020, Merchant Marine Personnel Advisory Committee (May 11).

The Coast Guard is seeking applications for appointments to membership on the Merchant Marine Personnel Advisory Committee (MERPAC). It is a 19-member federal advisory committee that advises the Coast Guard on matters related to the training, qualifications, licensing, certification and fitness of seamen serving in the United States merchant marines.

DATES: Applications must be received by July 10, 1995.

Addresses: Persons interested in applying for membership on MERPAC may obtain an application form by writing to Commandant (G-MVP-3), Coast Guard headquarters, or calling (202) 267-0224.

For further information, contact: Ms. Barbara Miller, assistant to the executive director, MERPAC, Rm 1210, Coast Guard headquarters. Telephone: (202) 267-0224.

Request for applications

CGD 95-042, Commercial Fishing Industry Advisory Committee (May 18).

The Coast Guard is seeking applications for appointments to membership on the Commercial Fishing Industry Vessel Advisory Committee. The committee acts as in an advisory capacity to the secretary of transportation and the commandant of the Coast Guard on matters related to the safety of commercial fishing industry vessels.

DATES: Applications must be received by July 31, 1995.

Addresses: Persons interested in applying should request an application form by Commandant (G-MVI-4), Room 1405, Coast Guard headquarters.

For further information, contact: LCDR Mark D. Bobal, executive director, Commercial Fishing Industry Advisory Committee, Telephone (202) 267-2307.

Request for applications

CGD 95-038, Towing Safety Advisory Committee (May 18).

The Coast Guard is seeking applications for appointments to membership on the Towing Safety Advisory Committee (TSAC).

DATES: Completed applications and resumes must be received by July 14, 1995.

Addresses: Persons interested in applying for membership on TSAC may obtain an application form by writing to Commandant (G-MTH-4), Coast Guard headquarters, or calling (202) 267-2997.

For further information, contact: LTJG Patrick J. DeShon, assistant to the executive director, TSAC, Room 1304, Coast Guard headquarters.
Telephone: (202) 267-2997.

Notice of meeting

CGD 95-045, Merchant Marine Personnel Advisory Committee; meeting (May 26).

The Merchant Marine Personnel Advisory Committee (MERPAC) and working groups will meet to discuss issues including certified instructors, approved training, the National Research Council report, "Minding the Helm: Marine Navigation and Piloting," and manning on United States vessels. All meetings will be open to the public.

DATES: The working groups will meet on July 13, 1995, from 8:30 a.m. to 4 p.m. The full committee will meet on July 14 from 9 a.m. to 4 p.m. Written material should be submitted no later than July 5, 1995.

Addresses: The meetings will be held in room 2414, Coast Guard headquarters. Written material should be submitted to CDR Scott J. Glover, MERPAC executive director, Commandant (G-MVP-3), Coast Guard headquarters.

For further information, contact: CDR Scott J. Glover (G-MVP-3). Telephone: (202) 267-0224.

Final rule

CGD 95-033, National Vessel Traffic Services regulations (33 CFR parts 26, 161, 162 and 165) RIN 2115-AF12 (May 31).

The Coast Guard is amending its Vessel Traffic Services (VTS) regulations to clarify certain sections and correct inaccurate geographic information. In addition, the final rule is deleting certain sections and adding existing vessel traffic management information which was inadvertently omitted in a separate final rule published in the *Federal Register* (59 FR 36316) on July 15, 1994. This rule is intended to promote safe vessel movement by reducing the potential for collisions, rammings and groundings, and their attendant loss of lives, property and environmental harm.

DATE: This rule was effective May 31, 1995.

Addresses: Unless otherwise indicated, documents referred to in this preamble are available for inspection or copying at the office of the executive secretary, Marine Safety Council (G-LRA), Room 3406, Coast Guard headquarters, between 8 a.m. and 3 p.m., workdays. Telephone: (202) 267-1477.

For further information, contact: Ms. Irene Hoffman, Vessel Traffic Services Division (G-NVT), Office of Navigation Safety and Waterway Services. Telephone: (202) 267-6277.

Reopening of comment period

CGD 95-022, Presidential regulation review (33 CFR chapter 1, 46 CFR chapter 1) (May 31).

The Coast Guard announces an initial policy determination on regulatory reform initiatives. The Coast Guard also reopens the period for public comment on its regulatory process and response to the president's regulatory reinvention initiative

DATE: Written comments must be received by December 8, 1995.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CCD 95-022), Coast Guard headquarters, or delivered to room 3406 between 8 a.m. and 3 p.m., workdays. Comments will become part of this docket and will be available for inspection or copying in room 3406 during the same period. Telephone: (202) 267-1477.

For further information, contact: Mr. Bruce P. Novak, regulations coordinator, Oil Pollution Act (OPA 90) staff. Telephone: (202) 267-6819. This phone records messages 24 hours a day.

Notice of proposed rulemaking

CGD 94-105, Coast Guard rulemaking procedure (33 CFR part 1) RIN 2115-AE99 (June 14).

The Coast Guard proposes to revise the regulations describing its rulemaking procedures to provide for a "direct final rule" process for use with noncontroversial rules. Under the direct final rule procedure, a rule would become effective within 60 days after publication in the *Federal Register,* unless the Coast Guard receives written adverse comment within 30 days. This new procedure should expedite the promulgation of routine noncontroversial rules by reducing the time necessary to develop, review, clear and publish separate proposed and final rules.

DATE: Written comments must be received by July 14.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406) (CCD 94-105), Coast Guard headquarters, or delivered to room 3406 between 8 a.m. and 3 p.m., workdays. . Telephone: (202) 267-1477.

For further information, contact: LT R. Goldberg, staff attorney, Regulations and Administrative Law Division, Office of Chief Counsel, Coast Guard headquarters. Telephone: (202) 267-6004.

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Final rule

CGD 95-014, Centralization of Vessel Documentation Offices (46 CFR parts 67, 68 and 69) RIN 2115-AF05 (June 15).

This rule revokes the designation of 14 ports as ports of record for vessel documentation, and reflects that the Coast Guard has moved the performance of all vessel documentation services to the National Vessel Documentation Center. The centralization of vessel documentation services will permit the Coast Guard to provide more efficient and effective service to the public by enhancing uniformity, specialization and expertise. The centralized office will also enable the Coast Guard to operate within budgetary constraints in concert with efforts to reduce the federal budget.

DATE: The rule is effective August 1, 1995.

Addresses: Unless otherwise indicated, documents referenced in this preamble are available for inspection or copying at the office of the executive secretary, Marine Safety Council (G-LRA/3406), Coast Guard headquarters, between 8 a.m. and 3 p.m., workdays. Telephone: (202) 267-1477.

For further information, contact: LCDR Don M. Wrye, Vessel Documentation and Tonnage Survey Branch, Merchant Vessel Inspection and Documentation Division (G-MVI/5). Telephone: (202) 267-1492.

Notice of availability

CGD 95-049, Consolidation of Coast Guard training centers; environmental assessment and draft finding of no significant impact (June 15).

The Coast Guard has prepared a programmatic environmental assessment for the proposed consolidation of Coast Guard training centers. This may result in transfer of training activities from one training center to other centers. One of more of the five training centers may be closed or partially closed.

Based on the information presented in the assessment, the Coast Guard finds no significant impacts to the environment will result from the proposed implementation of several alternatives consolidating the training functions at the five facilities and a proposed finding of no significant impact has been prepared. The Coast Guard seeks comments on the assessment and the proposed finding of no significant impact.

DATE: Comments must have been received by July 17, 1995.

Addresses: Copies of the programmatic environmental assessment and the proposed finding of no significant impact are available for public review at the following libraries: Petaluma Library, 100 Fairgrounds Drive, Petaluma, CA; Cape May Public Library, 110 Ocean Street, Cape May, NJ; Pasquotank-Camden Library, 205 East Main Street, Elizabeth City, NC; Newport News Public Library, 2400 Washington Avenue, Newport News, VA. and the New London Public Library, 63 Huntington Street, New London, CT.

Written comments should be mailed to and copies of the programmatic environmental assessment and the proposed finding of no significant impact may be obtained from Ms. Susan Boyle, NEPA branch chief, Coast Guard Maintenance and Logistics Command Pacific, Coast Guard Island, Building #54D, Alameda, CA 94501-5100. Telephone: (510) 437-3626.

For further information, contact: LT Jan Proehl, Public Affairs Staff. Telephone (202) 267-2304.

Notice of agency policy

CGD 95-047, National Environmental Policy Act: agency procedures for categorical exclusions (June 20).

The Coast Guard is announcing two changes in its policy concerning agency actions that are categorically excluded from additional environmental analysis under the National Environmental Policy Act. One change concerns the need for an environmental analysis checklist in the development of drawbridge regulations and procedures. The other change concerns permits for sailing competitions and demonstrations.

For further information, contact: Mr. David Reese, Environmental Compliance and Restoration Branch, Civil Engineering Division, Office of Engineering, Logistics and Development.
Telephone: (202) 267-1942.

Mariner's Seabag

Tankerman regulations

Recently published regulations created six new tankerman endorsements for a merchant mariner's document. They also specify the number of tankermen, and the types of endorsement required for each size tankship and barge. These regulations will affect many mariners.

Effective March 31, 1996, to serve as the master, chief mate, chief engineer or the first assistant engineer on a tankship, a mariner must have a suitable tankerman endorsement in addition to a license. On that same date, the person in charge of the transfer of oil or hazardous material in bulk as cargo from a tankbarge must have the appropriate tankerman endorsement. This endorsement is also required for the first time for the transfer of some non-flammable hazardous cargoes.

In most cases, to acquire an endorsement, the mariner must attend a Coast Guard-approved tankerman course; provide proof of having attended an approved fire-fighting course, and have participated under supervision in several transfer operations.

These endorsements cannot be obtained through testing. When the regulations become effective, the current tankerman exam will no longer be offered at the regional examination centers.

The examinations for all licenses affected by these regulations will be modified to reflect the new service limitations. For example, the chief mate and master examinations will no longer contain questions on the handling and stowage of hazardous liquid cargo. These and other subjects will be included in the mandatory training required for the endorsement.

The regulations include grandfather provisions for some of the endorsements. This allows a phase-in period to cause the least disruption to the individual mariner and the industry. In some instances, the grandfather provisions are temporary, and the mariner must complete the mandatory training to retain the endorsement.

The regulations are too complex and lengthy to be fully explained in the limited space available here. Further information may be obtained from the Merchant Vessel Personnel Qualifications Branch of the Merchant Vessel Personnel Division (G-MVP-3) or from the nearest regional examination center. A copy of the proposed regulations may be obtained from G-MVP-3, Coast Guard headquarters.

Revision to "Bowditch"

The American Practical Navigator, known to most mariners as "Bowditch," has been extensively revised and combined into one volume. The examination rooms will continue to provide the tables from the older edition, Bowditch volume II.

Modern global system

By Mr. Joseph Hersey

For nearly a century, ships have relied on the Morse code for distress and safety telecommunications. Invented by Samuel Morse and first used in 1844, the code was introduced at sea after the radio was invented at the end of the 19th century.

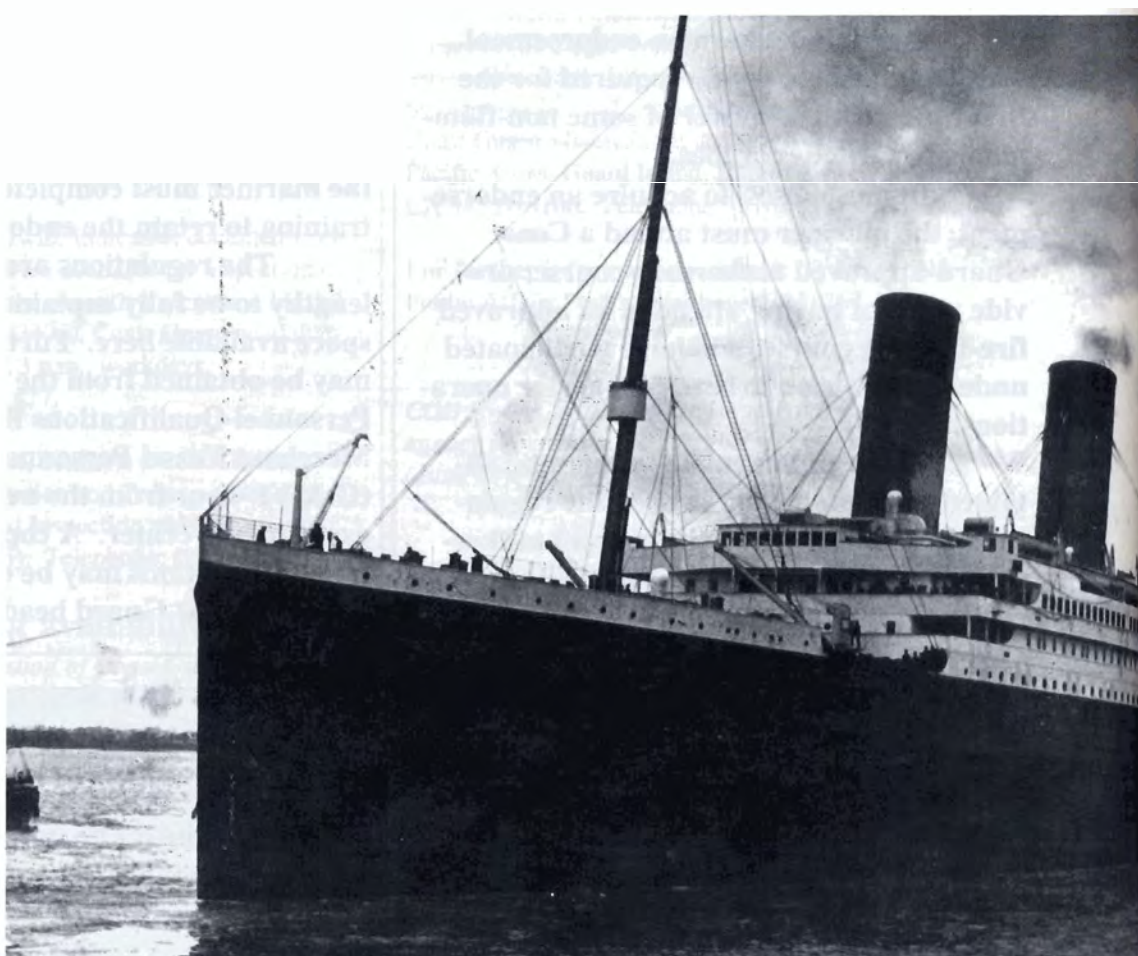
The need for ship and coast radio operators to use telegraph equipment on a common radio frequency for Morse encoded distress calls was recognized after the sinking of the passenger ship *Titanic* in the North Atlantic in 1912.

The Congress enacted legislation soon afterwards requiring all United States ships to use Morse code radiotelegraph equipment for distress calls. The International Telecommunications Union, now a United Nations agency, followed suit for ships of all nations.

Morse encoded distress calls have saved thousands of lives since it began. However, it requires skilled radio operators spending many hours listening to the radio distress frequency. Its range on the medium frequency distress bank is limited, as is the amount of traffic carried by Morse signals.

New global system

More than 15 years ago, the International Maritime Organization (IMO) started looking at ways to improve maritime distress and safety communications. In 1979, a group of experts drafted the International Convention on Maritime Search and Rescue, which called for developing a global plan. The group also passed a resolution mandating IMO to establish a global maritime distress and safety system to provide the communication support needed for the search and rescue plan.



The Titanic before its ill-fated voyage in April 1912.

replaces Morse code

The new system, which the world's maritime nations are adopting, is based upon a combination of satellite and terrestrial radio services, and has changed the basis of international distress communication from primarily ship-to-ship to ship-to shore.

The new system spelled the end of Morse code communications for all but a few users, such as amateur radio. The global system generates automatic distress alerting and locating in cases where a radio operator doesn't have time to send an SOS or MAYDAY call. Also, for the first time, ships receive broadcasts of safety information which can prevent a distress from happening in the first place.

The system actually coordinates several functions, some of which are new, but others have been in operation for many years. These functions include alerting and position determination of the unit in distress, search and rescue coordination, locating (homing), safety data broadcasts, general communications and bridge-to-bridge communications.

Specific radio carriage requirements depend upon the vessel's area of operation rather than its tonnage. The system also provides redundant means of distress alerting and emergency power sources.

The global maritime distress and safety system consists of many coordinated elements, which include the following.

COSPAS-SARSAT

COSPAS-SARSAT is a satellite-based search and rescue system established by Canada, France, Russia and the United States. Together these countries developed a satellite emergency position-indicating radio beacon (EPIRB), which is activated automatically. They are required by IMO on ships that travel internationally, commercial fishing vessels and other ships. The EPIRBs are designed to transmit vessel identifications and accurate locations from anywhere in the world to a rescue coordination center.

NAVTEX

A mechanism called "NAVTEX" instantly distributes maritime navigational warnings, weather forecasts and alerts, search and rescue notices, and similar information to ships.

A small, low-cost, self-contained printing radio receiver installed in the pilot house of a vessel checks each incoming message to see if it has been received before or if it is of no interest to the master. These messages are ignored. However, if it is a new, important message, it is printed on a roll of adding machine-size paper.

One of the biggest problems with marine safety broadcasts is their high volume. Since ships are constantly moving in and out of a broadcast service area, each broadcast has to be constantly repeated to ensure every ship receives it. NAVTEX is designed to print the first of these broadcasts, but reject repeated ones.

No operator needs to be present during a broadcast to receive vital information.

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"... the global maritime distress and safety system will significantly improve safety of life at sea."

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INMARSAT

Another important element of the global system is operated by the International Mobile Satellite Organization (INMARSAT). It operates two satellite systems.

The first, called INMARSAT-C is a low-cost telex and data telecommunication service. This system also provides broadcasts of high seas weather warnings, navigational and radio-navigation warnings, ice reports and similar information not provided by or outside the coverage of NAVTEX. That broadcast service is called INMARSAT-C SafetyNET.

The second, INMARSAT-A, is a larger, somewhat more expensive voice, data and telex telecommunications service. A similar, more modern version, called the INMARSAT-B, is of similar size and higher initial cost than INMARSAT-A, but telecommunications charges are the least of any INMARSAT services.

INMARSAT offers EPIRB service similar to that of COSPAS-SARSAT.

High frequency

As a result of the global system, the Coast Guard is improving its high frequency radio telex safety services from communication stations to the maritime community, as well as broadcasts of high seas safety information over high frequency telex.

Digital selective calling

IMO also introduced digital selective calling on VHF, medium and high frequency radio channels as part of the global system to speed distress and general radiotelephone calls to and from shore, and other ships. When fully implemented, digital selective calling will eliminate the need for persons on a ship's bridge or on shore to continuously monitor radio receivers. It could also help reduce the growing congestion in the United States on VHF channel 16. Ship watchkeeping on this frequency will end on February 1, 1999.

Once ships under the Safety of Life at Sea (SOLAS) Convention disband watchkeeping on VHF and medium frequency radio-telephone channels, other ships will need digital selective calling to contact the SOLAS ships, particularly in a passing situation.

The Coast Guard recommends that all radio-telephone equipment carried on ships should include digital selective calling capabilities for safety. A national requirement is being considered that all new radio-telephones have at least a basic capability by February 1, 1999.

Radar transponders

The global system includes one or more search and rescue radar transponders to locate survival craft and distressed vessels.

Conclusion

With the loss of radio officers on ships, the global maritime distress and safety system is not without problems. False alert rates on some devices are as high as 99 percent. The lack of an accurate international database of electronic identities needed to identify vessels sending a distress alert, has been a problem.

Mariners don't always know how to use the equipment, and many who have accidently sent a distress alert don't cancel it, often because they don't know how. The Coast Guard has often deployed search and rescue aircraft to help a vessel in distress, only to discover some mariner had accidentally sent an alert with a false position, had not canceled it and did not respond to calls from the rescue coordination center over the device which sent the distress alert.

Although the Federal Communications Commission is responsible for inspecting radio installations on United States ships, no one inspects radio installations on foreign ships entering United States ports.

These problems, however, will be overcome in time, and the global maritime distress and safety system will significantly improve safety of life at sea.

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Saving lives from the sky

By PA1 Randy Midgett

The heroic efforts of swimmers from the sky have saved numerous lives over the past several years. Coast Guard swimmers dive into the cold Alaskan waters from helicopters to rescue fishermen who have gone overboard.

Prior to 1990, commercial fishing in Alaska led all other industries in work-related deaths, with an average of 35 fatalities a year. In 1993, this number fell to 18 deaths, and in 1994, there were only 13.

The number of Alaskan fishermen who died when their vessels went down has dramatically decreased from 24 percent in 1991 to one percent in 1994. These numbers reflect the effects of the 1991 fishing vessel safety regulations, including better trained crews, improved survival equipment, voluntary dockside examinations and the rescue swimmer program, which began in the late 1980s.

In fact, there were occasions when people would have died if not for the rescue swimmer program.

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Takan incident

When the 52-foot troller *Takan* went down near Icy Point in 1990, the crew of four would have died if not for the rescue swimmers.

It was about 6 a.m. on April 7. The crew of the *Takan* were enjoying a very successful haul of black cod and were nearing the end of the string. The weather was clear and cold with 15-foot seas and winds coming in from the east. The skipper was at the wheel and had been on watch for about three hours when he noticed the boat was acting sluggish. Each time the *Takan* would meet the sea, the stern was buried by water.

"I told one of the guys to go check the bait hatch to see if we were taking on water," said the skipper. "We were, so I had them drag out the pump and start pumping the water out."

They had a new pump and once it started working, the boat handled better. The skipper, however, couldn't shake an uneasy feeling so he radioed a nearby friend, who plotted the distance between the two boats as 10 miles. The friend started working his way toward the *Takan*, which was now sinking.

Things were looking up when the pump took in some loose line and froze up. It had a screen, but the line was small enough to fit through the holes. Once the pump froze up, the skipper knew it was too late to save the boat so he radioed the Coast Guard.

"Boy, was I lucky. The Coast Guard just happened to have a helicopter in the air helping another boat in the area. But because of the trouble I was in, they headed for me," reported the skipper.

Once overhead, the helicopter pilot asked the skipper to change the heading of the boat so they could drop a pump. "The wind was blowing like hell and, when I changed the heading, we took a hard starboard list and started taking on more water," the skipper said.

"When I went back to check the fish hold, I was hit by a wave and washed overboard. Now I can't swim a lick and the survival suit I was wearing was filling up fast with water, so I closed my hands tight and held on."

He was in the water about five minutes when the helicopter crew tried a basket pick up. "They lowered a basket down to me, but I couldn't get into it. I was really worried about the outrigging on the boat dragging me under," noted the skipper.

The helicopter crew tried five basket pick ups to no avail, then pulled the empty basket back up. "I thought they were going to leave me, so I started trying to stay warm," said the skipper. "Then I saw a swimmer drop into the water. He wasn't a very big man, but as soon as he hit the water he started swimming toward me. When he got near me, he told me not to fight him and just do what he told me to. He rolled me into the basket like a sack of potatoes.

"He stayed in the water the whole time and, one by one, got the rest of the crew into the basket. He was the last to get out. I'm telling you, he was like an angel from heaven.

"I've been working boats since 1947 and have seen my share of troubles. Yes, greed made me stay out there longer than I should have, but I wouldn't be sitting here today if it wasn't for that swimmer and the Coast Guard. I owe my life to the Coast Guard and I'm telling you, you can't put a price on a life."

Pilot rescue

Rescue swimmers aren't always deployed in the water. In a case last year, a rescue swimmer had to force himself into a downed aircraft to rescue the pilot.

"We were working our way back from Cape Spencer when we got diverted to look for a missing airplane," recalled a Coast Guard aviation survivalman. "There was a small float plane that was overdue around Chatham Straight. The weather was terrible. We were flying in and out of snow squalls."

The crew of the Coast Guard plane spotted the downed aircraft along the tree line. "It looked like the plane just flew right over the water, up the beach and right into the trees," said the survivalman. "We made a call down to the plane, but got no recall. So the pilots sent me in to access the crash."

Because it was low tide, he was lowered into waist-deep water and walked up to the aircraft. "The closer I got to the plane and could see the force of the impact, I knew there was no way anyone could have lived through it," he reported.

When he got to the plane, he found the pilot slumped over, pinned down by the dash. The survivalman climbed up on the plane, but couldn't find any way inside the cockpit. The left wing was folded down over the left door and the right door was buckled so badly, it wouldn't open. The front windshield was broken, but was too small to crawl through.

On the left side of the aircraft were two small cargo doors with four pins holding them in place. The Coast Guard survivalman reached through the broken glass and pulled the pins to release the doors. He could then crawl through the opening to get to the pilot.

He asked the pilot if he was OK, not really expecting him to be alive. He was shocked when the pilot moaned. Now he had to think of a way to get him out of the plane.

The pilot was pinned in the seat by the dash and floorboard with exposed compounded fractures in both legs.

Rescue swimmers are lowered from a helicopter.

The helicopter crew lowered a litter and back-board to the beach. The survivalman gathered up the equipment and moved in behind the pilot , racing against time. He knew the helicopter was running low on fuel and soon it would be dark.

Back in the plane, he noticed the right seat in the cockpit was loose. "I started kicking the heck out of the seat," he recalled. "Man, I must have kicked that seat for 10 minutes straight before it finally broke loose."

After removing the seat, the survivalman had room to force the dash off the pilot. Laying on his back, he pushed up on the dash, prying the weight off of the pilot's legs.

It took about 30 minutes to get the pilot out of the plane. Putting him in the litter was rough, because his legs were smashed and entangled in wreckage.

The hoist to the helicopter went smoothly, but the trip back to the air station in Sitka was anything but. The helicopter had to slow to a hover in blinding snow with zero visibility. During the arduous journey, the survivalman treated the pilot's most life-threatening wounds.

Finally, they spotted the street lights of Sitka, followed them in and landed safely.

"I really don't remember much about the whole day or the crash. All I know is those guys saved my life," noted the pilot. "They went a long way for me, and if it wasn't for the rescue swimmer program, I would be dead. It's just that simple."

The cost of training a third class aviation survivalman is about $25,000. That may seem high, but when a life is saved, the program is a bargain at any price.

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The Coast Guard to the rescue -- is it the real thing?

False distress alerts

By Mr. Dan E. Lemon

A false alert is a call for help when no one really needs help. The growing number of false alerts affects search and rescue (SAR) efforts, and safety at sea more than most people realize.

It will require a lot of cooperation to bring false cries for help under control. We must be better at designing, building, integrating, testing, maintaining, registering and using communications equipment. We must also improve our efforts to cope with false alerts.

Most emergency position-indicating radio beacons (EPIRBs) can automatically send a distress alert when a ship sinks. Last summer, we received a satellite EPIRB alert from a ship 200 miles from the Federated States of Micronesia. The SAR response involved a chartered aircraft, a fishing vessel and another ship. Also a Coast Guard aircraft, diverted from another SAR case, flew more than eight hours to the scene. The ship with the EPIRB could not communicate with any of the responding units. When the Coast Guard plane dropped a message onto the vessel asking it to turn off the EPIRB, it complied. As soon as the aircraft departed, the vessel turned it on again.

In October, the Coast Guard received a digital selective calling alert from a ship near Russia. The United States and Japan worked with a rescue coordination center in Vladivostok for 24 hours before the vessel was identified and found not to need help.

Until recently, most calls for help were by voice and the rescue coordination centers could be reasonably sure they were genuine. Now, the number of false alerts, especially through automated data, impairs the Coast Guard's ability to promptly respond to genuine calls for help.

Most false alerts are inadvertent and can usually be traced to equipment problems or human error. Some are hoax calls. They all take time and attention away from real emergencies. The Coast Guard attempts to treat every alert as genuine, but skepticism grows as more alerts turn out to be false.

False alerts cause delays which may cost lives, and prolong or intensify suffering. They adversely affect seafarer safety and waste limited resources. The Coast Guard responds to thousands of them every year.

False alerts erode confidence in both seafarers and SAR personnel in the global maritime distress and safety system (see page 50) being set up by the International Maritime Organization (IMO). Many cases could be resolved quickly with a phone call, if global system equipment was properly registered. It is vital that national authorities ensure that ships register their equipment and that the registration data is readily available to SAR personnel.

Causes

Most false alerts are caused by inadequate equipment designs or human error. Satellite and digital selective calling equipment, and EPIRBs are all causing trouble. This will increase as the devices penetrate the market, unless something is done.

Australia, for example, receives many digital selective calling alerts with maritime mobile service identities which are clearly incorrect, such as with all digits being zeros or ones, apparently as the result of commissioning operations. These alerts tend to be relayed many times on multiple frequencies, so they continue to be received for hours.

False alerts are often traced to ports or drydocks, and sometimes even to manufacturers. Sometimes equipment seems to malfunction by itself.

Last November, the Coast Guard received several alerts which were tracked by aircraft to a shipyard in Washington state. Relays of this signal were also received from several high flying aircraft. It turned out to be the homing signal from a properly mounted EPIRB aboard a fishing vessel. It was correctly set in the "armed" position. But, even after the EPIRB was turned off, it continued to transmit, and had to have its battery removed. Water leaking into the unit caused the malfunction. The Coast Guard worked with the manufacturer to correct the flaw that caused the failure.

During the third quarter of 1994, false satellite EPIRB alerts fell by ten percent, mostly due to feedback on problems to equipment manufacturers, which resulted in design improvements.

During 1994, only 12 percent (145 cases) of EPIRB alerts involved actual distresses. Of the false alerts, 15 percent were due to bracket failures, 39 percent to human error, 19 percent to beacon problems, seven percent to testing and the remaining 20 percent were undetermined.

This time, the alert was real.

"*False alerts cause delays which may cost lives, . . .*"

The Coast Guard tracks about 13,000 ships from more than 130 countries annually, about 2,800 on a typical day, which voluntarily report their sail plans so they can be more easily used to assist other mariners. These vessels helped to save over 700 lives worldwide in 1994.

False alerts can result when the operator is distracted during a performance verification test. The operator may be asked to send a test alert which the equipment would not normally send. However, if the test time expires while the operator is distracted, when the test is resumed, a real alert may be transmitted.

Misuse of the equipment may partly relate to design. Distress alerts have been sent by the software of some terminals without the operator being aware. This may happen when an officer transfers to a ship with different equipment than he or she has used before. The user may accidentally hit the "return" keyboard at a time when it automatically sends an alert. The equipment may not pause to ask, "Are you sure you want to send a distress alert?"

The Coast Guard devoted 5.7 hours of aircraft time, and seven hours of diversion time for a merchant ship, responding to an alert 350 miles east of Guam. The identification number was apparently invalid, and the Coast Guard was unable to contact the ship or its owners. Not until rescue units arrived on scene, was it determined that the alert had been due to human error. The flight time would have exceeded 20 hours had the Coast Guard not been able to divert the aircraft during a return flight. This case was in the central Pacific, the vessel owners were in Hong Kong, and the alert was received in Australia. Different time zones made it harder to verify information. This alert caused the diversion of a merchant ship, which proper equipment identification could have avoided.

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"... Coast Guard mus[t]
as though they involve[...]

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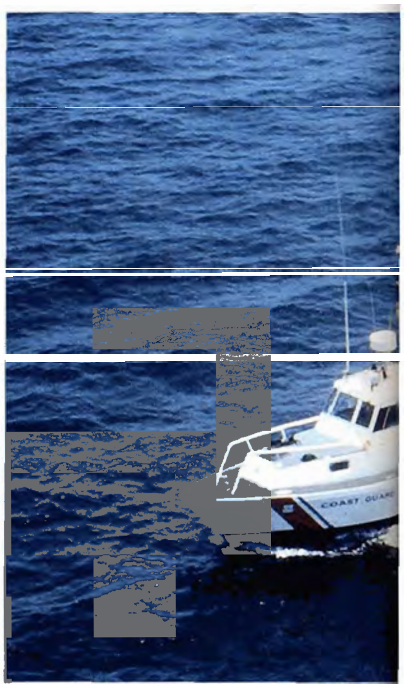
Problems responding to false alerts are compounded when the ship appearing to be in distress fails to respond to attempts to contact it. Matters get worse when other vessels near a distress situation do not respond to SAR authorities trying to obtain their aid.

On November 26, the rescue coordination center in Hong Kong received an alert from an offshore EPIRB. The call sign was used to identify the ship, and an alert was relayed to ships in the area. When no one responded, an aircraft was launched and located the vessel. It was learned that a false alert resulted from a test. That response cost $4,300. Ironically and sadly, the ship had received the relay of its own EPIRB alert and was not even aware of it. Was this a training problem, an equipment problem, a compounded symptom of too many false alerts, or careless watchstanding?

Earlier in the year, the Coast Guard received a distress call from a sailing vessel hundreds of miles southwest of Los Angeles, California. The Coast Guard knew that a global maritime distress and safety system-equipped cruise ship was near, but could not get an acknowledgment from it by any means of communication. Finally, a fishing vessel was contacted which arranged for the cruise ship to assist. It is unclear why the cruise ship failed to respond in the first place.

When a ship does not answer a call from SAR authorities seeking assistance, arrangements should be made when practical to have the matter investigated at the ship's next port.

Another problem arises when personnel do not know how to use global maritime distress and safety system equipment when they need help. The results can be costly.



Inadequately trained on the use of global maritime distress and safety system equipment, one crew activated an EPIRB to arrange for the evacuation of an injured crew member. A Coast Guard and a Navy fixed-wing aircraft responded. When contacted by the aircraft on scene, the master revealed the nature of the problem. Of course, the fixed-wing aircraft could not do an evacuation. The resource time, including that spent by the rescue coordination center, already totaled 59 hours for personnel, 19.7 hours for the Coast Guard aircraft and 1.6 hours for the Navy aircraft. The cost for this time was more than $90,000.

If the crew had used appropriate equipment to contact the Coast Guard, the delay in assisting the injured crew member could have been avoided.

Another costly situation stems from vessels with unregistered or misregistered equipment. When registration data is inaccurate, the alert is partly false, and when the data is not readily available, it is more difficult to handle alerts.

Discipline must improve regarding database registration, updating and availability of data to international rescue coordination centers.

respond to all alerts actual distress."

The Coast Guard answers another distress alert.

When the Coast Guard responded to one satellite EPIRB alert, none of the registered points of contact were accurate, and the ship could not be contacted. Another ship and a plane were diverted to investigate, each devoting nine hours to the case. A rescue coordination center was appraised of the situation and contacted seven alleged owners of the ship, all with negative results. When the aircraft arrived on scene, it was learned that the EPIRB had activated after being taken from its bracket, but that the vessel was not in distress. (EPIRBs are often removed from mounting brackets and set on the deck, which typically activates the beacon.) With accurate registration information, the Coast Guard could have contacted the ship without having to launch the aircraft. A new IMO requirement that EPIRBs be in the water to automatically activate will help reduce this problem.

Costs

The cost of operating Coast Guard patrol boats and cutters for SAR ranges from $500 to more than $3,000 an hour, depending on type and size. Each type of aircraft costs about $4,000 per hour. A typical utility boat used near shore costs more than $300 an hour.

One shipping company estimates the cost to divert a typical tankship to investigate alerts at from $15,000 to $30,000 per day, not including profit loss and indirect expenses.

Necessity for response

While the following case did not involve a false alert, it shows why the Coast Guard must respond to all alerts as though they involve actual distress.

A signal was received from a beacon registered to a tuna seiner 800 miles from American Samoa. Ships in the area were alerted via satellite. After unsuccessful attempts to contact the vessel by radio, a double-crewed Coast Guard aircraft was launched to investigate. The plane arrived on scene in darkness 7.5 hours later, located the EPIRB and several strobe lights in the water. Several rafts and a marker buoy were deployed and the aircraft departed. At daybreak, all 19 crew members were in the water (some without life jackkets). They noticed the rafts and swam to them. They were rescued 34 hours after the initial alert by a fishing vessel. The seiner had sunk after catching fire.

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The Coast Guard searches and rescues by sea.

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A single response like this is beyond the capabilities of most rescue coordination centers. Even in the United States, only a limited number of such responses can be carried out within operating budgets. Not only is it cost prohibitive to routinely launch facilities to find out if distress alerts are real, but the false alert problem is compounded by lack of readily available equipment registration data and problems contacting ships.

In the last case, it may have been reasonable to assume that the alert was false and abstain from launching. That would have made 19 survivors victims of the false alert problem.

Recommendations

False alerts have been traced to two main causes: poor equipment design and inadequate training.

The Coast Guard must ensure that when false alerts are transmitted, SAR personnel have the information they need promptly to determine that the alert is false without having to launch rescue units.

In particular, digital selective calling system false alerts are on the rise, but work in the EPIRB area is beginning to show positive results. If a substantial reduction is not achieved soon, the quality and efficiency of SAR organizations will be jeopardized for years.

The trend toward increasing false alerts can be turned around if all concerned do their part.

According to IMO and other maritime organizations, national administrations should:

1. **inform seafarers about the implications of false alerts;**
2. **provide for ships to properly register all global maritime distress and safety system equipment, and ensure that this data is available to rescue coordination centers;**
3. **pay attention to testing and alerting functions of equipment during approval processes;**
4. **investigate causes of unwanted alerts; and**
5. **ensure that surveyors and inspectors know how to operate and test equipment.**

Manufacturers should:

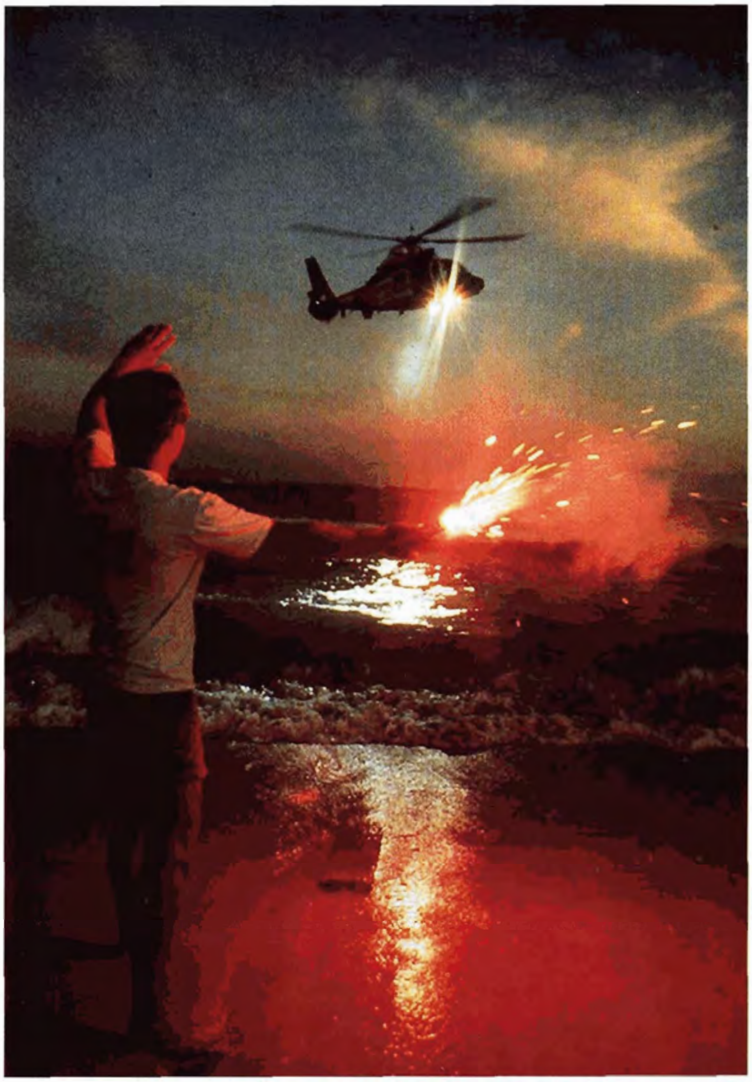
1. **provide clear and precise operating instructions;**
2. **ensure that equipment is designed so it cannot transmit an inadvertent alert, and so that testing will not result in false alerts; and**
3. **ensure that any distress alert activation is indicated visually or acoustically.**

Maritime trainers and educators should:

1. **teach about false alert problems; and**
2. **ensure that no inadvertent alert occurs when training on global maritime distress and safety system equipment.**

Users should:

1. **ensure that all ship personnel responsible for sending a distress alert are competent to operate all radio equipment on the ship;**
2. **ensure equipment is tested only under supervision of the person responsible for communications; and**
3. **ensure that encoded ship identities used by SAR personnel are properly registered.**



Search and rescue is also conducted by air.

Conclusion

We must bring false alerts under control before 1999, when SOLAS ships will be required to have global maritime distress and safety system equipment.

Organizations working to reduce false alerts should be supported. The International Chamber of Shipping sees a need for better instructions for mariners on what to do if they suspect a false alert was sent from their stations. While a single button or click of a mouse may send an alert, a quick an easy way to cancel false alerts must be found.

False alerts do more than cost dollars, time and resources. They divert limited resources from responding to genuine distress calls. They lower morale and place the lives of SAR personnel at risk.

Receiving too many false alerts erodes shipboard attention to messages received. But, worst of all, false alerts undermine the SAR system's ability to save lives and reduce suffering.

Everyone must do whatever they can to help keep distress and safety communications competent and reliable. Lives are at stake.

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COVER PHOTOGRAPHS

Front cover: ***Rescue crew courtesy of Mustang Survival.***

Rear cover: ***Free-fall lifeboat courtesy of Schat Watercraft.***

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