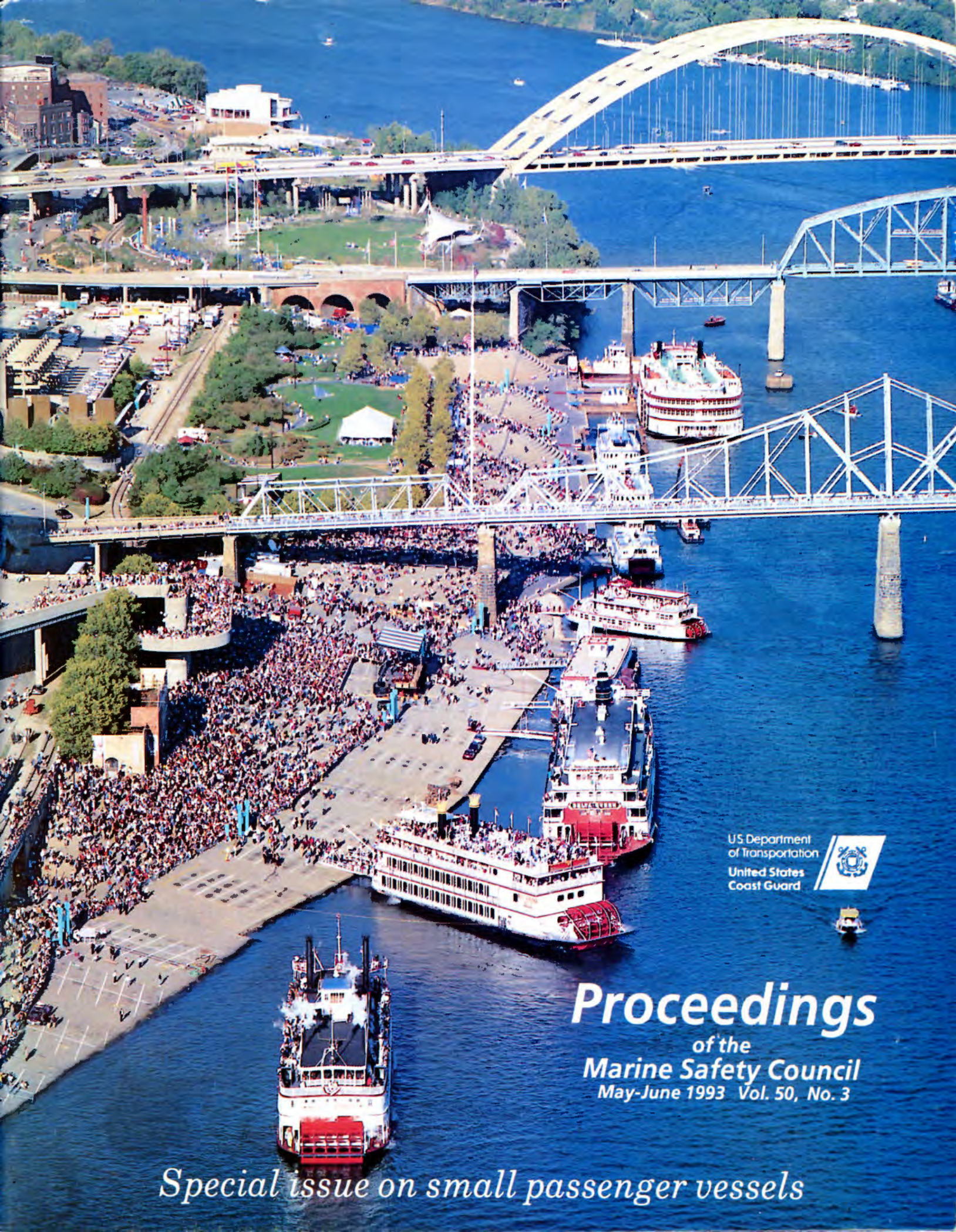

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Special issue on small passenger vessels

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Proceedings

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Features

Departments

More features

Cover photos

(Front) **Tall Stacks Celebration of 1988 on Ohio River at Cincinnati featured replicas of American steamboats.**
Photo courtesy of Elder Photographic, Inc.

(Rear) **Aluminum white-water jet passenger boat skims rapids of the Snake River in the Northwest.**
Photo courtesy of Daryl Bentz.

Small passenger vessel safety is everybody's goal

By RADM A. E. "Gene" Henn

The maritime industry is in a state of flux. Events like the *Exxon Valdez* oil spill in Prince William Sound, Alaska, in March 1989 have focused public attention on vessel safety with an intensity unmatched since the sinking of the *Titanic* off the coast of Newfoundland in April 1912, and the tragic loss of women and children aboard the fire-ravaged *General Slocum* on New York's East River in 1904.

The impact of these events was to alter the course of maritime safety. For example, the legacy of the *Exxon Valdez* was the Oil Pollution Act of 1990 (OPA 90), which has already brought about substantial improvements in spill prevention technology and environmental protection.

While the small passenger vessel industry has not been plagued with catastrophic maritime disasters, there are dynamics at work that will not permit a "status quo" philosophy to endure.

A changing industry

Fortunately, "status quo" has not been a trademark of the small passenger vessel industry, whose history has been marked with dramatic changes. The entrepreneurial energy of this dynamic segment of the maritime world has propelled it to the forefront of creativity. The demand for such innovations as excursions, dinner cruises and the western riverboat gaming extravaganzas is accelerating tremendously.

This enormous growth is accompanied by an equally large responsibility to ensure passenger safety aboard these new vessels. Just because there hasn't been a substantial casualty in this industry, doesn't mean that it cannot or will not happen. This is no time for complacency. Now, as small vessels carry up to a thousand passengers, it is vital that we maintain safety.

Continued on page 2

Sonoma is one of three 169-foot, 725-passenger, fast aluminum commuter ferries serving San Francisco Bay.

Navatek I, an ultramodern catamaran, can carry 422 passengers. *Photo courtesy of the Passenger Vessel Association.*

Continued from page 1

Partnership roles

The Coast Guard's role in this era of exciting innovations is to be an honest broker in partnership with small passenger vessel owners and operators. Organizations including the National Party Boat Owners Alliance, the Passenger Vessel Association and the National Association of Charter Boat Operators continue to assist in regulatory efforts and policy development.

Our mutual goal is to provide public services which are safe and environmentally sound. At the same time, we must not impede the healthy growth of the industry nor its ability to adapt to a changing economy, which has been a hallmark of this truly American small business community.

One of many projects the Coast Guard is pursuing at the request of the industry is the revision of subchapter T of title 46 of the Code of Federal Regulations (46 CFR 175-185). These regulations have not been overhauled in over 30 years. They have stood the test of time well, but their revision is long overdue.

True, this revision has been a long time coming. Progress was delayed in 1992, due in part to federally-imposed regulatory moratoriums and to the higher priority of mandated OPA 90 legislation.

However, "God willing and if the creek don't rise," we hope to publish a supplemental notice of proposed rulemaking in 1993. Stay with us. It will happen.

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

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-- *Small passenger vessels* --
"T-Boats" *of the 1990s*

Excursion boat Isle Royale Queen III carries visitors across Lake Superior. *Photo courtesy of Timothy Graul.*

By Mr. Eric Scharf and Mr. Peter Lauridsen

The small passenger vessel industry has evolved rapidly over the past decade. While its roots are in small ferries, party fishing vessels and charter yachts, the industry has grown to include large dinner cruise vessels, small cruise ships and excursion boats with many unique construction styles.

Today, small passenger vessels range from water taxis under 20 feet carrying a few passengers to 175-foot dinner cruising vessels and ferry boats capable of transporting a thousand passengers. There are conventional hulls, catamarans, submersibles and SWATHs (small waterplane area twin hull) made of steel, aluminum and fiberglass, operating in rivers, harbors and open water. (See page for detailed descriptions.)

1980s growth

The industry saw dramatic growth in dinner cruise and excursion boats during the 1980s, which continues at a somewhat more measured, but sustainable pace today. This growth was spurred on by waterfront redevelopment projects, a vibrant tourism industry in the United States, and improvements in the service and quality of the cruise vessels and their menus. These activities have created a substantial small shipyard industry with increased employment opportunities for maritime workers.

The latest development in the domestic passenger vessel industry is riverboat gaming. However, it has not found a home in the **small** passenger fleet because of the demand for large casino spaces.

The industry today

While there are about 5,000 craft classified as "small passenger vessels" for regulatory purposes in the United States, only about 2,000 are actively involved in public passenger service. Many others are either inactive or used in the offshore services industry, which has very different requirements.

The industry is comprised of between 500 and 600 operating bodies, including incorporated businesses, non-profit organizations and sole proprietors. While the vessels are mostly operated by small family businesses, large corporations are showing more interest in the industry.

Continued on page 4

John H, one of the largest T-boats in the world, is 260-feet long, and can ferry 1,000 passengers and 110 automobiles across Long Island Sound.

Continued from page 3

More than 350 companies and single operators of small passenger vessels have joined the Passenger Vessel Association (PVA), formerly the National Association of Passenger Vessel Owners. (The new name reflects a broader membership than just owners.) To foster growth, the exchange of ideas, and to enhance safety awareness, PVA promotes industry issues among government agencies, travel and hospitality businesses, financial markets and insurance firms.

Safety

Small passenger vessel operators have long recognized that a safe industry is a successful one. They have worked hard to ensure that passenger and crew safety are top priorities every time a boat leaves the dock. PVA members recognize that affordable insurance is dependent upon vessel owners who are primarily interested in safe, accident-free operations. To encourage safe operations, the association sponsors an insurance program and also conducts a comprehensive loss control program.

Regulations

The need for updating regulations to meet new industry challenges, developing technologies and growing safety concerns is recognized by both vessel operators and the Coast Guard. Two priority issues are:

1) **Development of final revisions of Title 46 Code of Federal Regulations (CFR) subchapter T dealing with small passenger vessels (T-boats). (See page 17 for more information.)**

These new industry rules will acknowledge technological advances, as well as incorporate today's policies and practices. Many of the ideas submitted in the original Coast Guard proposal more than three years ago generated extensive industry comment. The new regulations need to see the light of day for the industry to continue to grow and prosper.

2) **Incorporation of the Americans with Disabilities Act into regulation. (See page 18 for more information.)**

This law, seeking a barrier-free environment for the disabled, already applies to the marine industry, but there are no regulations to guide vessel operator compliance. Many long-standing safety standards dealing with structural fire prevention and watertight integrity conflict with methods of facilitating access for the disabled.

Generally, the regulation process has moved too slowly to accommodate evolutionary changes. The dialogue process has been used to deal with such issues as emergency egress in excursion vessels and structural fire safety in vessels with large public spaces. The broad regulatory process must respond more rapidly to mirror the success of these single-issue efforts.

The passenger vessel industry expects to see steady growth in the 1990s as the economy improves and the United States travel market remains active. The need to maintain a strong, cooperative partnership with the federal government will ensure passengers of safety, while sustaining a healthy industry.

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T-boats & T-boats...

(Above left) Goodtime III *-- 130-foot dinner/excursion boat carries up to 1,000 passengers on Lake Erie. Built in 1990.*
(Above right) Tambor *-- 130-foot ferry carries about 30 vehicles, 200 passengers on deck and another 200 in an upper cabin. Built in 1992.*
(Left) Friendship Bay *-- 60-foot recreational vessel sails passengers around Bar Harbor, Maine. Built in 1961.*
(Below left) Zumbrota *-- A restored yacht built in 1918, the 87-foot vessel is now a charter yacht, entertaining up to 149 passengers in Southern California.*
(Below right) Kaulana *-- 63-foot excursion boat carries up to 149 passengers on tours out of Lahaina, Hawaii. Built in 1972.*

(Left) Atlantis IV *-- 65-foot submersible vessel takes up to 46 passengers on underwater tours off Honolulu, Hawaii. Built in 1987.*
(Below left) Obsession *-- 103-foot private charter boat carries up to 88 passengers or small parties on overnight cruises out of Seattle, Washington. Built in 1991.*
(Below right) Miss Key West *-- 41-foot harbor cruise boat takes up to 47 passengers around the Florida Keys. Built in 1967.*

All photographs on this page are courtesy of the Passenger Vessel Association.

Small passenger vessels -- --

Blend of old and new -- -- Jonathan Padelford has both screw propellers and a hydraulic-driven paddlewheel.

A tradition of innovation

By Mr. Timothy Graul

A mere one hundred years ago, there were few real "population centers" in the United States. Local travel was on foot, horseback or by buggy. When people traveled any distance at all, it was generally by stagecoach, train or steamboat.

The country's rivers, lakes and seacoasts literally swarmed with freight and passenger craft: from rowboats and launches to the great river steamers of the Hudson, Mississippi and Columbia River systems; from barges to the big sidewheelers of the East Coast and Great Lakes.

The years around the dawn of the 20th century were truly exciting times for shipbuilders and naval architects.

The country was in its great westward expansion. There was no shortage of passengers and the age of steam was at its peak. The internal combustion engine was not sufficiently developed to be a candidate for boat propulsion, although a few naptha launches were built.

Travel between major cities was on the big sidewheelers and screw propeller ships. Local runs to outlying points were handled by small package freighters, coasters and ferries from 60 to 100 feet in length. They were constructed of wood, and usually had coal or wood-burning Scotch boilers and non-condensing engines. Schedules were planned to meet trains or large steamers.

Definitely modern -- -- Wendella LTD is an aluminum 65-foot commuter/sightseeing boat carrying up to 200 passengers.

One good reason for regulations -- The excursion steamer General Slocum before and after catching fire and burning in the East River in New York in 1904. More than 950 people lost their lives, incuding children on a church outing.

Photographs courtesy of the Steamship Historical Society, University of Baltimore.

Dawn of regulations

Robert Fulton's *Clermont*, acknowledged by most historians as the first successful steamboat in the United States made its maiden voyage in 1807. By 1812, a steamboat had navigated the Ohio and Mississippi Rivers from Pittsburgh to New Orleans.

In 1838, a law was enacted requiring periodic inspection of steam vessels, and, shortly thereafter, the Steamboat Inspection Service was established. Appointed by district judges, inspectors were to assure that boats had sound hulls and boilers, proper fire fighting equipment and lifeboats, and that skilled and experienced persons stood watches. If a vessel passed inspection, the federal port agent issued a certificate of compliance, without which it was illegal to carry passengers.

The Bureau of Navigation was established in 1884. Shipping commissioners arbitrated disputes between masters and crew, and served as an employment referral service. The Steamboat Inspection Service and the Bureau of Navigation merged in 1932 to form the Bureau of Navigation and Steamboat Inspection within the Department of Commerce. The name was changed in 1936 to the Bureau of Marine Inspection and Navigation.

Meanwhile, in 1915, the Life Saving Service and the Revenue Cutter Service merged to form the United States Coast Guard, an arm of the Treasury Department. Shortly after the start of World War II, an executive order temporarily transferred the responsibilities of the Bureau of Marine Inspection and Navigation to the Coast Guard. Congress made this transfer permanent in 1946. This marked the real beginning of the Coast Guard's involvement in the inspection and regulation areas as they are now.

Reactivity

As is the case today, most regulations in the early days were reactive. When steamboating started, there was no real weather forecasting. Schedules had to be kept, and revenue depended on the amount of freight and the number of passengers that could be carried. It is not surprising that casualties were high.

The Steamboat Inspection Service was established because boilers were blowing up at an alarming rate. Stability standards were set because vessels were capsizing. The first Safety of Life at Sea (SOLAS) Convention, resulting in rules on subdivision of passenger ships, came about because the "unsinkable" *Titanic* sank in

Continued on page 8

Continued from page 7
1912. The structural fire protection requirements in the Coast Guard passenger vessel regulations (46 CFR subchapter H) can be traced back to the burning of the *General Slocum* in 1904 and the *Morro Castle* in 1934.

The small passenger vessel regulations (46 CFR subchapter T) were the Coast Guard's reaction to the capsizing of at least two passenger boats in the early 1950s. The latest additions to the stability regulations for passenger craft are the direct result of the *Herald of Free Enterprise* swamping and capsizing in 1987.

Tonnage and footage

The Motor Boat Act of 1940, as amended, required the Coast Guard to inspect and certify all vessels over 15 gross tons carrying passengers for hire. (There were lots of passenger boats less than 15 gross tons.)

A Certificate of Inspection, then as now, was required to be "posted and framed under glass in a conspicuous place in the vessel, where it is most likely to be observed by passengers and others."

Boats over 15 gross tons and more than 65 feet in length carrying passengers for hire had to have a licensed pilot and a licensed engineer. Under 65 feet, a motor boat operator's license was required.

The Small Passenger Vessel Act of May 10, 1956, chapter 1, title 46 of the United States Code of Federal Regulations (46 CFR), was published in the *Federal Register* in October, 1957, to take effect June 1, 1958.

For the designer and builder of small passenger vessels, CG-323 (the booklet containing subchapter T) became the "rules to live by." It required Coast Guard-approved lifesaving, fire fighting and fire-extingishing equipment; established regulations for machinery, piping, electrical and ventilation systems, and set standards for hull strength and integrity, stability and subdivision.

After the initial inspection and certification of small passenger vessels, major changes were made to subchapter T and published in the *Federal Register* in 1960. The next major revision was made in 1963, when the scope of subchapter T was broadened to include vessels more than 65 feet in length, but less than 100 gross tons and carrying one or more passengers. This is when the "S" (less than 65 feet) and "L" (65 feet and above) designations came into effect.

Before the definition of a small passenger vessel was expanded from "under 65 feet" to include "or under 100 gross tons," some clever means were used to build the largest boat possible within the length limit. The *West Shore*, built in 1946-47 to serve the Bass Islands in Lake Erie, was an example of the extreme beam approach. The vessel is 64 by 31 feet.

Blount Marine built several 65-foot "flat top" ferries in the 1950s, including the *Corsair* and *Commuter*. The latter has since been lengthened to 95 feet, and both boats are still in service. Another example of broad beam is the *Voyageur* of the Washington Island Ferry Line, which is 64 by 34 feet.

The late Walter W. Haertel devised the trick of a discontinuity in the main deck 64 feet 11 inches aft of the stem, with a sloping surface from there aft. In this way, a boat 70 or more feet long was still considered under 65 feet long. This gambit was first employed on the ferry *Challenger*, built in 1947, and later on the *C. G. Richter*, *Marlyn* and many other craft built before 1963.

There is still some inconsistency as to how a boat's length is measured.

There is still some inconsistency as to how a boat's length is measured. The prevailing practice is to measure the length on deck, not including any platforms, pulpits, racks or other areas not contiguous to the deck and not accessible to passengers. This gives rise to some confusion when comparing the real size of boats, because in advertising brochures and publicity, it is common practice to give the "length" of the vessel over its outermost extremities, like from the landing stage to the sternwheel. In other cases, the "register length" from the boat's document is sometimes given. This is measured from the "inside of the stem at the underside of the deck to the forward face of the rudder stock."

Class "L" vessels have to meet higher standards than "S" vessels -- both for equipment, such as bilge lines, bilge and fire pumps, and for stability and subdivision regulations. In practice, local Marine Inspection Offices have a fair degree of autonomy in approving "S" vessels, while plans for "L" vessels generally are reviewed by the Coast Guard's Marine Safety Center in Washington, D.C.

Built in 1961, the 70-foot Marlyn's sloping main deck qualified it as under 65 feet. *Photo by Herb Reynolds.*

Today the definition of a small passenger vessel remains as one under 100 gross tons, according to the Moorsom system (an archaic method of calculating the internal capacity of merchant vessels formerly accepted by most countries), now referred to as "regulatory" tonnage. United States-flag vessels on international voyages must also be evaluated under the International Maritime Organization's convention tonnage system, which reflects more accurately the size of a vessel than the old system and exposes the larger "small" passenger vessels to port charges more consistent with their actual size.

By cleverly capitalizing on the quirks of the old tonnage rule, designers are able to keep incredibly large vessels below the 100-gross ton limit. Probably the largest "T" boat now in service is the 240 by 60-foot ferry *John H*, which runs between New London, Connecticut, and Orient Point on Eastern Long Island, New York. This huge enclosed RO-RO vessel, built in 1989, can carry 110 cars and 1,000 passengers.

Stability and subdivision regulations depend on passenger capacity and length. Any vessel 65 feet or longer, carrying 150 or more passengers must meet intact and damage stability standards, requiring formal inclining tests witnessed by the Coast Guard. Vessels under 65 feet with fewer than 150 passengers need only comply with the simplified stability test.
(See page 19)

Offshore industry contributions

When the first offshore oil well was drilled around 1948 in the Gulf of Mexico near Morgan City, Louisiana, the crewboat industry was born. Oil rig roughnecks come under the Coast Guard definition of passengers, so as soon as crewboats carried more than six of them, they came under passenger boat rules.

After a variety of existing speedboats, tugs, yachts and shrimp boats had been pressed into offshore service and found wanting, the first true crewboats were designed. When the quest for oil spread farther into the Gulf of Mexico and other offshore fields, builders responded with larger, faster, more rugged boats very rapidly.

The first aluminum crewboat was built in 1955. Only six or seven years later, 90 and 100 footers were common. Today, the longest are the *Ashley Alyse McCall* and sister vessels, all 160 by 30-feet with six engines.

The 1960s and 1970s were years of unparalleled activity and progress in the construction of aluminum crewboats. One yard alone built more than 1,700 boats between 1955 and 1974. Another constructed more than 1,000.

The experience gained building all those crewboats was put to good use later on as the yards turned to military and passenger vessel work when the demand for offshore oil support craft dried up in the early 1980s.

Continued on page 10

The 400-passenger steamboat Julia Belle Swain.

Continued from page 9

Shallow-water vessels

For years, almost every small passenger vessel on sheltered water had a wide shallow hull with stern or side wheels, or screws. The venerable Dubuque Boat and Boiler Co., Dubuque, Iowa, which was in continuous operation from 1870 to 1972, quietly and steadily built more than 50 excursion boats from 1950 to 1970. Most of them had barge-like hulls and sternwheel propulsion. Deck-mounted, radiator-cooled gasoline or diesel engines drove the wheels through a reduction gear to a roller chain final drive.

In the 1950s, Dubuque built a series of vessels with conventional propulsion and unpowered sternwheels to evoke the nostalgia of the romantic old river sternwheelers. They probably started, or at least kept alive, the present popularity of sternwheel excursion boats.

Before it closed, Dubuque built one of the most accurate replica sternwheelers -- the steamer *Julia Belle Swain*. Large enough not to look like a caricature of a steamboat, the vessel has operated on the Mississippi since 1972. A 400-passenger T-boat of 98.6 gross tons, the *Julia Belle Swain* has a steel hull and aft house on the main deck and aluminum upper works.

The *Creole Queen*, a large craft built in time for the 1984 New Orleans World's Fair, really epitomized the rebirth of the dinner-excursion boat boom of the 1980s. Its sternwheel is driven by DC electric motors powered from diesel-driven AC generators and silicon rectifiers.

Tug/barge combinations

The humble barge has been the dray wagon of the waterways for centuries. Among the first passenger craft in the country were ferry barges, which crossed rivers, streams, lakes and bays. Some were powered by horses or oxen on treadmills. Some were poled. A few were even slewed across rivers by the current, prevented from drifting downstream by cables. Some winched themselves across streams by cable. Others were pushed or pulled by tugs.

The propulsion and service module, which carries no passengers, is an uninspected vessel, although the "barge" part of the unit must be built to subchapter H or T rules. The vessel does have to comply with applicable stability and subdivision rules, and with lifesaving, fire fighting, and door and access regulations.

Most probably, the first modern straight passenger vessel to use this concept was the *Gateway Liner*, built in the middle 1960s. A recent version of the tug/barge idea is the 93-foot, 360-passenger excursion boat *Anson Northrup*, which sometimes pushes the 450-passenger barge *Betsey Northrup*.

The 360-passenger excursion boat Anson Northrup pushes the 450-passenger barge Betsey Northrup.

A typical Lake Michigan passenger/vehicle ferry, Washington, can carry 250 passengers, and between 24 and 26 automobiles.

The first Iowa riverboat casino was a tug and barge, the 2,250-passenger *Dubuque Casino Belle*, built in 1991. The 100-foot service module and 250-foot barge are virtually indistinguishable from a single vessel when mated up.

Coastal and lake craft

Away from the rivers, most small passenger vessels were designed conservatively and conventionally. The 65-foot *Welcome*, built in 1928, and the 66-foot *North Shore*, built in 1931, are excellent examples of early ferry and passenger/freight boats. The *Welcome* was the first ferry built specifically to serve Washington Island, Wisconsin.

The *C. G. Richter*, built in 1949, greatly resembled The *Welcome*. The major difference between the two is that the *Richter* was built of steel. The *Richter* was also designed and built with twin screws, but was soon converted to single screw because of that design's superior protection against ice damage. As a testimonial to the longevity of a fundamentally sound design, the *C. G. Richter* was fitted with a new engine in 1991, and is now in its 43rd season, making daily trips across Death's Door Passage in northern Lake Michigan in all kinds of adverse weather conditions.

Fast craft

Trains, automobiles and airplanes all took advantage of the boat's one shortcoming -- its relative lack of speed. When ferry or commuter boat operators compete for passengers with other transportation modes, speed takes on an importance that is unnecessary for excursion or dinner cruise operators. The development of fast passenger craft has been encouraged more in other parts of the world than in the United States.

Actually, there are only a few locations in this country where conditions justify truly fast passenger boat routes. The first requirement is a steady supply of people who need to traverse a suitable body of water preferably in both directions at different times. The water can't be too rough, too shallow, or too full of debris or other boat traffic, and must be open all year.

Many places outside the United States meet this criteria, including the Straits of Messina, the English Channel and Sydney Harbor. Fast passenger ferries are gaining in popularity, however, in San Francisco Bay, California, and Puget Sound, Washington. The Intermodal Surface Transportation Efficiency Act of 1991 is expected to encourage expansion of fast ferry service in urban areas of the United States.

In the 1960s, hydrofoils were thought to be the solution for speedy passenger service on water. With the Navy's encouragement, two giant aero-space firms poured millions of dollars into their development. However, complexity, high operating and fuel costs, and the lack of a market sounded the death knell.

Beside the planing hull, two types of fast craft appear to have the greatest potential for commercial success: catamarans and air-cushion vessels.

Continued on page 12

Continued from page 11

Catamarans

The idea of using two long, slim hulls instead of one fat one probably goes back to the Polynesians. Apparently, the only vessel mounting a serious challenge to the cost efficiency of the conventional monohull is the light planing catamaran.

A fast, light catamaran was introduced to the Florida party fishing fleet around 1964 and achieved a modest degree of acceptance. Aluminum catamarans were built by a few firms and saw service primarily as party fishing boats.

The real breakthrough in catamaran acceptance came with the Australian INCAT designs. INCATs can have either conventional screws or water jet propulsions. Noise abatement is accomplished by isolating the passenger cabin from the hull by rubber mounts.

A later design, called the "Wave Piercer," incorporates a tertiary hull well above the waterline, which provides great buoyancy and lift when the slim catamaran hulls plunge into seas. One of these is in operation between Cape Cod and Nantucket Island, Massachusetts. An advantage of the Wave Piercer is its ability to sustain high speeds in rough seas.

Air-cushion vessels

The extremely high stability of the catamaran can produce a quick, jerky ride at speed in a chop. The hovercraft, SES or air-cushion vessel was designed to reduce wave-contouring motion.

The first commercially marketed hovercraft were British vessels supported on rubberized fabric skirts and propelled by air-screws. Another British air-cushion vessel, appearing in 1965, took a rigid sidewall approach. This craft looked more like a boat, and used water jets or propellers and conventional marine propulsion. The sidewalls stayed in the water to capture the cushion and retain directional stability.

Experimentation with rigid sidewall air-cushion vessels began in the United States in the early 1970s. A pioneer was the "SECAT," which started as a 40-foot aluminum planing hull split down the middle and separated by two centrifugal lift fans, powered by a gasoline engine.

A 110-foot prototype built in the late 1970s embodied a ride-control system, which used pressure transducers to vent the cushions as necessary to maintain a more-or-less level posture. The prototype was later lengthened, and versions were acquired by the Navy and Coast Guard.

The 86-foot aluminum INCAT catamaran ferry Island Express serves Mackinac Island in North Michigan.

Super T river excursion boat Quad City Queen is 135 feet long and is certified to carry 799 passengers.

Super T-boats

In the late 1960s, aluminum crewboats had passed the 100-foot length limit. Subchapter T passenger boats were about to increase in size vastly. The *Avalon*, designed in 1968, was 150 feet long, the largest by far at the time. An aluminum boat powered by two gas turbines and Z-drive pods with propellers, the *Avalon* was certified for 500 passengers. It made over 25 knots, and because of its size, provided a very comfortable ride. At last report, the *Avalon*, repowered with diesels, was serving as a dinner boat in Hawaii.

The *Avalon* was the forerunner of three aluminum 169-foot, 725 passenger ferries developed in the early 1970s for service in San Francisco Bay. Powered by three gas turbines and water jets, these craft made over 28 knots at full load displacement. These boats represented the first continuous application of gas turbines in a commuter ferry.

Unfortunately, the price of fuel soared around 1975, when the boats started service. This, coupled with problems with the water jets, discouraged their continued service. By 1984, the three boats had been repowered with twin diesel engines and conventional screws. Now operating at a lower speed with reduced fuel consumption, the ferries are in daily service in San Francisco Bay.

On the rivers, the excursion boat business was booming, with several very large vessels being built. A typical example is the *Quad City Queen* built in 1984. It is 136 by 38 feet at 94 gross tons, and is certified for 799 passengers. It was followed in 1988 by the 196-foot *Mississippi Belle II*, which is now a casino boat rated at 570 passengers. The *West Virginia Belle*, certified for 1,200 passengers was delivered in 1989.

Meanwhile, the era of subchapter T overnight cruise boats was dawning. Around 1969, the first overnight cruise boat built after the 65-foot length limit on T-boats was lifted was the 112-foot *Mount Hope*, which slept 44. This was not enough paying passengers to be an economically viable entity, however. In 1972, the *New Shoreham I*, accommodating 62 overnight passengers, came along. It was reportedly the first overnight T-boat allowed to be used internationally. A decade later, overnight T-boats were required by the Coast Guard to comply with structural fire protection regulations.

In the 1980s, several small overnight cruise ships appeared with such innovations as bow ramps which enable landing on isolated beaches and discharging passengers directly ashore, retractable pilot houses for slipping under Erie Canal bridges, and shallow drafts to permit Bahamas cruising.

Continued on page 14

Continued from page 13

Other examples of large overnight T-boats include three vessels built for Clipper Cruise Line of St Louis, Missouri. The first, launched in 1983, was the *Newport Clipper*. It and the *Nantucket Clipper* and the *Charleston Clipper* are 207 feet long and carry 102 passengers on coastwise routes -- basically in New England in the summer and the Gulf of Mexico and Caribbean Sea in the winter.

Auto ferries

Wherever there is an island, cape, peninsula or riverbank to be reached where people wish to drive their cars, there will be ferry boats. The variety of ferries is so broad that an entire paper could be written on them. Vehicle ferries range from 53 footers designed to carry baggage and golf carts, up to vessels over 100-feet long capable of carrying any legal highway load.

Speed costs

In almost every passenger ferryboat application, speed is a primary consideration. However, speed never comes without a price -- light and consequently costly construction, high power/light weight engines, and special propellers or other propulsors, such as water jets. No matter how light the boat, the passengers always weigh the same, and more power requires more fuel, and the auxiliary systems and accommodations, insulation and outfitting all must be taken into account.

Since passenger space generally dictates the gross deck area of a boat, and, in turn, its size and weight, that weight can be proportioned in any number of ways. The boat can be short, wide and shallow, or long, slender and deep -- a catamaran, hydrofoil, SWATH or cushion supported. Each type has its power demands for certain speeds, and, whatever the case, stability and subdivision criteria must be met.

Many other factors must be considered, including water and air draft, and overall length and width constraints, close-quarters maneuverability, wake and noise -- both on board and emitted. Another factor is ride comfort, and here the SWATH concept seems to have a lot of promise. But, again, this is at the cost of draft, complexity and sophistication.

Moreover, the operator is concerned that the boat make a profit. It must move people reliably, efficiently and comfortably while generating enough revenue to pay for itself and reward the entrepreneur's risk taking.

The fleet today

With all the publicity about super T-boats, fast catamarans, casino boats and enormous dinner cruise "yachts," one tends to forget how many small passenger vessels less than 100 feet long there are.

According to December 1990 figures reported by IMA Associates, Inc., the subchapter T fleet includes some 5,100 vessels in the United States. About 47 percent of these boats are under 29 gross tons. (The largest group -- 32 percent of the fleet -- is under 20 gross tons.)

In terms of capacity, the IMA report says that 3,665 vessels -- or about 70 percent -- have a capacity for 49 or fewer passengers.

It appears that about 150 to 200 T-boats join the fleet each year. Two thirds of the active fleet has been in existence since 1980.

This demonstrates that the small passenger vessel industry is essentially a small business. Like the American business community as a whole, a very large part is made up of relatively small entities -- usually family-owned and operated, with perhaps one or two boats.

This is what gives the small passenger vessel community its individuality, its appeal, its sense of community, its vitality and its confidence.

Photographs for this article were supplied by the author, Mr. Timothy Graul, a naval architect and marine engineer of Timothy Graul Marine Design, Sturgeon Bay, Wisconsin 54235. Telephone: (414) 743-5092.

Inspector checks integrity of wood hull during drydocking.

Save time and money on T-boat inspections

By LT Brian F. Poskaitis

Quality management techniques can save small passenger vessel owners both time and money. Regular upkeep and a program of self checks will not only ensure smooth Coast Guard inspections, but also will reap economic rewards. Following are concrete ways to use quality management techniques to advantage:

Keep your vessel up to standards all year round, not just for inspections.

The annual Coast Guard inspection is not a quality control check. When a vessel has not been well maintained, it is obvious to the inspector, and makes him or her examine it closer to ensure its safety.

Set up a preventive maintenance schedule.

Numerous small, but potentially serious problems are discovered during annual Coast Guard vessel inspections that could have been prevented through proper maintenance.

For example, on a recent T-boat inspection, the block of wood on which the steering rod was mounted had worked loose, and was barely holding as the rod moved. There was no hatch on the stern and it was a long crawl through a wet, stagnant bilge area to get to the steering gear. Once there, seeing the block of wood slammed around every time the rudder was shifted, it was obvious that the operator had not checked the steering gear components for a long time. A weekly, or even monthly check of these components most likely would have brought this to light before it became a potential danger.

Use inspection checkoff lists routinely.

Most Coast Guard MSOs use checkoff lists to conduct inspections. Ask your local MSO inspection department for a list to follow or for help in organizing a list of your own. Major items to check include:

- **lifesaving equipment**
- **fire extinguishing equipment**
- **watertight integrity**
- **steering**
- **machinery**
- **electrical systems**
- **navigational equipment**
- **emergency signals**
- **general safety and housekeeping**
- **documents and records**

Continued on page 16

Con tinued from page 15

Pay particular attention to lifesaving and fire fighting equipment, and to your vessel's watertight integrity.

Most Coast Guard inspectors will require any deficiencies on lifesaving, fire fighting and watertight integrity to be corrected before the vessel is permitted to continue operation.

Every lifejacket should be taken out and examined periodically. If you aren't sure how to check lifejackets, ask at your next inspection.

Waterlight batteries should be checked regularly and replaced every year. Check routinely to see if fire extinguisher charges are good, and that hoses and handles are in satisfactory condition. It is also a good idea to have extinguishers serviced once a year.

To ensure watertight integrity of your vessel, checking for leaks in the hull is not enough. Conduct a hose test periodically on your watertight hatch covers. Also, make sure that any coamings around the interior compartment are intack to prevent downflooding.

Regular attention to these details will make life as a small passenger vessel owner or operator a whole lot easier.

Open up all accessible spaces.

Generally, "accessible" means any area that can be opened for access to the hull, without significantly damaging the structure. All areas of the interior hull should be at least visible from some location on the vessel. If there are spaces on your vessel that are accessible only by tearing up interior sections, you should find or make alternative means of access. You may be asked to tear up finished interiors during inspection.

When in doubt, ASK.

Whether you want to know if a new piece of equipment is acceptable or if a planned vessel modification is subject to approval, ask your local inspection department. Assuming that any vessel or equipment changes you make yourself are acceptable can be very costly.

For example, the hull of a large paddle-wheeler was recently built without regard for weld-joint detail and without any quality control procedures. The owner was given the benefit of the doubt by just requiring non-destructive testing to verify the quality of the welding. When 11 of 12 radiographs came back with bad results, there was no alternative but to have the owner back-gouge nearly all of the vessel's hull welds.

Partnership

A partnership was formed in 1956, when the United States Congress charged the Coast Guard with the responsibility of regulating the small passenger vessel industry, due to casualties resulting in lost lives.

Both the Coast Guard and the industry value their primary customers --- the public. The small passenger vessel industry is a secondary customer of the Coast Guard, with the safety and welfare of the passengers and crew coming first.

The Coast Guard's use of quality management throughout its programs, reaps benefits often shared by both the public and the industry.

Small passenger vessel owners can save both time and money by regular maintenance practices, which are, in fact, quality management applications. A vessel safety check today can save a lot of trouble in the future - and it could also save lives.

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Coast Guard inspector checks condition of T-boat propeller shaft during haul-out.

Subchapter T revision

A notice of proposed rulemaking revising subchapter T was originally published in the Federal Register on January 1989. Due to considerable public interest (311 letters and six public hearings with more than 100 speakers), the Coast Guard will publish a supplemental notice of proposed rulemaking, which is now in regulatory clearance.

The final clearance of this supplemental notice was delayed because of the 270-day regulatory moratorium ordered by President George W. Bush in 1992, as well as the myriad of legislation mandated by the Oil Pollution Act of 1990.

It is anticipated that the supplemental notice of proposed rulemaking will be published in the Federal Register in mid-1993, followed by a second public comment period.

Public comments

Public comments on the notice of proposed rulemaking focused on:

- **complexity of proposed regulations compared to the existing subchapter T;**
- **proposed breakpoint scheme for different requirements;**
- **structural fire protection requirements for vessels with more than 150 passengers;**
- **requirements for inflatable survival craft, including costs, space needs and effects on vessel stability;**
- **fire pump requirements; and**
- **requirements to maintain passenger lists and counts.**

Operators and/or owners of smaller vessels were also concerned about the "trickle-down effect" of new regulations designed for larger and more specialized vessels, such as multi-deck excursion boats and dynamically-supported craft.

Public recommendations

Interested public citizens recommended:

- **a definite limit be set on the size and capacity of future T-boats, above which subchapter H requirements would apply;**
- **increased use of commercial (i.e., non-Coast Guard-approved, but meeting approval specifications) incombustible and fire-retardant materials be allowed;**
- **American Boat and Yacht Council recommended standards be permitted as an alternative inspection criteria for smaller vessels;**
- **the entire International Maritime Organization (IMO) dynamically-supported craft code be adopted for inspection purposes;**
- **passenger count and list requirements be relaxed, consistent with the letter of the law; and**
- **a revised scheme be provided for the type and amount of survival craft required, based on but not limited to vessel survivability, casualty analysis, rescue scenarios, number of passengers, route and effects of hypothermia.**

Casualty analysis

In response to public comments, the casualty analysis used for the notice of proposed rulemaking was reevaluated, examining the most severe T-boat casualties over the past 20 years. This analysis was entered into the regulatory docket, and will be addressed in the preamble of the supplemental notice of proposed rulemaking.

The proposed changes are the result of a "systems" approach, where the safety of the

Continued on page 18

Continued from page 17
vessel was evaluated as a whole. This approach is based on the vessel itself as its own best survival craft. This notice, therefore, proposes options or reductions in safety equipment required for vessels with improved survivability.

Hypothermia was a strong driving force in the proposed survival craft requirements. More cold water drownings have been caused by hypothermia than was previously thought. People who must abandon ship in cold water must be able to keep themselves out of the water.

Further information on the revision of subchapter T can be obtained from LCDR Marc C. Cruder, project manager, Standards Development Branch, Merchant Vessel Inspection and Documentation Division.
Telephone: (202) 267-1181.

Americans with Disabilities Act and passenger vessels

The Americans with Disabilities Act prohibits discrimination against individuals with disabilities. Title II on public services will affect the design and arrangements of ferries and other means of public transportation, and title III on public accommodations and services provided by private entities will affect accommodations on excursion and cruise vessels.

The issues of access and accommodation raised by the Americans with Disabilities Act were addressed in final rules and guidelines published in the *Federal Register* on September 6, 1991, by the Department of Transportation (DOT) and the Architectural and Transportation Barriers Compliance Board.

The sections on ferries, excursion boats and other vessels (49 CFR 38.177 and 36 CFR 1192.177) have been reserved due to a lack of information and statistics on the use of the vessels by the disabled community. In other words, although the act applies to waterborne transportation, no specific regulations yet carry it out.

Regulations' status

DOT's general counsel is responsible for drafting the regulations applying to the passenger vessel industry. The Federal Transit Administration is conducting the research for DOT to evaluate the impact of the Americans with Disabilities Act on the maritime industry.

The Federal Transit Administration contracted the Urban Harbors Institute of the University of Massachusetts in Boston to investigate and analyze the impact of the act on the waterborne transportation industry. This study was completed and is now under review. Once the study is accepted by the Federal Transit Administration, DOT anticipates publishing an advance notice of proposed rulemaking in the *Federal Register*, making the study available for review and soliciting comments from the public.

At present, there are no Americans with Disabilities Act requirements or proposed specifications in the pending subchapter T supplemental notice of proposed rulemaking. The Coast Guard is engaged in open dialogue with the Federal Transit Administration and DOT on this rulemaking.

The Coast Guard expects to play a key role in developing the regulations to implement the requirements of this act to ensure that they are consistent with existing regulations.

Further information on the Americans with Disabilities Act and passenger vessels can be obtained from Mr. Allen Penn, project manager, Standards Development Branch, Merchant Vessel Inspection and Documentation Division.
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Do-it-yourself stability tests

By LCDR Mark Prescott

You don't have to be a naval architect or an engineer to perform a simplified stability test on your small passenger vessel. The vessel is subjected to a heeling force, equal to the maximum it would normally experience in service. If sufficient stability is indicated, the vessel passes. It is that simple.

Stability requirements for vessels carrying passengers are in 46 CFR part 171. Subpart B deals with small passenger vessels and describes the simplified stability test.

Vessels

The simplified stability test may be used on vessels under 100 gross tons, not more than 65 feet in length and carrying between seven and 150 passengers. Such vessels are commonly known as T-S boats (small subchapter T boats).

For T-S boats carrying more than six, but less than 50 passengers, the test is required when the vessel's stability is questioned by the Officer in Charge, Marine Inspection (OCMI).

T-S boats with more than 49 passengers must perform the simplified stability test or complete an inclining experiment, which requires the services of a naval architect. Usually, an owner is advised of test requirements when he or she applies for a Certificate of Inspection, or during the vessel's construction.

If a vessel is required to pass this test, the owner should be able to conduct it with the help of a straight-forward form, CG-4006, available at local Coast Guard inspection offices. A marine inspector will observe the test and answer any questions.

Conducting the test

A vessel can heel when passengers move to one side or when wind blows against its side. These actions create what is known as a "heeling moment," which simply is a force applied at a certain distance. (It is something like a lever moving a heavy object. The moment is the force applied at the end of the lever times the distance to the pivot point.)

Other forces, due to flooding, shifting cargo, waves, loads being lifted by crane or free surface effect, may also cause heeling moments. However, wind and passengers are all that should concern a T-S vessel owner. If it gets more complex, there would be a need for an inclining experiment and a naval architect.

Basically, the simplified stability test consists of fully loading a vessel in its worst case condition, moving weights across the deck, and checking to see if a mark placed on the hull is submerged.

First, the following must be determined:

1) **basic dimensions, including overall length, beam, freeboards and heights of the deckhouse or any enclosed areas;**

2) **number of passengers and amount of cargo; and**

3) **vessel's intended route.**

With this knowledge, the owner can determine how much weight is needed and how much will have to be moved to create the required force. The necessary weight is determined by multiplying the number of passengers times their weight. This weight is generally assumed to be 160 pounds, unless there is a mix of women and children, reducing it to 140 pounds.

Continued on page 20

Inspector measures deckhouse height to figure wind area.

Inspector measures distance test weights have moved across the deck. Total weight times distance must be at least equal to the greater of the passenger or wind heel moments.

Continued from page 19

Add in the weight of any cargo, and the total weight needed to be loaded on the vessel will be known. This weight must be distributed realistically. The cargo will be in its normal location and the passengers will be distributed evenly. If a vessel has more than one deck, the form has a formula to determine the amount of weight to place on the upper deck.

The basic dimensions required are clearly marked on the form. They will indicate the distance passengers can move across the deck, help calculate the total area subjected to pressure from the wind and determine the height of the maximum immersion mark to be placed on the side of the hull. An accurate set of plans is helpful, but not necessary. The dimensions can be determined with a tape measure directly from the vessel. Once the weight and dimensions have been determined, the required heeling moment can be calculated.

The greater of the passenger or wind heel moments now must be imposed by moving some of the added weights across the vessel. Test weights can be anything that can be accurately weighed, including sand bags, barrels of water, steel shafts or plates. The center of gravity should be about 2.5 feet above the deck.

To simulate the maximum moment, a known weight or weights are moved a known distance. The moment created is equal to the weight multiplied by the distance. A convenient table is provided on form CG-4006 to record and calculate the actual imposed moment.

Before the weights are moved, a mark is placed on the side of the hull. For flush deck vessels, the mark is placed at one half the freeboard. CG-4006 has a section to help the owner determine the height of the mark above the waterline. After the vessel is heeled by moving the appropriate amount of weight, the mark is checked. If it is not submerged, the vessel passes.

Following the successful completion of a simplified stability test, the OCMI may issue a stability letter. However, since the issuance of this letter is not required for T-S boats, the owner should keep a copy of the test in case the vessel's stability is ever questioned.

Conclusion

If you have or are building a T-S vessel, you may be required to conduct a simplified stability test. Don't panic! Ask for a test form (CG-4006) from your local Coast Guard inspection office and look it over. If you have any questions, the inspectors you normally deal with will be glad to answer them for you. The test is not difficult to conduct and generally takes less than half a day.

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For this flush deck vessel, the maximum immersion mark is placed at one half the freeboard after weights are added.

Cockpit? Well deck? Flush deck? Open boat? Which is your T-boat?

By LT Lincoln Stroh

Are you sure what hull type your T-boat is? You would have to know to take a simplified stability test. (See page 19.) The following should help you discern T-boat hull types and designs.

Definitions

Understanding the definitions of sheer line, bulwark, gunwale, freeing port and scupper is essential in differentiating hull types.

Sheer line - Generally, the line formed by the intersection of the main deck and the side is the sheer line. On cockpit and open boat designs, the sheer line typically continues along the gunwale. Similarly, on well deck and flush deck designs, the sheer line usually follows the deck.

Bulwark - The portion of the vessel's side above the sheer line is the bulwark. For example, a well deck vessel has bulwark around its periphery.

Gunwale - That portion of a vessel's side below the sheer line and above an exposed recessed deck is a gunwale.

Freeing port - A large opening in the bulwark at the deck edge for drainage of the weather deck area is a freeing port.

Scupper - A small drainage opening leading overboard is a scupper. Sometimes, the scupper opening is in the deck and drains the deck area through a pipe out the side shell. Scuppers are usually "non-return types" in that they allow self-bailing of a recess or cockpit and deter the water from returning.

Freeboard measuring

Understanding these definitions makes measuring freeboards for simplified stability tests easier. The information in 46 CFR part 171 and form CG-4006 is very explicit concerning where to measure freeboards, provided you understand the terminology.

For both well deck and flush deck designs, the freeboard is measured to the weatherdeck. For cockpit and open boat designs, the freeboard is measured to the gunwale. In all T-boat designs, the maximum freeboard attainable is the sheer line's height above the waterline. Bulwark height should never be given credit when measuring freeboards for simplified stability tests.

The following examples distinguish between the bulwark and the gunwale, indicating where the freeboard should be measured.

On a cockpit vessel with bulwark in front of the recess, the freeboard is measured to the lowest freeing port at gunwale height.

On a well deck vessel modified with a step, which gives the appearance of a cockpit design, the new freeboard is measured to the lowest freeing port at "modified gunwale" height. The addition of the step in this design creates a very shallow cockpit. The increase in freeboard from the original well deck to the new cockpit design is only the step height. From a simplified stability test point-of-view, the new cockpit vessel will probably have a lower allowable immersion mark than the original well deck design.

Continued on page 22

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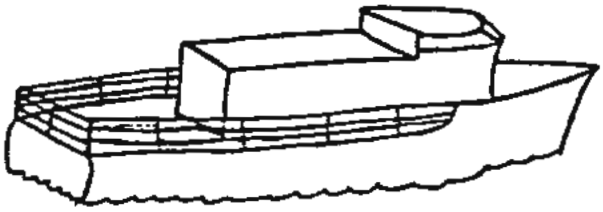
Editor's note: This article highlights many areas that can cause confusion when applying stability regulations. Small passenger vessel builders and owners should contact their local Coast Guard marine safety office early in the design process to resolve any uncertainty. Coast Guard headquarters is preparing guidelines on determining flush decks, well decks and cockpit vessels to help clarify these issues.

Understanding T-boat terms and structure makes the simplified stability test extremely fair.

Continued from page 21

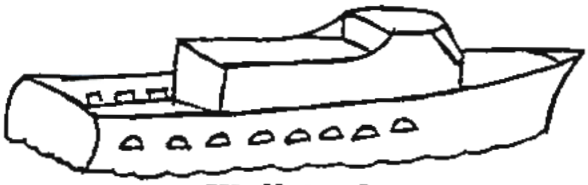
T-Boat designs

Differentiating between T-boat designs and the intent of the regulations regarding drainage is also critical in discerning T-boat types. The intent of the regulations varies with each design.



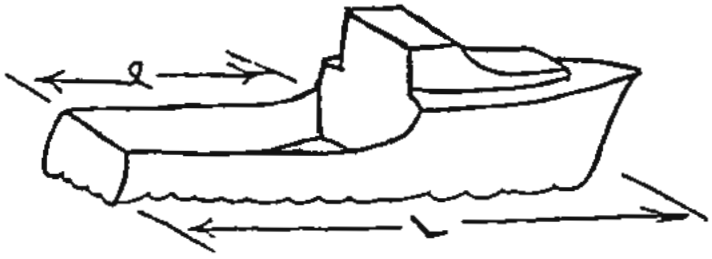
Flush deck

The hull and weather deck form a continuous watertight envelope. Railings are installed around the periphery of the weather deck with little or no bulwark forward. The weather deck is flush with the sides. Additional drainage is not required. Water on deck quickly drains over the flush side.



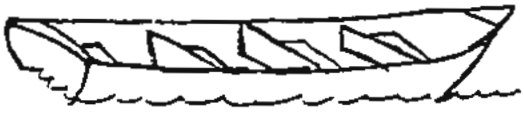
Well deck

This design is similar to a flush deck, except that bulwark is used in place of railing around the periphery of the vessel. The bulwark forms a "well" around the vessel, which restricts spray and waves from getting on deck. If water gets on deck, the well has freeing ports to rapidly clear and drain it.



Cockpit

Unlike well and flush decks, the cockpit design has an exposed recess in the main deck, usually located aft. Scuppers drain the cockpit. Designed to prevent water from entering the cockpit, scuppers maintain the hull's watertight integrity. The regulations originally intended that cockpit vessels have little or no bulwark forward so that the foredeck and midship areas would drain overboard, separately from the cockpit area. However, many of today's cockpits incorporate bulwark forward, midship and aft. Cockpit scupper sizes do not account for bulwark, which may channel water from the foredeck and midship areas back into the cockpit. Thus, additional drainage may be needed to ensure that entrapped water forward rapidly drains overboard, not back into the recess or cockpit.



Open boat

This design is open to the weather with little, if any, deck or superstructure to drain water overboard. The upper edge of an open boat's side is the gunwale. Drainage is to the bilge. Vessels with gunwales are intended to have high freeboards to minimize the amount of seawater coming in.

"FE + AL" spells "TROUBLE"

By CWO2 Philip Peacock

During a drydock examination of a 14-year-old 74-foot aluminum passenger vessel, the Coast Guard marine inspector discovered holes in the forward section of the main deck above the forepeak and the #2 void. The inspector was told by the vessel owner that blisters in the deck first appeared 18 months earlier. The owner attributed this to salt water getting under the nonskid coatings and he simply cleaned and repainted the affected areas. Then he filled the pits and holes with an epoxy compound.

Problem persists

As the problem continued, the owner considered that stray electrical current might be the culprit. But, after testing all electrical systems, there was no sign of current going to ground. He assumed that his first diagnosis was correct, and continued to address problems as they occurred.

The inspector speculated that the blisters and holes were the result of galvanic corrosion. However, the cause of this problem and why it was limited to the forward area of the vessel remained a mystery.

Examining the underdeck structure for possible indicators of the cause of the corrosion, the inspector found that the structure was enclosed by insulation, later identified as "CAFCOTE 800." This fibrous insulation was kept in place by galvanized expanded metal secured directly to the underdeck by studs. These insulation studs were stainless steel pins set into aluminum sockets, which were spot welded to the vessel. This insulation was found in all of the below deck spaces.

Coast Guard inspector examines repairs to foredeck.

The insulation in the forepeak was saturated with moisture. After pressure was applied, a milky white fluid dripped from it. Below the insulation, which extended down the side shell about 24 inches, all exposed metal surfaces were coated with a chalky residue. The insulation and supporting structure had to be removed to accurately assess the situation and its cause.

On a second visit to the vessel, the inspector found the damage in the forepeak to be more extensive. The underdeck surface was heavily pitted and the number of holes had increased. Several steel flat bar brackets were found bolted to the underdeck aluminum stiffeners. They were not visible until the insulation was removed. The corrosion was the most severe where the steel flat bar stiffeners were connected to the aluminum structure.

The corrosion was not as extensive in the #2 void as it was in the forepeak, and was more localized to the contact points of a steel ladder bolted directly to the forward bulkhead. This was the common bulkhead between the forepeak and the #2 void. The corrosion in that area consisted of a white powder coating most of the exposed metals on the bulkhead. Also, an opaque gelatinous substance had formed in the areas around the bolts.

The white powder coating and the opaque gel are prime examples of galvanic corrosion in progress. The problem was in finding the cause.

Pinpointing the cause

The inspector found that the insulation was approved by the Coast Guard. However, it was fibrous and very absorbent -- ill-suited for a poorly ventilated forepeak used for stowing wet anchor line. The inspector then found a wide variety of dissimilar metals used in the construction of the vessel and in the support structure for the insulation. This included steel for the ladder and flat bar stiffeners, stainless steel for the insulation studs, zinc from the galvanized expanded metal, and aluminum for the hull.

Referring to a galvanic series table, it is noted that the zinc and aluminum are above mild and stainless steels. This means that they will corrode first when used together. The zinc dete-

Continued on page 24

Advanced corrosion was found in #2 void overhead (far right), in ladder attachment to bulkhead (right) and in the forepeak (below).

Continued from page 23

riorated first, in the form of the galvanized expanded metal. The next metal to deteriorate was the aluminum, in particular at the contact points of the stainless steel studs and the bolts used to attach the ladder and flat bar stiffeners.

Unfortunately, with an aluminum boat, the results, if left unchecked, would be that the vessel would waste away to protect the more resistant metals, such as the steels in the ladder and brackets. This situation would have proved costly to the owner in unnecessary repairs and lost operating time.

Finding a solution

The problem did not happen overnight. It started with the initial design and construction of the vessel when all components were brought together, and continued through many years of operation and Coast Guard inspections.

The use of insulating material better suited to a wet environment would have reduced the action of the electrolyte necessary for galvanic corrosion. Secondly, the problem could have been avoided entirely if the galvanic series table had been consulted early in the design process, resulting in the choice of more compatible materials. However, this is not always feasible or possible. The next best method to decrease metal-to-metal contact is by isolation.

Isolation can be achieved with non-conductive materials, such as rubber, lexan, plastic or teflon. There are many suitable, moisture-resistant materials. They provide cheap and effective ways to isolate dissimilar metals, thereby reducing the chances of galvanic corrosion.

Poor ventilation and extensive moisture build-up also contributed to the corrosion. These factors are easy to control. However, by maintaining good ventilation and keeping spaces relatively free of excess salt water, the chances of corrosion occurring are greatly reduced.

By heeding corrosion indicators and taking proper corrective action, vessel owners can prevent major, costly repairs.

The owner of the vessel in this case discovered this to be true. Everywhere he turns, there are more plating and stiffeners to be replaced. He learned an expensive lesson, and is much more careful about any new installations.

The old adage, "an ounce of prevention is worth a pound of cure," is especially appropriate in this case.

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How yachts qualify for passenger service

By LCDR Marc C. Cruder

PART 1 -- CERTIFICATION

So you have a beautiful classic wood vessel that has been meticulously maintained, and you wish to have it certified for passenger service. Before applying for certification, there are some preliminary conditions to consider, including your vessel's structural condition.

All vessels are not created equal. There are substantial differences between vessels designed and constructed to comply with Coast Guard regulations and those built according to recreational or yachting standards. Following are some important considerations.

Regulations

Coast Guard certificated passenger vessels are controlled by one of two sections contained in title 46 of the Code of Federal Regulations (CFR). Vessels less than 100 gross tons fall under subchapter T (46 CFR 175-185), while those of 100 gross tons or more are regulated by subchapter H (46 CFR 70-80). Most passenger vessels are small, falling under subchapter T and are referred to as "T-boats."

These regulations are available at the Government Printing Office and many local marine outlets. Your local Coast Guard marine safety office can help you obtain them.

The best way to start the certification process is to research the appropriate regulations, which should produce as many questions as answers. When you have done your homework and are thoroughly confused, visit the inspection department of your local marine safety office.

Ask for the section or Coast Guard officer in charge of small passenger vessel plan review. You will be given an opportunity to ask questions and, in most cases, written materials about specific local procedures.

Preliminary considerations

Documented tonnage

Is the vessel under 100 gross tons? If not, this will not necessarily prevent certification. However, there are higher standards required for vessels of 100 tons or more.

Check your current documentation certificate. If your vessel is over 100 gross tons, you may want to change the tonnage. This may require some physical modifications to exempt specific areas of your vessel, which will affect the tonnage measurements. The process may also require the services of a naval architect or someone else with knowledge of tonnage regulations.

Documented trade endorsement

Most existing yachts have pleasure license endorsements on their certificates of documentation. These endorsements would have to be changed from pleasure to either coastwise or registry to qualify for certification.

A coastwise endorsement requires the vessel to have a hull built in the United States that has been maintained under United States

Continued on page 26

Continued from page 25

ownership, unless the vessel can qualify for special legislation contained in 46 CFR 67.19-7.

A registry endorsement for a foreign-built hull is available only after the United States Customs Service determines that the vessel's intended service is not in coastwise trade.

Plan review

Early in the process, you will be required to submit plans of your vessel for Coast Guard review. This may present a problem as yachts rarely come with plans, and the manufacturer may no longer be in business. Although costly, it may be necessary to hire a professional to help you produce suitable plans for your vessel.

The plans need not be naval architectural quality, but must be legible to "scale" drawings. Minimum submissions generally include an outboard profile; interior arrangement; electrical, mechanical and piping system installations; as well as hull construction details. Your local Coast Guard office can advise you on the minimum requirements.

Scantlings

Every office involved in certification of existing vessels not built according to Coast Guard regulations, must make judgments on vessel scantlings (physical dimensions of structural members).

Coast Guard regulations incorporate classification society rules as required structural standards. Few existing vessels, particularly yachts, meet those standards line by line.

Aided by submitted plans, existing vessel scantlings are evaluated case by case. Plans including hull construction details are vital for this evaluation. Equivalency determinations are based on such things as how a vessel's scantlings differ from established standards, a documented history of at least five years' satisfactory service on a similar operating route as the one requested, or the satisfactory service of a similarly constructed vessel.

The owner should be prepared to document the adequacy of his or her vessel's scantlings as they are, without modification. The Coast Guard's only latitude in this regard is the vessel's operating route requested by the owner.

A vessel designed for service in protected waters would not qualify for service 100 miles

offshore. At the same time, a vessel whose offshore service can be documented, and is still structurally sound after physical inspection, stands a good chance for structural sufficiency. The Coast Guard makes the judgment call and any information provided assists in the final determination.

Hull considerations

Collision bulkheads

Most vessels are required to have watertight collision bulkheads, depending on their length, intended route and number of passengers. Existing yachts are not usually constructed with collision bulkheads.

If your vessel should require this bulkhead, it most likely will entail altering its internal arrangement. The cost of this procedure varies according to the number and type modifications involved.

Subdivision

Watertight subdivision of the entire hull might be required, depending on the number of passengers and the severity of the operating route. While the collision bulkhead only disrupts the extreme forward of the vessel, subdivision can render the entire hull space below deck unusable to passengers. On classic yachts this could destroy a good measure of the vessel's beauty and charm, especially if passenger spaces are to be retained below deck.

Therefore the intended route and below deck arrangements should be determined with care. If subdivision is imminent, determine how existing bulkheads can be made watertight. Obtain advice on this matter from your local Coast Guard office before making any alterations.

Stability

The vessel's intact stability must be evaluated. If it is less than 65 feet in length and carries no more than 150 passengers, at a minimum, a simplified stability test is required. This is a straightforward procedure carried out by local Coast Guard inspectors, provided that the hull is conventional.

If a vessel exceeds 65 feet or carries more than 150 passengers, or both, an inclining test supervised by a naval architect or other authorized individual, will be required.

Structural condition

Your vessel must pass certain physical fitness standards to justify conversion to passenger service. If you are unable to evaluate your vessel, there are many marine surveyors and other professionals who can help you assess the vessel's condition, estimate repair costs and inform you how to comply with Coast Guard regulations as well as the provisions of subchapter T.

Next step - drydock

After successfully completing these steps, it is time for the drydock examination.

Often there is a substantial difference between the condition the owner perceives his or her vessel to be in and the results of a drydock exam. This is the acid test which separates those vessels that only appear impeccable from the waterline boot stripe up from those which are indeed structurally maintained.

Your vessel's hull will pass inspection by the Coast Guard only if it is intact, and not in need of major repair as it starts its life as a certificated small passenger vessel.

Continued on page 28

Continued from page 27

PART 2 -- DRYDOCKING

Schedule your vessel's drydock examination in advance with your local Coast Guard marine safety office. They will inform you how best to prepare for the inspection.

Following is a broad outline on how to prepare your vessel, what the Coast Guard will be looking at and some conditions which will require repair.

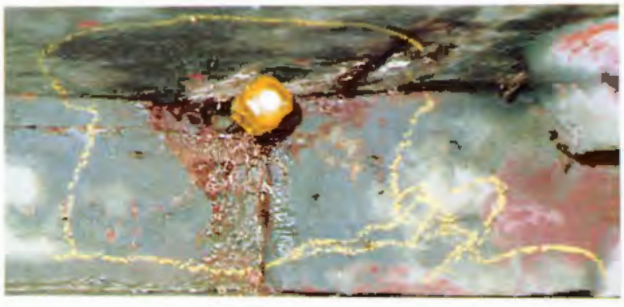
Preparations

External

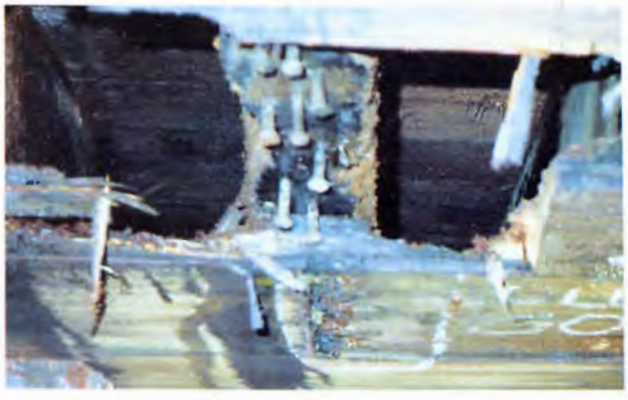
Some inspectors prefer to be present as the vessel emerges from the water and its bottom is cleaned. If any places on the underbody continue to leak from the inside out after the rest of the hull has stopped dripping, further investigation may be in order.

If the Coast Guard inspector is not going to be present until after the boat is hauled, the hull should be clean and free of sea growth. Repairs should not be made nor fresh bottom paint applied until after the inspection.

Seams leaking from inside out should be investigated.

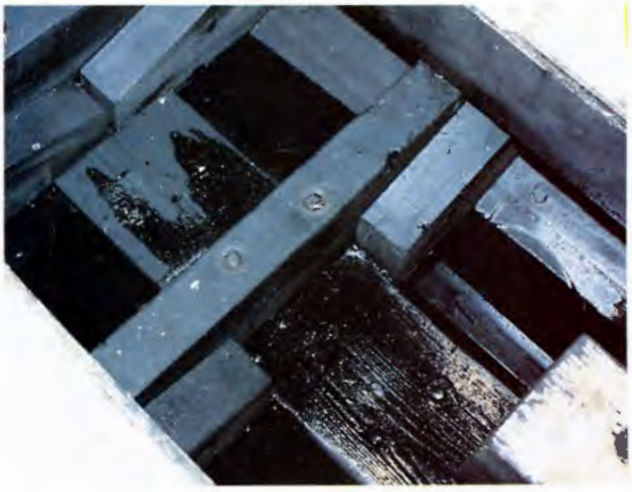


Outer planking rotted from inside out due to extensive internal ceiling, lack of ventilation and inability to inspect.



Internal

All internal compartments should be accessible. Many yachts have extensive ceiling over the frames, which makes internal inspection almost impossible. You may be asked to make access openings at strategic locations. In fact, you may be asked to open up the ceiling if anything is amiss, such as the presence of rot. Often, an extensive ceiling inhibits adequate ventilation, so opening it up may be the best thing to do. The alternative may be to remove outside planking to provide access for inspection.



Bilges must be pumped down and cleaned for inspection.

Make sure that all sea valves are accessible for individual inspection. Bilges should be pumped down and as clean as possible. Opaque standing water and oil make inspecting critical internal structural attachments difficult.

External survey

Hull

The hull is inspected from the sheer strake down, and below the waterline to the keel. Leaks, which are visible at the garboard, and below the waterline at the plank seams and butts, should be investigated, the cause ascertained and the leaks repaired.

The hull should be visually sighted along the sheer, the turn of the bilge or anywhere there are dramatic shape changes. Breaks in what should be smooth plank lines indicate that the plank and/or frames are not holding together, and the vessel is losing it's original shape.

Bulging plank indicates break in smooth hull lines.

A little hog or sag is inevitable with age, but a smooth planked hull side that looks like a lapstrake hull (clinkered) through the turn of the bilge is good reason to take a closer look. The bottom line is that if the hull lines are not fair (joined so that the external surfaces blend smoothly), there is a reason. Look further.

Planking

Pay particular attention to plank ends. Look for evidence of split planks, over fastening, open seams, missing or loose bungs, and bleeding of fastenings. Examine attachments to major structural members, such as the stem, keel and transom. Look for evidence of excessive hull movement, and/or nonstandard repairs.

Open seam and over-fastened butt caulked with water-setting epoxy.

Examine areas of missing or displaced caulking, installation of short planks, and splines used to close up overcaulked seams. Remove any metallic sheathing installed to cover leaking seams, and determine the condition of the wood structure behind the sheathing. Look for large areas of filler or fairing compound inserted to disguise hull defects.

Plank ends filled with water-setting epoxy.

Continued on page 30

Continued from page 29

Marine borer damage below waterline at plank ends in way of transom.

Assess the general appearance of the hull exterior, looking for previous collision or grounding damage. In warm climates, check for indications of marine borer activity, and ascertain the extent of any structural damage.

Awl penetration beyond fastening depth indicates rotted frames and no holding power for screws.

Fastenings

The condition of the vessel's fastenings must be determined. Most Coast Guard offices have policies on fastening pulling that take into account the age of the vessel, when it was last fastened, the type of fastening and the practicality of pulling if some method other than screws was used. Areas where the hull is found to be unfair will be suspect, and will require some fastening to be pulled.

Provide historical background on the condition of the fastenings to help the Coast Guard decide how extensive the exercise will be. For example, if the hull looks like planks are pulling away all over the place, and you don't have any history of the fastenings, expect the worst.

Drift (used to sound boat nail fastening) penetration beyond plank thickness indicates soft wood structure.

On the other hand, new fastenings alone do not ensure a good structure. Good fastenings screwed into rotting frames mean problems. Being prepared may minimize the number of fastenings removed for inspection. Record where fastenings have been extracted to prevent pulling the same ones at future inspections. This record should become part of a permanent file.

Rotted framing behind plank pulled for inspection.

If age and conditions warrant, you may be asked to pull an entire plank. This will usually be required when structural repair work is necessary, or when a combination of wood structure and fastenings are in need of replacement.

Pulling planks is not done indiscriminately. However when the combination of external and internal examinations along with a fastening inspection indicate a focused problem area, it is the only way to get a good picture of the structural condition of the area. Such a case, for example, could be a leaking garboard plank caused by more than just poor caulking or a series of structural members, such as frames, found broken, rotted or no longer attached, or in extreme cases, when a plank itself is broken or rotted through its face.

Planking rotted from inside out, found by outside sounding.

Thru-hull fittings

Thru-hull fitting installation and integrity with the hull will be examined from the outside. Any external strainer screens should be removed for this inspection.

Underwater appendages

Shafts, propellers and rudders will be checked for damage or wear from misalignment or grounding. If conditions warrant, you may be asked to pull the shaft and/or propeller. Worn shaft and strut bearings may have to be replaced. The same goes for rudder shaft bearings.

Historical work records can help the Coast Guard determine if further examination or replacement is necessary.

The general condition of all zinc as well as metallic fittings and appendages below the waterline will also be checked. Evidence of galvanic corrosion caused by electrolytic action may require further investigation of the electrical and bonding systems.

Internal survey

Structural connections

The internal structure is checked for fractures, splits, previous repairs, improper repairs and rot. Nonstandard repairs or those not in kind will not necessarily be rejected, but will need to be evaluated carefully.

Much progress has been made with resins, epoxy and adhesives, which lend themselves to more creative local repairs. Such repairs, however, must be justified when found.

Rotten, broken frame heels were originally fastened to the keel.

Attention will be focused at the turn of the bilge or any other sharp hull shape changes; at the frame ends and heels; and at major construction joints at the keel, keelson, floors, sheer clamp, bilge clamp and underdeck frames.

Any areas where planking was found standing away from the fair hull shape, or where other problems were noted during the external survey, should be closely examined. All places, such as in bilges or underdeck areas with leaking decks, lack of ventilation and/or drainage where water can accumulate should be closely checked. Planking butt blocks and backing blocks in the way of thru-hull fittings should also be inspected.

Continued on page 32

Continued from page 31

Floor timber rotted due to fresh water accumulation and lack of drainage.

If the vessel had been repaired by installing additional frames (sister frames) instead of replacing damaged ones, find out if the repair was required because of broken or rotted frames. Ensure that sister frames are long enough and properly fastened. If existing frames were left in place, make sure they were properly treated against rot, and that new wood was scarfed in the way of the break or rotted area.

Fastenings

All major bolted or screwed connections, including keel and engine bed bolts, will be checked. The condition of the visible ends does not always ensure that the rest of the fastening is likewise.

Depending on the age and condition of the vessel, and if the bolted connections are loose or corroded on the inside of the vessel, you may have to pull a representative sampling of these connections, including keel bolts. This random pulling will determine whether loose bolts can be tightened or if they should be replaced. An account of any bolt pulling and replacement should be part of the vessel's permanent record.

Thru-hull fittings

Generally, any thru-hull penetration within six inches above the waterline and below must have a sea valve. Therefore, all penetrations should be located and compared against those found during the external survey.

Generally, sea valves must be metallic and properly installed with backing blocks, suitable reinforced hose, if used, and appropriate metallic clamps. Other construction materials may be reviewed and approved by the local Coast Guard office if they have the same strength and fire resistant qualities as the hull.

Sea valve installations are checked for accessibility, lack of interferences and free operation throughout their range of motion. The valves also must be disassembled for close inspection of the seat, disk, stem and integrity of the body. If the seating surfaces are cut or the

Deteriorated floor timber to frame fastening.

valve components are in such shape that positive closure is questionable, repair or replacement may be required. Seacocks should be properly lubricated and checked for full closure.

The condition of the wood in the way of thru-hull fittings as well as the fittings themselves will be closely examined. If galvanic corrosion was suspected during the external hull survey, the metallic fittings may be deteriorated. Excessive cathodic protection, on the other hand, can cause rapid, severe damage to the adjacent wood structure.

Bilge conditions

If the bilges are not reasonably clean and dry, the inspection may be delayed until they are cleaned enough to see what is being examined. A clean bilge will place the vessel and the owner in a positive light. On the other hand, if the boat leaks so much that the bilges cannot be kept dry, except by draining when the vessel is out of the water, that will be evident.

The bilges or garboard area should not be filled with anything to compensate for structural integrity or watertightness, such as poured latex or cement along the length of the keel. If there is anything in the bilge except normal ballast, its presence will have to be justified by the owner.

Bilges filled to the top of floor timbers with rubber latex.

Underway evaluation

After extensive hull rebuilding, the owner may be asked to conduct an underway sea trial to check the vessel's internal structure under normal operating stresses. A lot of things move around underway that remain still at the dock. Also, an underway exam tests any new repairs and their effect on the hull as a whole.

Bilges should be pumped down and automatic bilge pumps deenergized. The vessel should be run at normal cruising speeds and operated through various headings, including hard turns into its own wake and into prevailing seas. Shaft log and rudder packing glands should be checked and properly adjusted. Any local or excessive leaking should be investigated thoroughly and immediately.

Epilogue

Many other items worthy of discussion include specific vessel systems, such as electrical, bilge, fire protection and lifesaving. However, if you pass the exams described, there should be no real problems that can't be solved.

The conversion of existing vessels is always a challenging proposition that calls for understanding on the part of the Coast Guard, as well as the vessel owner. Judgment calls abound, but are reasonable if the intent of the regulations is understood and logically applied.

The Coast Guard is primarily concerned about the safety of the passengers and the ability of the vessel's hull to maintain integrity.

Remember that the successful completion of this whole process relies heavily on your careful preparation and planning. Your success will also be based on your careful choice of a vessel in the first place, and your strategy for dealing with known stumbling blocks.

Many vessel owners have gone through the process and succeeded -- you can too.

Photographs in Part 1 are courtesy of Bristol Yacht Services, Inc., in Pennsylvania.

Photographs in Part 2 are by LCDR Marc C. Cruder, the small passenger vessel project manager with the Standards Development Branch of the Merchant Vessel Inspection and Documentation Division.

Telephone: (202) 267-1181.

Tapping  for termites

By LTJG Morgan Powers

Termites can be a devastating problem for small wooden passenger vessels. While not as common as rot, particularly in warm humid climates, termites are found often enough to merit attention. Termites can be very difficult to find, but there are some guidelines that are helpful to marine inspectors and small vessel owners.

What to look for

There are several thousand species of termites. However, wood and ground termites are the major concern of boat owners.

Wood termites live in the timbers they eat. They progress fairly slowly through wood, taking several months to eat their way through a timber. Their deposits are fine sand-like granules, ranging in color from light brown to black.

Ground termites live in the ground, traveling to their food source. On a boat, they usually live in a nest of their deposits, which resemble fine sawdust, clumped together. The material may be simply piled up or made into tunnels for termite colonies. The ground termites are far quicker in their destruction, gnawing up to six inches a day through a two by four. Glue laminates or heat doesn't hinder them one bit. They are unmatched for speed in destroying an entire wooden boat.

Sometimes, termites excavate open holes in timber, leaving little doubt of their presence. Usually, however, the only clear sign of infestation is the deposits. Even these obvious signs may be absent if the vessel has good housekeeping practices.

Termites did a job on this timber.

More termites . . . *more devastation.*

Wood termites tend to scatter their deposits, so it is usually difficult to see where they came from. Ground termite deposits, on the other hand, usually collect around the exit hole, usually at timber joint surfaces. Locating ground termites is easier than wood termites, but it is sometimes difficult to determine what timber is infested. These termites will travel far to get rid of their waste, so it is possible for sound wood to be around external holes.

How to search

Once termites are determined to be on board, further inspection is called for. Several acoustic techniques with an awl used by professional exterminators can be productive. Listening for termites is more effective than going after them with a pick, which should never be used until the damage is found.

First, rub the handle of the awl along the timber surfaces and listen for changes in tone, especially drum-like sounds. As an alternative, tap the handle along the surface, and listen for changes. Hollows in the timber will produce a high drum sound.

Finally, rattle the pick end of the awl along the surfaces, listening for the same high notes. This exercise covers broad areas faster, although tapping with the handle reaches deeper into the wood.

It is sort of eerie to hear a snare drum sounding from a timber spot that looks normal on the surface. A large hollow can be covered with only a thin veneer or a coat of paint.

In all these techniques, attention must be paid to the vessel's architecture. Unbacked spans will sound "hollow" compared to supported pieces.

Wooden boat owners should have regular inspections.

Conclusion

Routine termite inspections typically turn up nothing. Most vessels are not infected. In a warm, wet climate, such as in Hawaii, the number one wood boat problem is rot.

However, when termites do infest a boat, the damage can be severe. In six months, they can destroy timbers that were clean in drydock.

The only effective cure and, at the same time, preventive measure is to tent the entire vessel, and exterminate the critters, repeating the exercise every three or four years.

Termites can be more than simple nuisances, but with regular thorough inspections, they can be held in check.

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Coast Guard investigators examine a vessel which had struck an unmanned offshore platform.

How to report T-boat accidents

By LTJG Todd J. Offutt

Small passenger vessel accidents must be reported if they occur upon navigable waters of the United States, its territories or possessions, or if they involve a United States vessel [46 CFR 4.03-1(a)]. Verbal notice should be given as soon as possible and written notice within five days to the Officer in Charge, Marine Inspection (OCMI), at the port in which the casualty occurred or the nearest port of arrival.

Vessel status

The status of the vessel must be considered in determining casualty reporting requirements. It must be established whether it was being operated as a passenger, cargo or recreational vessel at the time of the accident.

For example, if a small T-boat (less than 65 feet long) was operating without passengers or freight for hire (without compensation for services), it does not have to comply with 46 CFR part 4 requirements. Rather, it is subject to the recreational boat requirements of 33 CFR 173.55, with the operating status to be determined by the state boating authority designated in 33 CFR 173.59.

In short, if the involved vessel was operating under the authority of its Certificate of Inspection at the time of the casualty, the provisions of 33 CFR part 173 do not apply. Instead, the casualty should be reported on form CG-2692 (report of marine accident, injury or death).

Violations

Vessels failing to notify the Coast Guard of casualties in which they are involved may be subject to investigation under civil penalty proceedings.

Reporting criteria include:

A) all groundings which create a hazard to navigation, the environment or the safety of the vessel;

B) loss of main propulsion or primary steering, or an associated component or system, the loss of which causes a reduction in the maneuvering capabilities of the vessel;

This charter vessel sustained an 8 x 9 foot hole in its bow after colliding with a wellhead in the Gulf of Mexico last year.

C) an occurrence materially and adversely affecting the vessel's seaworthiness or fitness for service or route, including, but not limited to fire, flooding, failure of or damage to fixed fire-extinguishing systems, lifesaving equipment or bilge-pumping systems;

D) loss of life;

E) injury requiring professional medical treatment beyond first aid, and rendering an individual involved in commercial service unfit to perform routine vessel duties; and

F) an occurrence not meeting any of the above criteria, but resulting in property damage over $25,000. (Damage costs include labor and material to restore the vessel to its condition before the casualty, but not salvage, cleaning, gas freeing, drydocking or foregone revenue.)

Log entries

Vessel log entries are an invaluable source of evidence to determine operating status. Although the majority of T-boats are not required to maintain official logs (except on international voyages), many do to document their activities for compensation purposes. In any event, the person in charge is required to retain all vessel records for Coast Guard review.

Conclusion

In the course of its investigations, the Coast Guard accumulates vast amounts of data concerning casualty causes and effects. As the computerized Marine Safety Information System compiles and sorts this data, existing regulations will be amended accordingly, to provide for the safest possible marine environment.

LTJG Todd J. Offutt is a marine safety investigator with MSO Morgan City, 800 David Drive, Morgan City, Louisiana 70380-1304.

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1991 license statistics
Deck department

Type of License	Issues	Endorsements	Failures	Renewals
Master ocean AGT*	120	43	3	590
Master near coastal AGT	15	5	0	32
Chief mate ocean AGT	111	62	4	181
Chief mate near coastal AGT	2	2	0	0
Second mate ocean AGT	176	41	4	174
Second mate near coastal AGT	6	1	0	1
Third mate ocean AGT	467	46	12	413
Third mate near coastal AGT	9	1	0	4
Master ocean or near coastal NMT** 1600 GT	283	205	10	585
Mate ocean or near coastal NMT 1600 GT	127	56	11	82
Master ocean or near coastal NMT 500 GT	38	86	12	372
Mate ocean or near coastal NMT 500 GT	22	33	4	70
Master ocean or near coastal NMT 200 GT	58	100	6	167
Mate near coastal NMT 200 GT	152	27	11	5
Master near coastal NMT 100 GT	1,812	374	111	3,855
Master uninspected fishing industry vessel	39	53	2	102
Mate uninspected fishing industry vessel	42	21	1	10

Deck department

continued

Type of License	Issues	Endorsements	Failures	Renewals
Master MODU***	1	3	0	1
Mate MODU	0	0	0	0
Master Great Lakes and inland AGT	8	8	1	58
Master inland AGT	22	8	0	117
Mate Great Lakes and inland AGT	14	7	2	45
Master Great Lakes and inland NMT 1600 GT	9	2	0	6
Mate Great Lakes and inland NMT 1600 GT	1	0	0	0
Master Great Lakes and inland NMT 200 GT	2	4	0	1
Mate Great Lakes and inland NMT 200 GT	1	2	0	0
Master Great Lakes and inland NMT 100 GT	298	61	30	599
Master inland NMT 100 GT	1, 225	116	66	1,396
Offshore installation manager	50	2	0	2
Barge supervisor	59	131	0	23
Ballast control operator	43	2	0	0
First class pilot	125	370	2	808
Operator uninspected towing vessel	299	99	12	1,291

Continued on page 40

Continued from page 39

Deck department

continued

Type of License	Issues	Endorsements	Failures	Renewals
Second class operator uninspected towing vessel	53	13	7	26
Operator uninspected passenger vessel	1,267	71	104	1,961
Master liftboat	8	0	0	0
Assistance towing endorsement	0	865	15	162
TOTALS:	6,964	2,920	430	13,139

*Any gross tons ** Not more than ***Mobile offshore drilling unit

Engine department

Type of License	Issues	Endorsements	Failures	Renewals
Chief engineer motor	148	142	1	496
First assistant engineer motor	76	42	1	47
Second assistant engineer motor	75	34	3	86
Third assistant engineer motor	135	27	2	294
Chief engineer steam	63	32	2	256
First assistant engineer steam	86	9	1	121
Second assistant engineer steam	102	21	0	206
Third assistant engineer steam	110	10	1	148

Engine department

continued

Type of License	Issues	Endorsements	Failures	Renewals
Chief engineer steam or motor unlimited	48	11	0	281
First assistant engineer steam or motor unlimited	53	13	0	59
Second assistant engineer steam or motor unlimited	91	11	2	83
Third assistant engineer steam or motor unlimited	397	16	2	514
Chief engineer limited oceans	64	48	0	339
Chief engineer limited near coastal	24	14	1	46
Assistant engineer limited	76	26	2	62
Designated duty engineer	217	53	7	14
Chief engineer uninspected fishing industry vessel	28	35	0	65
Assistant engineer uninspected fishing industry vessel	15	9	0	7
Chief engineer MODU	8	0	0	8
Assistant engineer MODU	0	0	0	0
Liftboat engineer	6	0	0	0
TOTALS:	1,822	553	25	3,132

Continued on page 42

Continued from page 41

Radio officer and certificates of registry

Type of License	Issues	Endorsements	Failures	Renewals
Radio officer	81	0	0	181
Chief purser	9	0	1	1
Purser	9	0	0	0
Senior assistant purser	4	0	0	0
Junior assistant purser	15	0	1	1
Medical doctor	11	0	0	0
Professional nurse	6	0	0	1
TOTALS:	135	0	2	184

Summary 1991 license transactions

	Issues	Endorsements	Failures	Renewals
Deck department	6,964	2,920	430	13,139
Engine department	1,822	553	25	3,132
Radio and staff officers	135	0	2	184
TOTALS:	8,921	3,473	457	16,455

GRAND TOTAL: 29,306

Interim final rule

CGD 91-036, Response plans for marine transportation-related facilities (33 CFR parts 150 and 154) RIN 2115-AD82 (February 5).

The Coast Guard is establishing regulations requiring response plans for marine transportation-related facilities, including deepwater ports, certain Coast Guard-regulated onshore facilities, marinas, tank trucks and railroad tank cars. This interim final rule also establishes additional response plan requirements for facilities located in Prince William Sound, Alaska, permitted under the Trans-Alaska Pipeline Authorization Act. This rule addresses all marine transportation-related facilities that could reasonably be expected to cause substantial harm to the environment by discharging oil into or on the navigable waters of the United States, adjoining shorelines or the exclusive economic zone.

Regulations requiring facility response plans and discharge removal equipment are mandated by the Federal Water Pollution Control Act, as amended by the Oil Pollution Act of 1990 (OPA 90). The purpose of requiring facility response plans and discharge removal equipment is to enhance private sector planning and response capabilities to minimize the environmental impact of spilled oil.

Date: This interim final rule was effective February 5, 1993, except for sections 154.1110 through 154.1140, subpart G, which are effective August 18, 1993. Comments on this rule must have been received by April 6, 1993.

The executive secretary maintains the public docket for this rulemaking. Comments are part of this docket and are available for inspection or copying at room 3406, Coast Guard headquarters.

The director of the *Federal Register* approved as of February 5 the incorporation by reference of certain publications listed in the regulations. A copy of this material is available for inspection in room B-718, Coast Guard.

For further information, contact: LCDR Walter (Bud) Hunt, project manager, OPA 90 staff (G-MS-1), (202) 267-6740. This telephone can record messages 24 hours a day.

Request for applications

CGD 93-004, Request for applications for membership on National Offshore Safety Advisory Committee (February 5).

The Coast Guard seeks applicants for appointment to membership to the National Offshore Safety Advisory Committee (NOSAC). This committee advises the secretary of the Department of Transportation on safety and rulemaking matters related to the offshore mineral and energy industries.

The committee consists of 14 regular members who have particular expertise, knowledge and experience regarding the transportation and other technology, equipment or recovery of offshore mineral resources. The committee charter requires membership be distributed among particular segments of the offshore industry, as well as the general public and environmental interests. Five members will be appointed for terms commencing in January 1994, one representing each of the following:

- offshore operations;
- diving services related to offshore construction, inspection and maintenance;
- pipelaying services related to offshore construction;
- geophysical services related to offshore exploration and construction; and
- the general public.

To achieve the balance of membership required by the Federal Advisory Committee Act, the Coast Guard is especially interested in receiving applications from minorities and women. The committee will meet at least once a year in Washington, D.C. or another location selected by the Coast Guard. Committee members serve without compensation (neither travel nor per diem) from the federal government.

Continued on page 44

Continued from page 43

Date: Applications are due by May 31, 1993.

Addresses: Persons interested in applying should write to Commandant (G-MVI-4), room 1405, Coast Guard headquarters, 2100 Second Street, S.W., Washington, D.C. 20593-0001.

For further information, contact: CDR M. M. Ashdown, executive director, NOSAC, room 1405, Coast Guard. Telephone: (202) 267-2307.

Notice of availability

CGD 90-071, Tank level or pressure monitoring devices: technical feasibility study, RIN 2115-AD61 (February 5).

A technical feasibility study, "Tank Level Detection Devices for the Carriage of Oil," commissioned for documentation and analysis for rulemaking, is available to the public.

Addresses: Copies of the study are available for inspection at Coast Guard headquarters, room 3406, between 8 a.m. and 3 p.m., Monday through Friday, except federal holidays. Telephone: (202) 267-1477. Copies of the study may be requested by telephone (202) 267-6740 or by facsimile (202) 267-4624. Order by title.

For further information, contact: LCDR Michael B. Karr, project manager, G-MS-1, OPA 90 staff. Telephone: (202) 267-6756.

Notice of proposed rulemaking

CGD 92-027, Marking of transfer hoses for hazardous materials (33 CFR parts 154 and 155) RIN 2115-AE20 (February 18).

The Coast Guard proposes to revise its transfer hose-marking regulations for hazardous materials. The current regulations, which require each hose to be marked with a list of each product transferred through the hose, are impractical. This rulemaking proposes an alternative that is more effective and easier to maintain.

Date: Comments must have been received by April 5, 1993.

The executive secretary maintains the public docket for this rulemaking. Comments are part of this docket and are available for inspection or copying at room 3406, Coast Guard headquarters.

For further information, contact: LT Jonathan C. Burton, Marine Environmental Protection Division. Telephone: (202) 267-6714.

Final rule

CGD 92-069, Administrative changes to deepwater port rules (33 CFR part 148) (February 24).

Certain rules on deepwater ports require information sent to the Coast Guard with a division specified as recipient. Since the original rules were issued, the division has changed. This rule corrects the Code of Federal Regulations.

Effective date: February 24, 1993.

For further information, contact: LT Jonathan C. Burton, Marine Environmental Protection Division. Telephone: (202) 267-6714.

Notice of withdrawal

CGD 88-031a, Documentation of vessels: controlling interest (46 CFR part 67) RIN 2115-AE25 (March 4).

The Coast Guard is withdrawing its action to develop a new interpretation of the citizenship "grandfather" or savings provision of the Commercial Fishing Industry Vessel Anti-Reflagging Act of 1987. This action is being withdrawn because the United States Circuit Court of Appeals for the District of Columbia reversed the decision of the United States District Court which determined the Coast Guard's current interpretation of the savings provision was incorrect, thus upholding the Coast Guard's interpretation.

For further information, contact: LCDR Don M. Wrye, staff attorney, Vessel Documentation and Tonnage Survey Branch, (202) 267-1492.

Notice

CGD 93-008, Response exercise workshops (March 5).

The Coast Guard is conducting a series of four workshops covering various topics to solicit

comments from the public and to serve as an open forum for the discussion of response exercises for area contingency plans, and vessel and facility response plans. Members of federal, state and local agencies, and the public are invited to participate and provide oral or written comments. This notice announces the dates, times, locations, format and topics for the series.

Dates: Comments should be submitted by October 31, 1993. The workshops are scheduled for April 2 (Tampa, FL), May 6 and 7 (Washington, D.C.), July 1 and 2 (Washington, D.C.) and August 5, 1993 (Washington, D.C.). Those interested in attending should contact LCDR Rhea Giacoma at least seven calendar days beforehand, indicating the workshop they wish to attend.

Addresses: Comments may be mailed to Commandant (G-MEP-4), room 2100, Coast Guard headquarters, attn.: LCDR Rhea Giacoma or delivered to the moderator of any workshop.

For further information, contact: LCDR Rhea Giacoma (G-MEP-4), (202) 267-2616.

Final rule

CGD 87-016a, Emergency position indicating radio beacons for uninspected vessels (46 CFR part 25) RIN 2115-AC69 (March 10).

The EPIRBs On Uninspected Vessels Requirements Act amended the shipping laws of the United States by requiring uninspected commercial vessels to have the number and type of alerting and locating equipment, including emergency position indicating radio beacons (EPIRBs) prescribed by regulation. As a result, the Coast Guard is amending the uninspected vessel regulations by requiring EPIRBs to be carried on all uninspected commercial vessels, except uninspected passenger vessels operating on the high seas and on the Great Lakes beyond three miles from the coastline. By implementing this law, the regulations will improve Coast Guard search and rescue activities during emergency situations.

Effective date: April 26, 1993.

For further information, contact: Mr. Robert Markle, Survival Systems Branch at (202) 267-1444.

Final rule

CGD 91-002, User fees for marine licensing certification of registry and merchant mariner documentation (33 CFR part 1, 46 CFR parts 10 and 12) RIN 2115-AD72 (March 19).

This final rule establishes user fees for Coast Guard services related to merchant marine licenses, certificates of registry and merchant mariner's documents. The fees in this rule are based on the way the Coast Guard presently conducts the merchant marine licensing and documentation activities, and costs of providing the services at its Regional Examination Centers.

Effective date: April 19, 1993.

For further information, contact: LT J. K. Gillespie (G-MP-1), (202) 267-6923.

Notice of proposed rulemaking

CGD 91-209, Requirements for longitudinal strength, plating thickness and periodic gauging for certain tank vessels (46 CFR parts 31 and 32) RIN 2115-AD99 (March 23).

The Coast Guard proposes to establish minimum longitudinal strength and plate thickness standards for tank vessels that carry oil cargoes. The proposed regulations also would require periodic gauging of the vessels after they reach 30 years of age. The regulations are proposed in accordance with the Oil Pollution Act of 1990. Their purpose is to reduce the likelihood of oil spills from structural failure of tank vessels, particularly in the case of unclassed tank barges.

Date: Comments must be received by May 7.

Addresses: Comments may be mailed to the executive secretary, Marine Safety Council (G-LRA/3406), Coast Guard headquarters, or may be delivered to room 3406 between 8 a.m. and 3 p.m., Monday through Friday, except federal holidays, (202) 267-1477. Comments on collection of information must be mailed also to the Office of Management and Budget, 725 17th St., N.W., Washington, D.C. 20503. ATTN: Coast Guard desk officer.

For further information, contact: Mr. Thomas Jordan, project manager, (202) 267-6751.

Chemical of the month *1/C Greg Duerstock*

Dichloromethane

Dichloromethane is a colorless, watery liquid with a sweet, pleasant odor resembling chloroform. It belongs to the chemical family of halogenated hydrocarbons, and is also known as methylene chloride and methylene dichloride.

A solvent degreaser, dichloromethane is found in furniture polishes, plastic processors, paint removers, solvent extractors, blowing agents in foams and cellulose acetate solvents. It has also been used in coffee decaffeination.

Health hazards

Exposure to dichloromethane, whether by skin contact or inhalation is hazardous. High concentrations of vapor have anesthetic effects, and the liquid causes skin and eye irritations. Common symptoms include light-headedness, mental confusion, nausea, vomiting and headaches.

The chemical has an odor threshold of 214 parts per million (ppm) and a threshold limit value of 50 ppm. Short-term exposure effects are not well established. However, after 30-minute exposure to 1000 ppm, incoordination, dizziness and slight nausea set in.

Treatment

When a person is exposed to dichloromethane, move him or her immediately to fresh air. If breathing stops, provide artificial respiration. If the victim has difficulty breathing, administer oxygen.

Remove all contaminated clothing and flush exposed areas with plenty of water. If eyes are affected, flush and then irrigate with large quantities of water for at least 15 minutes. If it is ingested and the victim is conscious, have him or her drink plenty of water or milk. Do not induce vomiting. In all cases, an exposed individual should be given immediate medical attention.

Other precautions

Appropriate containers for storing and transporting dichloromethane include glass bottles, drums and tank trucks, cars and vessels (barges or ships). In the event of a spill, avoid contact with the liquid. Self-contained breathing apparatus and goggles should be used at all times when near the chemical.

Discharge of the chemical should be halted, if possible, and the discharged material isolated. Cool all containers exposed to fire with water, because poison gases form when dichloromethane is heated.

In the event of a spill, notify local health and pollution-control agencies, and water-intake operators. The effects on aquatic life are not known, but the chemical may be dangerous. Dichloromethane sinks in water. It produces an irritating vapor, so all spills should be dispersed and flushed.

Dichloromethane is a nonflammable, stable compound, but contact with open flame causes decomposition. It corrodes aluminum and magnesium, and when in water, it corrodes steel.

The Coast Guard regulates the transportation of dichloromethane in 46 CFR subchapter O. The International Maritime Organization classifies it as a 6.1 poison in the IMDG Code.

Dichloromethane

Chemical name:	Dichloromethane
Formula:	CH_2Cl_2
Synonyms:	Methylene chloride and methylene dichloride
Physical description:	Colorless watery liquid with a sweet pleasant odor resembling chloroform
Physical properties:	
Boiling point:	104°F (40°C)
Freezing point:	-143°F (-97°C)
Vapor pressure:	350 mmHg @ 20°C (68°F) 19.0 psia @ 46°C (115°F)
Threshold limit value:	
Time weighted average:	50 ppm (174 mg/m3)
Short-term exposure limit:	Unassigned
Flammability limits:	
Lower flammability limit:	12% by volume
Upper flammability limit:	19% by volume
Combustion properties:	
Flashpoint:	None
Autoignition temperature:	1033°F
Densities:	
Vapor (air = 1):	3.0
Specific gravity at 20°C:	1.34
Identifiers:	
CHRIS code:	DCM
Cargo compatibility group:	36 (Halogenated hydrocarbons)
CAS registry number:	75-09-2
U.N. number:	1593
U.N. class:	6.1, Poisons
IMDG code page number:	6127
NFPA:	
Health hazard:	2
Flammability:	1
Reactivity:	0

Greg Duerstock was a first class cadet at the Coast Guard Academy when this article was written as a special chemistry project for LCDR Thomas Chuba.

This article was reviewed by the Hazardous Materials Branch of the Marine Technical and Hazardous Materials Division of the Office of Marine Safety, Security and Environmental Protection. Telephone: (202) 267-1577.

Nautical queries *May-June, 1993*

The following items are examples of questions included in the third assistant engineer through chief engineer examinations and the third mate through master examinations.

ENGINEER

1. An electric motor-driven (torque-producing) valve actuator is installed on the high sea suction to the main circulator with the "red" indicator light lit. When the "open" button is pushed, the "green" indicator momentarily lights and then goes out, without any appreciable valve movement. What should you do?

A. Alternately press the "close," then "open" buttons to get the valve open.
B. Manually engage the actuator hand wheel and "break" the disk from its seat, then push the "open" button.
C. Do nothing, as the valve stem has sheared.
D. Secure the breaker to this circuit.

2. High engine coolant temperature can be caused by _____.

A. air in the cooling system
B. an overhauled water pump
C. correct amount of coolant
D. no air in the cooling system

3. Heavy slagging and high temperature corrosion of boiler tubes can result from using fuel oil with high amounts of _____.

A. ash
B. sodium chloride salts
C. vanadium salts
D. all of the above

4. What device checks insulation resistance?

A. Magneto.
B. Megohmmeter.
C. Dynamometer.
D. Rheostat.

5. Which precaution should you take before opening any part of a refrigeration system?

A. Make sure positive pressure exists to prevent the entrance of moisture.
B. Find system leak with a Halide torch.
C. Set the high pressure cutout on manual to prevent automatic starting.
D. Use hot gas defrost line to remove frost on coils.

6. Commutators are on DC generators to__.

A. convert the sine wave output to DC electricity
B. provide a path for transient currents in the armature
C. maintain the proper frequency to the external circuit
D. supply a small voltage to the commutating poles

7. The safe upper limit temperature of lubricating oil discharged from purifiers is_____.

A. 150°F
B. 160°F
C. 170°F
D. 180°F

8. Failure of an oil pump to deliver fuel to the burner in a boiler could result from _____.

A. incorrect burner linkage adjustment
B. carbon deposits on ignition electrode
C. leaks in pump suction line
D. excessive fuel return pressure

9. As an armature revolves within a magnetic field, friction develops between magnetic particles as they are rotated through each cycle of magnetization, resulting in _____.

A. copper loss
B. eddy-current loss
C. hysteresis loss
D. armature reaction

DECK

1. Where should life preservers be stowed?

A. In the forepeak.
B. In the wheelhouse.
C. Topside in protected locations convenient to personnel.
D. In locked watertight and fireproof containers on or above the main deck.

2. BOTH INTERNATIONAL AND INLAND--You are underway in fog, when you hear a whistle signal of one long blast followed by two short ones, indicating a vessel_____.

A. is not under command
B. is being towed
C. is aground
D. is all of the above

3. It is good practice to use long tow lines for ocean tows because the _____.

A. wear on the tow line is equalized
B. weight of the tow line increases towing force
C. dip in the tow line absorbs shock loads
D. danger of overriding is reduced

4. Machinery lube oil sumps are not permitted to be drained into the bilges of _____.

A. vessels without a bilge oil pump
B. vessels over 100 gross tons
C. vessels going more than 50 miles offshore
D. any United States vessel

5. The Humboldt Current flows in which direction?

A. North.
B. South.
C. East.
D. West.

6. Normally, the percentage of oxygen in air is _____.

A. 16%
B. 18%
C. 21%
D. 25%

7. Part 156 of the Pollution Prevention Regulations concerns _____.

A. transfer operations and procedures
B. vessel design
C. large oil transfer facilities
D. equipment

8. You are about to go to sea and adjust the magnetic compass. To expedite the adjustment at sea, in what order should the following dockside adjustments be made?

A. Flinders bar first, then the heeling magnet and spheres.
B. Heeling magnet first, then the flinders bar and spheres.
C. Flinders bar first, then the spheres and heeling magnet.
D. Spheres first, then the flinders bar and heeling magnet.

9. Which statement is true regarding buoyant work vests aboard tank vessels?

A. They may be worn while working on deck, but not working over the side.
B. They should be used only under supervision.
C. They will be accepted for up to 10% of the required life preservers.
D. They may be worn during drills.

10. On a voyage charter, when a vessel is ready to load cargo, the master should render to the charterer a _____.

A. Notice of Readiness
B. Master Certificate of Service
C. Shipmasters Declaration
D. Vessel Utilization and Performance Report

ANSWERS

Engineer

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

Deck

1-C, 2-A, 3-C, 4-D, 5-A, 6-C, 7-A, 8-C, 9-B, 10-A.

If you have any questions concerning "Nautical Queries," please contact U.S. Coast Guard (G-MVP-5), 2100 Second St., S.W., Washington, D.C. 20593-0001. Telephone: (202) 267-2705.

Amphibious DUKW lands troops on beach during World War II.

A DUKW is a "DUCK" in and out of water

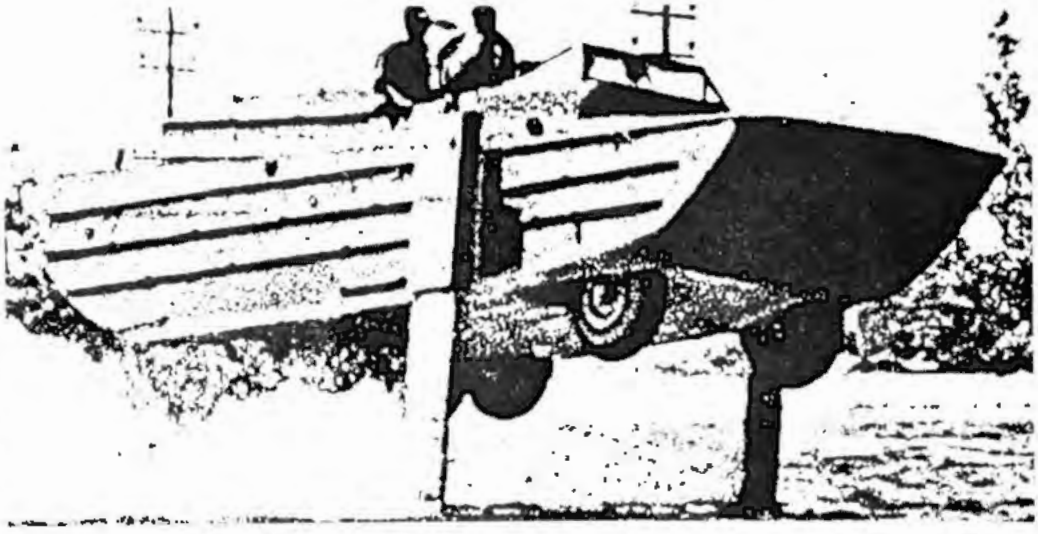
By LT Rondal B. Litterell

A sea trip on a DUKW cost 100 francs along the French channel coast in 1950.

Shortly after World War II started, there was a demand for a large amphibious craft to land troops and equipment directly to where they were needed. One proposal was to convert a General Motors Corporation two and a half ton personnel and cargo truck already in production into an amphibious vehicle.

Code named "DUKW," a prototype was built and demonstrated to a less than enthusiastic response. In desperation, the designers requested a second demonstration under severe conditions.

Luck was on the side of the developers. Just four days before the scheduled demonstration around 1941, a Coast Guard patrol boat had



The Flying Duck reaches planing speed of 13 knots during tests on the Florida coast.

Many of the old DUKWs were left to rust in excess property scrap piles.

run aground in a severe storm, landing on a sandbar about a quarter of a mile off the shores of Provincetown at the tip of Cape Cod, Massachusetts. Numerous attempts had been made with rafts and lifeboats to reach the seven sailors stranded on the vessel. Driving surf, 60-knot winds and strong currents aborted rescue efforts.

The commander of the Coast Guard base in Provincetown decided to use the experimental DUKW for one more attempt. Within minutes after its arrival, the DUKW was crashing its way through the heavy seas to the stranded vessel and back to shore with the seven safe and sound survivors in the nick of time. A few hours later, howling winds and pounding surf sent the battered patrol boat to a watery grave.

Two days later, President Franklin D. Roosevelt was handed a news clip, which read, "Two nights ago on Cape Cod, an Army truck went to sea and rescued the men from a stranded Naval vessel." Within weeks, the DUKW was headed for the front lines of the war.

The DUKW continued throughout World War II to prove its worth landing troops and equipment during such operations as "Torch" in North Africa on November 4, 1942; "Husky" on the Mediterranean island of Sicily on July 10, 1943; "Overlord" in Normandy, France, on June 6, 1944; and "Dragoon" in Province, France, on August 15, 1944; as well as during the conquest of the Pacific islands and atolls. About half of approximately 2,500 DUKWs used in World War II were destroyed in action.

After the war, the usefulness of these amphibious craft diminished. Attempts were made to upgrade the vehicle by equipping it with hydrofoil wings and a high velocity pusher propeller so that it could reach a speed of 30 knots. The cost of modifying and reinforcing the hull, however, made it untenable. Some were purchased for emergency responses, but most of the vessels were placed in excess-property scrap piles. There they languished until rediscovered.

Continued on page 52

Tires could be deflated for beach landing and reinflated while moving. Note rust alongside of DUKW.

From DUKW → To DUCK

Side seats -- -- replaced with -- -- bus benches.

Continued from page 51

DUKWs to DUCKS

Some 20 years later in the 1960s, far from the crashing surf of foreign shores and the deafening sound of artillery, the DUKW was again loaded to embark on a peaceful mission. Again, eager passengers sat silently in anticipation. Suddenly, the silence was broken.

"Welcome aboard. Please remain seated during the tour," said the conductor as the amphibious vehicle waddled over land and glided through water, displaying its new name in bright letters, "Ride the yellow DUCKS."

The DUCKS were no longer olive green or camouflaged, but painted bright yellow, red and white with stripped canvas tops.

The vehicles also have been used to carry passengers in France, Belgium, Argentina and in the Negev desert in Israel.

Regulations

Initially in the 1960s and early 1970s, in the United States, many of these vehicles were operated solely under the regulations of their home states. They usually were found in small lakes and recreational areas.

In the late 1960s, however, the Coast Guard began to look into these amphibious operations, and found that some of them were conducted on navigable waterways of the United States, which meant that the craft had to comply with 46 CFR parts 175 to 187.

This development was not met with enthusiastic approbation on the part of the operators of the tour DUCKs. However, it was established that indeed the Coast Guard did have the responsibility to assure that the amphibious craft operated according to safety standards of all small passenger vessels.

DUCK is launched . . . . . and comes ashore.

DUCKS don all colors...
Red --
-- Yellow --
-- Blue

Initial inspections of the converted DUKWs revealed many transgressions, primarily due to the age of the vessels. Electrical systems needed total overhauling. Bulkheads had to be reconstructed for water- and vapor tightness. And, due to their gasoline propulsion systems, many engines had to be upgraded to meet safety standards.

Once all the necessary repairs were made to comply with the regulations, basic stability tests were conducted on the vessels. The tests were accepted under limited conditions. DUKWs (or DUCKS) are only permitted to operate in sheltered areas with little or no current.

The Coast Guard office in Memphis has fielded numerous inquiries from prospective amphibious vehicle operators from Massachusetts to Alabama asking how to certify their DUCKS. The individuals are referred to their local Coast Guard inspection department, not the state fish and game department.

If the interest shown during the past year continues, and more serviceable DUKWs can be located, they may become more commonplace than unusual.

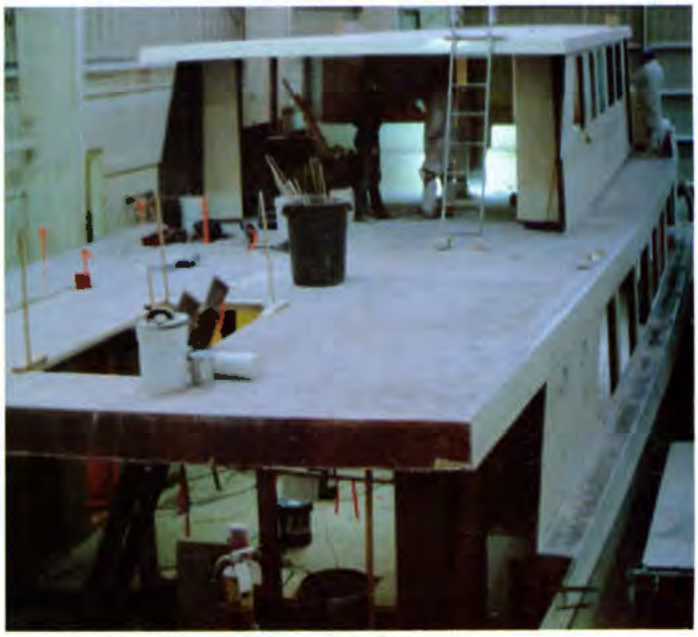
LT Rondal B. Litterell is chief of marine inspections at MSO Memphis, 200 Jefferson Avenue, Memphis, Tennessee 38103-2300.
Telephone: (901) 544-3941.

T-boats . . .

. . . From A to Z

By LT Lincoln Stroh

A plethora of unique T-boats are under construction or recently completed in the MSO Portland (Oregon) inspection zone. Running the gamut from stern wheelers to hydrofoils, these small passenger vessels are built of aluminum, steel, wood plank, cold-molded wood and fiber-reinforced plastic.



90-foot fiber-reinforced plastic monohull

Designed to carry 149 passengers on exposed waters, this vessel was built by Westport Shipyard, Westport, Washington. (Shown at right under construction.)

Photo by Doug Conde.

78-foot stern wheeler

Designed to carry 149 passengers, this steel hulled vessel (below) with a wood superstructure was built in Bandon, Oregon. Note paddlewheel at right.

Photo by Carl Litke.

85-foot fiber-reinforced plastic hydrofoil

This high-speed hydrofoil (left) was designed and built by Westport Shipyard for the United States passenger ferry boat market.

Photo by Woody Mayer.

85-foot aluminum SWATH

Designed to carry 49 passengers on coastal fishing trips, this twin-hulled vessel (left and below) was constructed in Vancouver, Washington.

Photo by LT Lincoln Stroh.

Continued on page 56

Continued from page 55

24- to 60-foot aluminum white-water jet boats

Designed for up to 80 passengers on "protected" white waters of the Northwest, these white water jet vessels are gasoline-powered, open boats capable of upwards of 40 knots in shallow waters. The boats above were built in Lewiston, Idaho.

Photo by Daryl Bentz.

26-foot wood planked long boats

Designed as replicas of the long boats aboard the *Lady Washington*, which was sailed by Captain Robert Gray in the 18th century when he explored the inland waters of the Northwest, these vessels were built by the Grays Harbor Seaport Historical Society in Aberdeen, Washington. Two long boats are shown below in various stages of construction.

Photo by Doug Conde.

64-foot cold-molded wood auxiliary sailing vessel

Designed to carry 65 passengers on partially protected waters, this sailing vessel was built using the constant camber method in Pacific, Washington.

Photo courtesy of Shaw Boats, Inc.

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