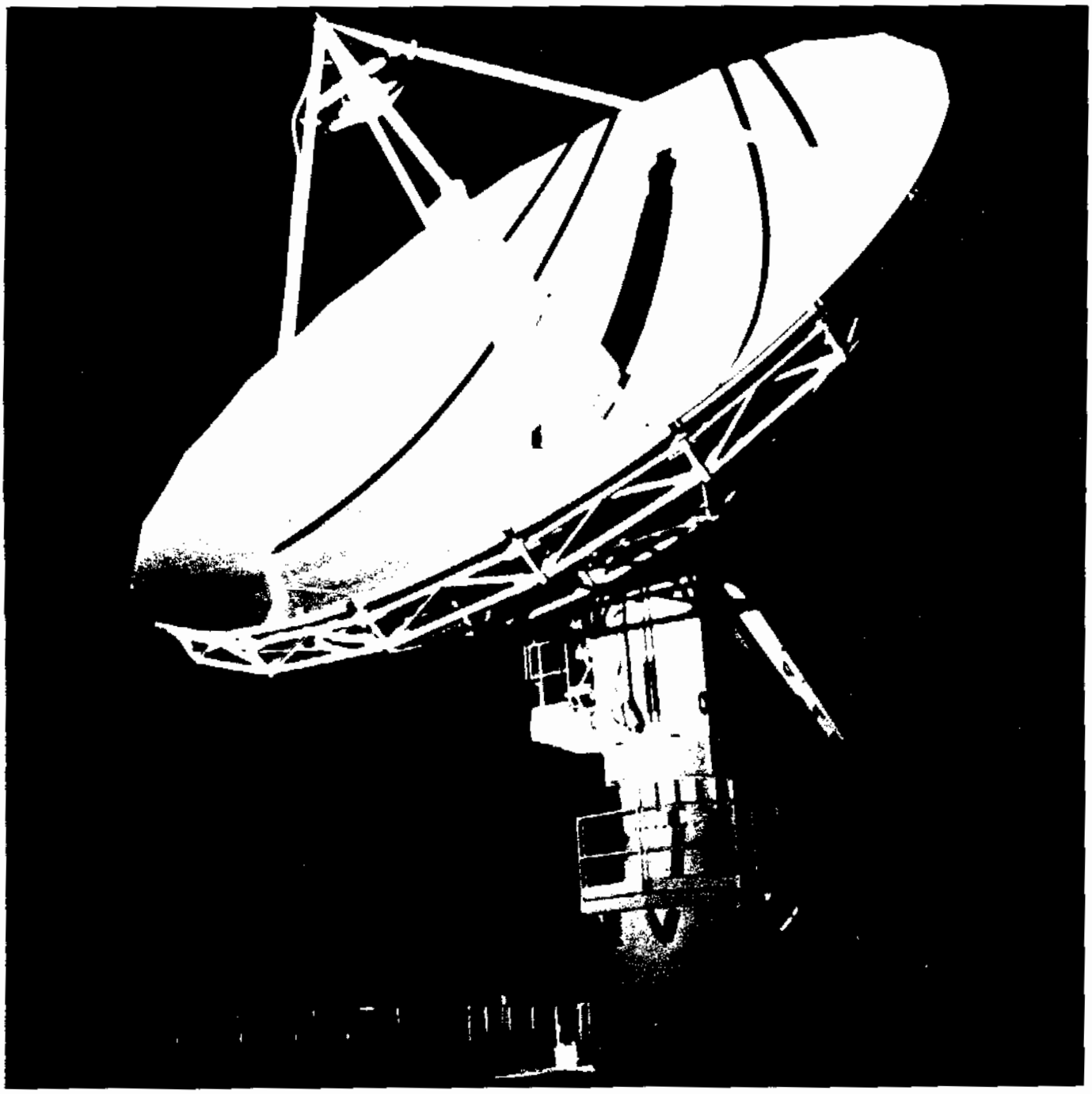
Proceedings

of the Marine Safety Council



United States
Coast Guard

January 1985

Proceedings
of the Marine Safety Council

Vol. 42, No. 1
January 1985

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DIST.(SDL NO. 120)
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George Tellmann's informative "Maritime Satellite Communications" begins on page 3. Photo of parabolic dish satellite courtesy of COMSAT.

Maritime Satellite Communications

George Tellmann
Vice President, Maritime Services
World Systems Division
Communications Satellite Corporation
(COMSAT)

Almost 30 years have passed since the first satellite was launched into orbit. That seems like a long time until we reflect on the thousands of years mariners have ventured out on the sea. For almost all of navigational history, a ship was completely isolated from the rest of civilization once it cast off lines or weighed anchor. Now, however, a ship can contact any port or vessel in the world in just an instant.

Today, over 3,000 cargo and passenger ships, tankers, yachts, seismic survey vessels, offshore oil rigs, fishing boats, and a handful of other types of vessels are equipped with satellite communications terminals. The number is growing by close to 100 a month, and not surprisingly, there are good reasons for that growth.

History

In the late 19th century, Guglielmo Marconi invented the wireless radio, and its usefulness in ship communication was obvious. In November 1899, the American passenger vessel ST. PAUL became the first ship to receive a radio message from shore. However, the real value of shipboard radio was brought to international attention in 1912, when the TITANIC sent an "SOS" before going down. All of her passengers would have been lost had not the CARPATHIA heard the signal and rushed to the rescue.

Because the practical application of maritime communication had been so clearly demonstrated, radio technology continued to advance in the early 20th century. In 1922, the first voice communication was established between a station in New Jersey and the SS AMERICA, steaming some 650 kilometers out at sea.

From the early technology evolved modern terrestrial radiocommunications in the medium frequency band (MF), the high frequency band (HF), and the very high frequency band (VHF-FM). Each frequency band has clear advantages, but each also may have limitations in range, availability, or clarity.

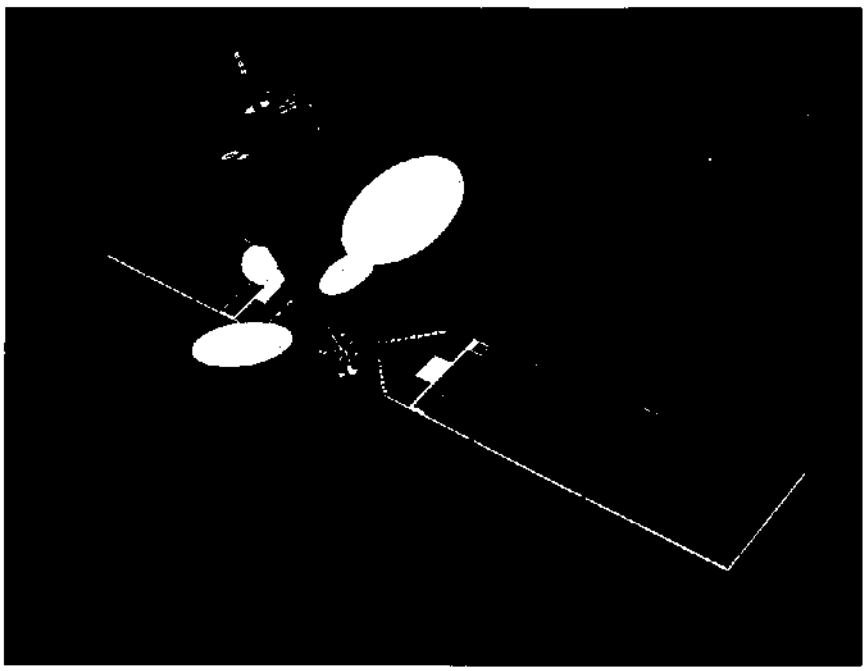
The International Maritime Organization Is Established

Because of these shortcomings, the maritime community was quick to recognize the potential of new technology when the first commercial communications satellite (Early Bird) was launched in 1965. In the following year, the International Maritime Organization (IMO), then called the Inter-Governmental Maritime Consultative Organization (IMCO), first considered the technology's application for enhancing the safety of life at sea. In 1971, the World Administrative Radio Conference for Space Telecommunications allocated frequency bands to be used by a future maritime mobile satellite service. IMO took the next step in 1972 by holding a series of Panel of Experts meetings, and in 1975 IMO convened the first of three sessions of an International Conference on the Establishment of an International Maritime Satellite System.

Among the objectives cited by IMO were

the relief of MF and HF radio congestion; the improvement of reliability, quality, speed, and geographic coverage; the provision of automatic communications and data transmission capabilities; and better distress and safety communications.

In the meantime, the United States Navy had the same idea and contracted for interim communications satellite services for its far-flung fleet. These services were provided by three Marisat satellites, the product of a joint venture run by Comsat General Corporation (a wholly owned subsidiary of COMSAT) in conjunction with RCA Global Communications, Inc., ITT World Communications, Inc., and Western Union International, Inc. The satellites had capabilities in excess of the Navy's needs, and these capabilities were used to establish the first commercial maritime satellite communications service in 1976 in the Atlantic and Pacific Ocean regions. By 1979, that service had been extended to the Indian Ocean.



INTELSAT V - Maritime Communications Subsystem satellite. (Photo courtesy COMSAT)

For the first time, commercial ships had available to them direct-dial telephone service to anywhere in the world at any time. Telex services were also provided, giving interconnection in both directions with the domestic and international telex networks. In addition, data transmission at rates up to 2,400 bits per second was available using the telephone channel, and high speed (56 kbs) data transmission could be arranged.

While this new system grew, the international diplomatic machinery continued to turn. The International Maritime Satellite Organization (INMARSAT) formally came into being on July 16, 1979, with an initial membership of 28 countries. The INMARSAT system became operational in February 1982, using leased capacity on the three Marisat spacecraft.

INMARSAT Organization

INMARSAT is an international organization with close ties to IMO (the Depositary of the INMARSAT Convention is the Secretary-General of IMO). INMARSAT was established as a commercial entity and, as stated in the Convention which created it, "shall operate on a sound economic and financial basis having regard to accepted commercial principles." INMARSAT has two basic governing documents: the Convention, which is signed by member governments (Parties), and the Operating Agreement, which is signed by the delegated operating entities (Signatories). The Communications Satellite Corporation, created by an act of Congress in 1962, was designated as the operating entity for the United States.

INMARSAT is made up of three bodies: the Assembly, the Council, and the Directorate. The Council is the operational and decision-making body of INMARSAT. It determines the global maritime satellite communications requirements and is responsible for carrying out

the purposes of the Organization. During its usual three meetings a year, it adopts policies, plans, programs, procedures and measures for the design, development, construction, establishment, acquisition, operation, maintenance, and utilization of the space segment of the INMARSAT system.

There are now 41 members of INMARSAT. Twenty-two of the Signatories sit on the Council. The first 18 seats on the Council are filled by the members having the largest investment shares in INMARSAT (determined by use of the system). The last four seats are filled from the remaining members by Assembly election to ensure fair geographic representation.

The Council has responsibility for providing satellite capacity in the most economical and effective manner possible. INMARSAT functions are funded by the Signatories in proportion to their investment shares, and each entity receives a return on its investment. The United States has the largest investment share (about 23 percent), and other major contributors include the Soviet Union, the United Kingdom, Norway, and Japan. Investment shares will be recalculated on January 31, 1985.

Each government (or Party) signing the Convention has a seat on the Assembly. The Assembly meets once every 2 years to consider and review the activities, purposes, general policy, and long-term objectives of the Organization. The Assembly expresses its views and makes recommendations to the Council. Each Assembly member has one vote.

The Directorate handles INMARSAT's ac-

INMARSAT Global Coverage

tivities and is headed by the Director General (now Olof Lundberg of Sweden), appointed by the Council. INMARSAT has its headquarters in London.

INMARSAT System

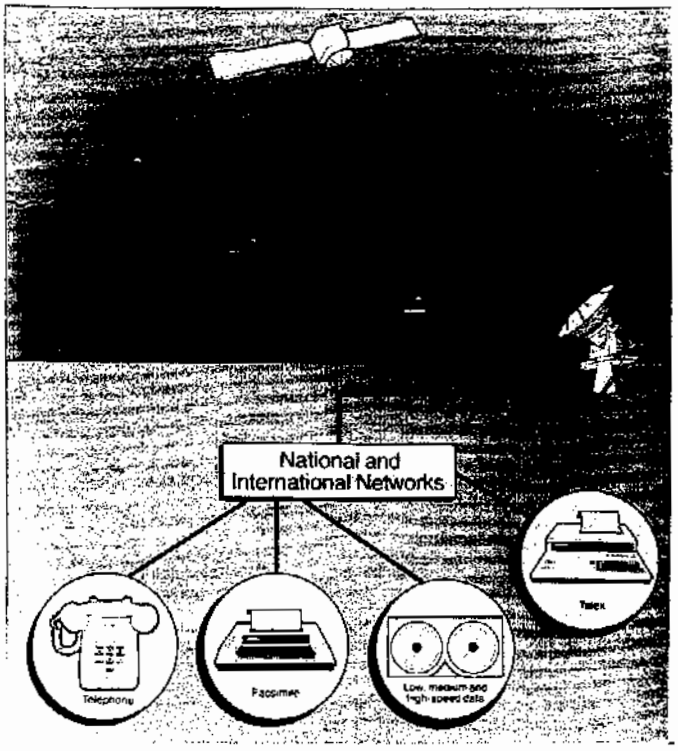
The INMARSAT system is composed of three major segments: the space segment (satellites), the coast earth stations (CES) which are used to receive and transmit signals from the land side, and the ship earth stations (SES) on the ocean end of the communications link.

The current space segment, including ground control facilities, is leased by INMARSAT. It contains three operational satellites, one over each of the three major ocean regions. The satellites are located in near geostationary orbit approximately 36,000 kilometers above the equator. In-orbit spare satellites are available to ensure continuous service.

First-generation space segment capacity is now being provided from satellites owned and operated by the International Telecommunications Satellite Organization (INTELSAT), the European Space Agency (ESA), and the Marisat Joint Venture. The INTELSAT satellites have maritime communications subsystems that can provide about 30 voice circuits; the ESA satellites have the capability for 60 circuits. To meet the increasing demand for maritime satellite service, INMARSAT is now in the process of procuring second-generation spacecraft which will be able to provide at least 125 voice channels each and which is scheduled to become operational beginning in 1988.

Signals from ship earth stations are relayed through the satellites to coast earth stations, more than a dozen of which are in operation or under construction. (There are now two CESs in the United States: one in Southbury, Connecticut, and one in Santa Paula, California.) The most prominent part of a coast earth station is normally a large parabolic dish antenna, typically having a diameter of 10 to 13 meters. The heart of the installation, however, is the signalling and channel assignment equipment which permits the channels to be operated on a demand-assigned basis.

Outline of maritime satellite communications



The only part of the system the mariner is ever likely to see is the ship earth station (SES). Each SES includes an above-decks unit consisting of an antenna and a low-noise receiver and amplifier. Below-decks equipment includes the necessary electronics, a telephone, and a teleprinter or message display unit.

The antenna must remain pointed at the satellite within restricted limits of roll, pitch, yaw, and vibration. Early antennas were parabolic dishes about 120 centimeters in diameter and were somewhat heavy. They were stabilized by very complex, active, servo-controlled systems. The newest antennas have reduced volume requirements and weight by up to 75 percent or more, and they use simpler passive direct-gyroscopic stabilization techniques.

A typical terminal now includes a microcomputer with a video display (often with built-in word processing software), a keyboard, a printer, and a telephone with modem. An emergency distress button, when pushed, automatically opens a priority channel to a coast

earth station. Provision for easy interfacing with navigation electronics, on-board computers, FAX machines, etc., is often incorporated into the terminals.

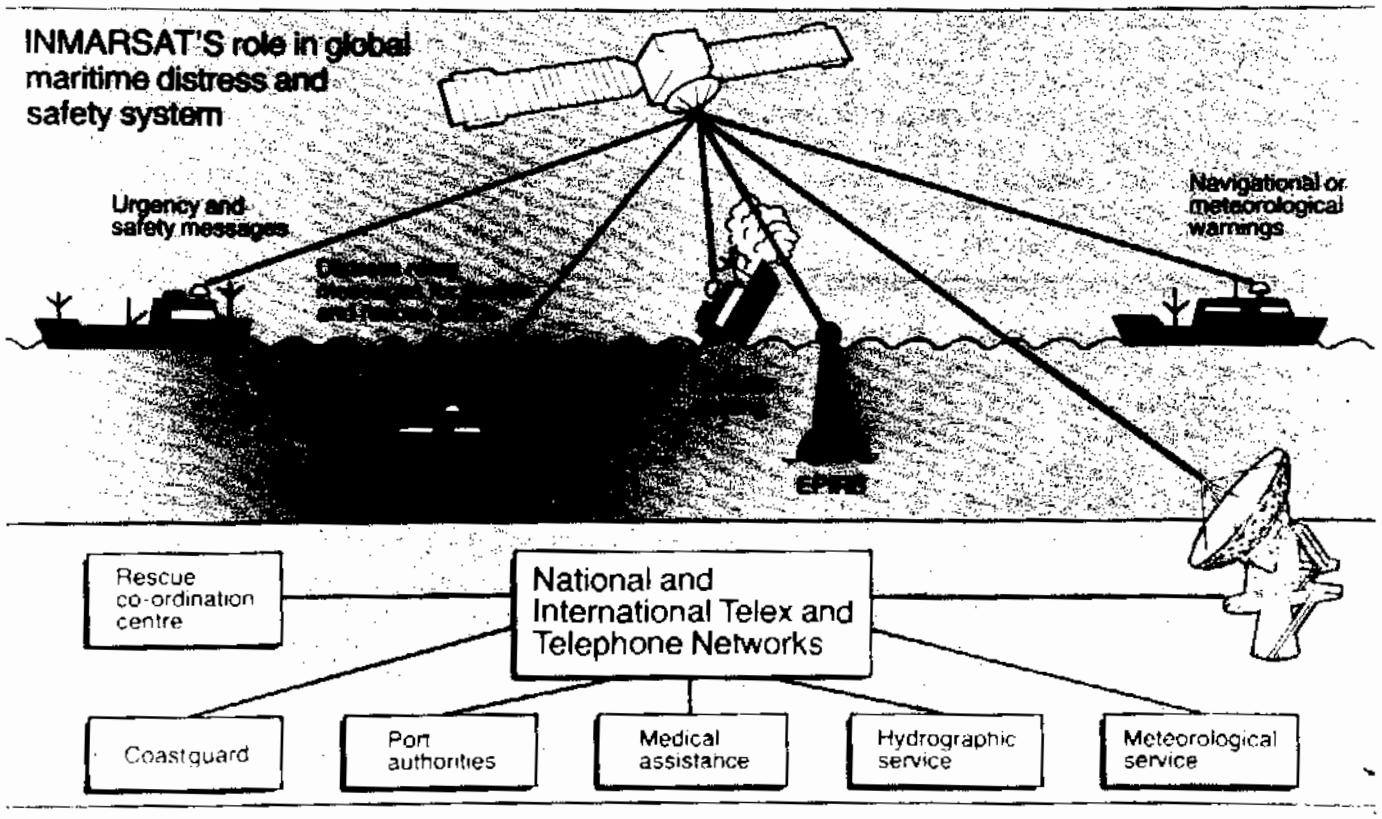
The ship earth station is purchased or leased by the ship's owner and is operated by ship personnel. How quickly the INMARSAT system expands is likely to be found by looking at the price, features, and ease of operation of ship earth stations on the market. Fortunately, the SES manufacturers have become very competitive, and prices for complete units have dropped from about $60,000 to near $25,000, while the technology has improved substantially.

Two new types of ship earth stations are now being considered, and both types use digital technology. It is expected that the first would perform the same functions as today's SESs, but it would be smaller. The second would offer only telex and low-speed data transmission, but it would have a very small omnidirectional antenna suitable for use on recreational boats and other smaller vessels.

Services

Maritime satellite communication is still in its infancy. Operators are discovering more and more uses for it, and as the number of users has increased, more services are becoming available. Efficiencies gained in voyage and cargo planning often pay for the cost of the SES, and the operator gains access to medical, maritime, navigational, and weather information. A daily news subscription service (Maripress) transmits a digest of international, national, and financial news, sports, and weather.

Vessel monitoring using the INMARSAT system is already available. Data on position, heading, speed, fuel, cargo, or whatever desired is made electronically available to SES processors which then respond to shore polling



(with suitable security codes) using an automatic duplex telex link. The system can also be set up to send data to a home office automatically at predetermined times. Intervention by ship's personnel is not needed in either case.

Maritime Safety

The INMARSAT system is likely to play an important part in the upcoming Future Global Maritime Distress and Safety System (FGMDSS). FGMDSS is scheduled to be implemented as new Chapter IV of the SOLAS Convention during a transition period beginning in 1990 and running for 6 years. The time of compliance would be determined by the age of the vessel.

The draft FGMDSS plan calls for a flexible system of requirements based on several radio systems, including INMARSAT's maritime satellite system, to perform a number of different distress and safety functions in four different geographic areas. Different requirements would apply to (1) all passenger vessels and cargo vessels over 1,600 gross tons and (2) cargo vessels of 300 to 1,600 gross tons. Because satellite communications are so reliable over such a large geographic area and because they are so useful for day-to-day communications, it can be expected that many more vessels will be adopting the INMARSAT system when FGMDSS is implemented.

Conclusion

We have seen on land in the past decade a "computer revolution" in which the massive integration of digital information and communications sytems has changed the way business is conducted. The business of international maritime trade is no less complicated than its land-based relations, and it seems reasonable that in the coming decade the quickened pace and efficiencies brought on by the inexpensive and easily available electronic components will move fully into the maritime community. With certainty, the INMARSAT system will be part of that maritime revolution. *

Mr. Tellmann's career in telecommunications and international relations began in the 1950s. While with AT&T, he was involved in the planning and deployment of the first transatlantic telephone cable in 1955, and in the arrangement for the U.S. side of the first international communications experiment using AT&T's TELSTAR satellite in 1962. In 1968, he joined COMSAT as Manager for Plans, Standards and Training and became the first U.S. Operations Representative to INTELSAT. He is now Vice President for Maritime Services, COMSAT.

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Revisiting the Inland Navigational Rules Act of 1980

Charles F. Lehman

Mr. Lehman is a member of numerous organizations concerned with inland waterways affairs. He is serving or has served as a board member on many of them, including the American Waterways Operators and the National Waterways Conference. Presently, he is a member of the Towing Safety Advisory Committee and is Vice Chairman of the Rules of the Road Advisory Council.

On Christmas Eve 1980, a bill passed by the Congress to unify the various rules and regulations governing the conduct of mariners when navigating on the different waterways of the United States was signed by the President and became law. This act was entitled the Inland Navigational Rules Act of 1980 and was the culmination of years of vigorous debate, rational argument, and intense discussion by the Rules of the Road Advisory Committee (RORAC).

RORAC's Directive To Create Uniformity

RORAC's directive was to create uniformity in the often conflicting instructions contained in the old Inland, Great Lakes, and Western River Rules, and in each of their supporting Pilot Rules. The impetus behind the charge was actually contained in Rule 1 of the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS). The United States, as a signatory of the international treaty which implemented the 72 COLREGS, was required to comply with all its provisions. Rule 1(b) of the 72 COLREGS states:

Nothing in these Rules shall interfere with the operation of special rules made by an appropriate authority for roadsteads, harbors, rivers, lakes or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.

With this statement as its guide, RORAC proceeded, and when its final effort was agreed to by the U.S. Coast Guard and sent to the Congress for passage into law, it was a dedicated and coordinated effort by persons from all the diverse facets of the maritime

community. These included ship pilots, recreational boaters, deep sea and Great Lakes operators, river pilots, Coast Guard as well as Navy personnel, nautical school teachers, and maritime lawyers. Since each of these groups was involved with operations on all of our waterways at one time or another and all would be affected by the final rules, a major effort was made to ensure the least possible deviations from the 72 COLREGS. Simultaneously, however, RORAC recognized that vessels encountering one another in our restricted waters would require some special rights and responsibilities to avert possible collisions in the future. These conditions were accommodated when and wherever a safety problem was perceived. The differences in the U.S. Inland Navigation Rules from the 72 COLREGS have been noted in numerous publications, including a five-part series published in 1980 in this magazine, and are graphically shown in the Coast Guard's publication, Commandant Instruction M16672.2A.

Further Changes Necessary

However, as with all complex revisions of existing laws, after-the-fact analysis often shows that, for every problem which is eliminated, often another problem is created. The new Rules of the Road Advisory Council soon became aware after enactment of the Inland Navigational Rules Act that some further changes were necessary to clarify the act's intent and correct some of its provisions to enhance the safe navigation of vessels.

The first problem which was presented after the new rules became effective dealt with the area below the Huey P. Long Bridge on the Mississippi River. The definition of "Western Rivers" in the old set of rules started north of the bridge, while the new definition extended the jurisdiction below the bridge approximately 125 miles down the Mississippi out through the South and Southwest Passes to the Gulf of Mexico. This route extension made applicable all other special provisions for the Western Rivers. These include Rule 9(a)(ii), which grants special rights to a downbound vessel in a narrow channel; Rule 15(b), which requires a vessel crossing a river to keep out of the way of a power-driven vessel ascending or descending the river; and Rule 24(i), which exempts from the requirement to display the white masthead lights those vessels towing alongside and pushing ahead.

Although the mariners piloting vessels below the Huey P. Long Bridge believe the special operating rule requirements under 9(a)(ii) and 15(b) are excellent and want them to continue to apply to their operations, many of the pilots were concerned with the white masthead lights exemption in Rule 24(i). The low-lying penisular sea-level area below New Orleans of the Mississippi Delta is unique. The area experiences unusual low-lying fog patterns as a result of the Delta's physical configuration and temperature variations. The heavy fog can render barge lights invisible. Also, it is difficult at times to see the red and green side lights of the pushing vessel. Mariners complained that many times only the upper structure of towing vessels was visible. They believed that if masthead lights were required, meeting vessels would more readily be able to discern and distinguish the towing vessel's employment and attitude.

RORAC agreed with the logic and recommended that the rules be changed to require vessels below the Huey P. Long Bridge to show masthead lights while towing alongside or by pushing ahead as is required on other inland waters. The Congress accepted the recommendation, and the law has been modified by inserting:

"(except below the Huey P. Long Bridge on the Mississippi River)" immediately after "Western Rivers" in Rule 24(i) of the Inland Navigation Rules.

Rule 9(a)(ii)

The next question posed to RORAC involved Rule 9(a)(ii). This rule was originally written with the intention that it would

basically replace the existing Western River statutory advice and Pilot Rule 95.11, which gave the right-of-way to a downbound vessel hy recognizing the restricted pilotage control of the vessel and the necessity to deviate from a port-to-port passage. Western Rivers mariners always emphasized that the downbound vessel rule in the previous Western River Rules was an absolute necessity for safe navigation because the vessel proceeding with the current is less maneuverable than the vessel proceeding against the stream's flow.

Since all the waters encompassed in the Western Rivers flow into a larger stream and eventually into the Gulf of Mexico and meander between two extreme points, their courses wind left and right more or less equally until they reach the sea. Therefore, it was estimated that commercial vessels on these waters meet and pass one another 50 percent of the time port to port and the other half of the time starboard to starboard. It is certainly a frequent occurrence, in any case.

In nearly all areas of the Western Rivers, two vessels risk collision when they meet. When navigating international waters and most inland waters, the correct procedure for vessels meeting would be to turn to starboard. In nearly all cases on the Western Rivers, this is not possible. Vessels may be driven into shallow water, may go too deep into a bend, or may slide into a bank, dock, or other obstruction. Most Western River vessel meetings are end-on or nearly end-on. However, since they are commonly in a bend or a curved channel, the vessels may not know which side the other is favoring until they are too close for the less maneuverable downbound vessel to change course without mishap. In a long river bend, a downbound vessel may want to meet an upbound vessel on one whistle (port to port) at the bend's upper end, but if the meeting occurs in the middle or lower part of the bend, the downbound vessel may want a two-whistle (starboard to starboard) passage. The downbound vessel in river current **must** have control in a meeting situation to decide how to avoid the risk of collision.

RORAC, when drafting the unified rules, believed these concerns had been addressed. An investigation of an accident between the M/V FORT DEARBORN and the M/V BRUCE BROWN on the Ohio River in 1980, however, raised many doubts as to how and when Rule 9(a)(ii) was applicable.

An inquiry as to the definition of a "narrow channel" was made at the hearing, and the two parties involved gave conflicting opinions. The National Transportation Safety Board (NTSB), after its investigation into the collision, made a recommendation to the U.S. Coast Guard, as follows:

publish interpretive rulings so that river towboat operators will know when to apply the narrow channel rule of the Inland Navigation Rules Act, 1980.

The U.S. Coast Guard asked RORAC to make the narrow channel issue an agenda item for analysis and advice. RORAC then reviewed numerous court opinions, as well as current operating practices, in an attempt to address the recommendations of the NTSB. The courts in narrow-channel rulings considered relevant many factors, such as channel width; water depth; the size of the meeting vessels and their tows; the presence of other vessel traffic in the area; channel shape (sharpness of bends or other irregular forms); the existence of eddies, tides, drafts, or other types of unusual flows; visibility; and any other condition which might affect a vessel's safe navigation. Since all of these conditions can differ on every occasion when two vessels meet, RORAC decided it would be virtually impossible to designate which areas of our inland waterways should be considered narrow channels and which should not.

Even though RORAC did not believe it could definitively designate "narrow channels" at the present time, it recommended clarifying the procedures of a downbound vessel meeting an upbound vessel on Western Rivers as well as when any two vessels would meet at any time on all Inland Waters. First, RORAC decided

that the mariner would be better served by adding a separate new rule within the Rule 14 "Head-on Situation" to alleviate any doubt concerning the right of way of downbound vessels navigating in certain waters. New Rule 14(d) was recommended and subsequently adopted by the Congress, as follows:

Notwithstanding paragraph (a) of this Rule, a power-driven vessel operating on the Great Lakes, Western Rivers, or waters specified by the Secretary, and proceeding downbound with a following current shall have the right-of-way over an upbound vessel, shall propose the manner of passage, and shall initiate the maneuvering signals prescribed by Rule 34(a)(i), as appropriate.

This new rule is essentially the same as narrow channel Rule 9(a)(ii) except that only the "manner" of passage is specified and not the "place" when designating the method of how the meeting shall occur. Also, **no** requirement is made that the vessel proceeding upbound against the current shall hold as necessary to permit safe passing.

RORAC decided that "manner" was not all-inclusive to require a vessel to hold in a certain "place" under Rule 14. When two vessels meet under the provisions of Rule 14, there should be sufficient room to safely pass one another. If a channel is so confined to require that a particular "place" be designated for one vessel "to hold" until another is safely past, then that area, for those vessels, at that time, could be considered a "narrow channel," and the provisions of Rule 9 would apply.

How Vessels Could or Should Meet

The second problem — how vessels could or should meet — was debated by RORAC in light of the 72 COLREGS and our Inland Navigation Rules. A close reading of the rules and strict compliance would lead one to believe that two vessels meeting could **never** pass starboard to starboard except under the provisons of Inland Rule 9(a)(ii). This type of passage was not, of course, intended by the drafters of the 72 COLREGS or RORAC members when the 1980 Inland Navigation Rules became law.

In requiring the Inland Rules to conform as closely as possible to the 72 COLREGS, we encountered a problem with the conceptual meaning of meeting signals. Under the International Rules, signals of **action** are given when two vessels meet. **Action** signals require an actual turn to be made. Under our Inland Rules, sound signals given when meeting indicate **intent.** They only signify the side on which a vessel proposes to pass another. Inland Rule 34(a)(i) states that a signal of one short blast means, "I intend to leave you on my port side," and two short blasts means, "I intend to leave you on my starboard side." No change of course necessarily occurs.

Even though the starboard-to-starboard signal for meeting is listed in our Inland Rules, there is no place where it would be allowed to be sounded except in limited Rule 9(a)(ii) situations and under the recent addition of new Rule 14(d) as previously mentioned. There are, of course, many circumstances within the broad expanse of inland waters where it would be necessary for two vessels to meet and pass starboard to starboard.

Therefore, RORAC recommended that if two meeting vessels agreed to a starboard-to-starboard passage, it would be allowed. The agreement could be accomplished by signals of intent, or under the provisions of Rule 34(h), by radiotelephone. If satisfactory agreement is not reached, the other provisions of the rules would then apply. The Congress agreed to the RORAC recommendation, and Rule 14(a) was changed as follows:

by striking "When" at the beginning of the rule and inserting the following words, "Unless otherwise agreed, when."

These changes all became effective when President Reagan signed the Coast Guard Authorization Bill on October 30, 1984. They are now a part of Public Law 98-557 and will be incorporated in the next edition of Commandant Instruction M16672.2A.

Although not included in the new law, RORAC has recommended that the word "minesweeping" now used in the Inland Rules be changed to "mineclearance." This change would make the wording identical with that of the 72 COLREGS and clarify some technical differences on vessels which might be locating, but not necessarily sweeping, mines. Under the existing rules, requirements for the display of shapes and lights would be different. These changes will be the subject of future legislation.

Effects of Change Should Be Studied Before Implementation

RORAC strongly believes the navigation rules of the road should not be changed without a great deal of study regarding the effects a change might have. Most questions concerning the present rules can be answered by clarifications and interpretive rulings under the present structure. If, however, after thorough analysis, a change to the existing rules will bring about safer navigation on our nation's waters, the Council will be obligated to make its counsel and advice known to the Coast Guard and to the Congress. RORAC believes the changes which have recently taken place will serve the mariner well in preventing future collisions. *

Correction

The article entitled "Vessels Meeting at the Confluence of Two Rivers" published in our December issue contained a typographical error. On page 274, in the paragraph **Rule 9. Narrow channel**, the correct sentence should read:

In the same situation, if the vessels were in a narrow channel on other waters, the Rule 9(a)(i) would apply, which would require each vessel to keep to the outer limit of the channel or fairway on her starboard side until the meeting had been completed.

The December issue incorrectly stated Rule 9(a)(ii) rather than the correct Rule 9(a)(i).

Motors Get Muffled in Connecticut

Boaters in Connecticut may want to tiptoe through that state's waterways as lawmakers there just added some teeth to a law banning loud boat engines.

Connecticut marine police may now require a skipper to undergo a test in which the noise created by a vessel is measured to see if it violates allowable limits.

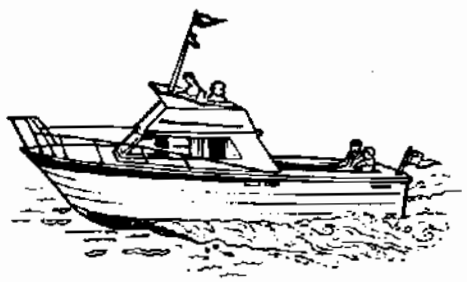
The noise law was first passed in 1978 after the Housatonic River was dammed, creating a lake 8 miles long but only half a mile wide. Residents rattled by the sounds of boat engines, in most cases high-powered racing boats, banded together and successfully pushed through legislation in one year.

Marine police use sophisticated $1,200 noise meters and, until recently, could test noise levels only in response to a complaint. But now police have the authority to direct a suspected boat through a test course to measure its noise level at a distance of 50 feet.

Marine police in Connecticut responded to about two dozen complaints last year. Exceeding the limit is an infraction carrying a $40 fine.

The majority of those stopped cooperate, law enforcement officials say, and some boat owners ask to be tested so they won't be unfairly blamed for noise on the water.

Boat engines built after 1982 are limited to 82 decibels within 50 feet of shore, those built between 1976 and 1982 to 84 decibels, and before 1976 to 86 decibels. By comparison, an automobile engine generates about 80 decibels at close range.



Reprinted from **BOAT/U.S. Reports,** Volume XIX, No. 6, November/December 1984, p. 2.

The National Cargo Bureau -- and How It Serves

Ron Bohn

The National Cargo Bureau, Inc. (NCB) describes itself simply as a "not-for-profit membership organization dedicated to the safe stowage, securing and unloading of cargo, and to the safety of shipboard cargo handling..." The range of its services and expertise, however, is noteworthy.

There are probably many readers who are not fully aware of the broad experience base and practical guidance that this unique organization can apply to their cargo-related questions and needs. I say "unique" because it is the only such organization recognized by name in the U.S. Department of Transportation regulation (49 CFR, Part 176, "Carriage by Vessel," Section 176.18, "Assignment and Certification").

NCB's origins and reason for being can be linked with, and considered an outgrowth of, several events: grain ships that capsized because of their shifting cargo; shipboard fires related to wet cotton or metal turnings; the nitrate ships explosions at Texas City in 1947 (450 people killed, 300 missing); and the increasing need for qualified, objective surveyors to pass judgment on cargoes and their stowage, securing, and compliance with regulations. Those events proved a need for uniform standards and new regulations that NCB would help bring about.

History and Origin

NCB was formed in 1952 from the inspection bureaus of two major groups of underwriters: the Board of Underwriters of New York and the Board of Marine Underwriters of San Francisco. NCB was then authorized by the U.S. government to assist in the administration of international regulations applicable to the safe loading of ocean cargoes.

During 1960 and 1961, NCB was recognized by both the U.S. Coast Guard and the Department of Labor as a cargo gear certificating agency. (If the term "cargo gear" puzzles you, think of it as a specifically marine application of the broader, current term, "materials handling equipment.")

By 1967, NCB was also applying its loading, stowage, and securing expertise to container loading inspection services. That too was a "natural" for it, considering that all NCB surveyors have sea experience as masters and deck officers as well as such directly related shoreside experience as pier and marine terminal superintendents or steamship line port captains. (Many, if not most, of them are graduates of maritime academies.)

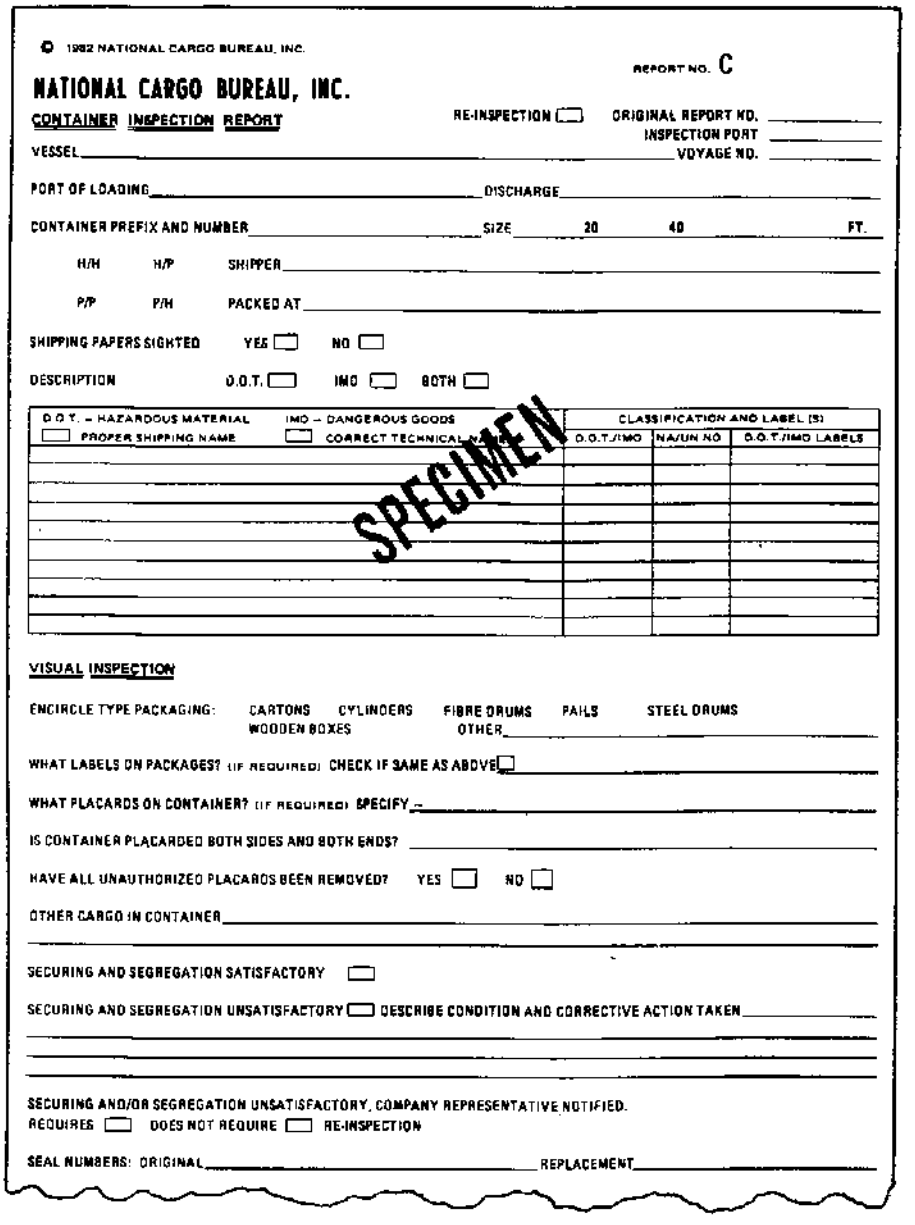
The relevance of that sea experience may be realized when we consider that the seeds of cargo problems planted ashore are likely to bear fruit at sea. The former ship's officer has the distinct advantage of having "lived through" the stowage and securing foul-ups and thus knowing what "will never make it."

Certificated Services

NCB is qualified to perform almost two dozen inspection and survey services. Of special importance legally is that it may issue the appropriate opriate certificates of loading that are acceptable "as **prima facie** evidence that the cargo is stowed in conformity with the requirements of 46 U.S.C. 170 and this subchapter" (i.e., 49 CFR, Subchapter C, which includes Part 176, "Carriage by Vessel") —quoting from 49 CFR 176.18(b).

Here's a sampling (not a full list) of the inspections or surveys related to loading or discharging a ship for which NCB may issue appropriate certificates and/or survey reports:

- Stowage of explosives, bulk, and packaged hazardous materials in accordance with federal regulations, including preloading, temperature checks, and loading/stowage of metal borings, shavings, turnings, and cuttings.
- Preloading inspection of holds and reefers for refrigerated cargoes; taking and recording temperatures.
- Loading, stowage, and securing of general cargo, on or under deck, including special surveys of large, heavy lift units.
- Stowage of bulk grain cargoes, related arrangements, and vessel suitability.
- Condition of cargo and packaging at point of origin and/or prior to being loaded and stowed.
- Cargo container inspections covering compatibility, regulations compliance (applicable to hazardous materials and/or dangerous goods), plus proper stowage and securing within the container. Tank container inspections are also performed.



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REPORT NO. C

NATIONAL CARGO BUREAU, INC.

CONTAINER INSPECTION REPORT

RE-INSPECTION ☐ ORIGINAL REPORT NO. _____
INSPECTION PORT _____
VOYAGE NO. _____

VESSEL _____

PORT OF LOADING _____ DISCHARGE _____

CONTAINER PREFIX AND NUMBER _____ SIZE 20 40 FT.

H/H H/P SHIPPER _____

P/P P/H PACKED AT _____

SHIPPING PAPERS SIGHTED YES ☐ NO ☐

DESCRIPTION D.O.T. ☐ IMO ☐ BOTH ☐

D.O.T. – HAZARDOUS MATERIAL ☐ PROPER SHIPPING NAME / IMO – DANGEROUS GOODS ☐ CORRECT TECHNICAL NAME	CLASSIFICATION AND LABEL (S) D.O.T./IMO	NA/UN NO	D.O.T./IMO LABELS

SPECIMEN

VISUAL INSPECTION

ENCIRCLE TYPE PACKAGING: CARTONS CYLINDERS FIBRE DRUMS PAILS STEEL DRUMS WOODEN BOXES OTHER _____

WHAT LABELS ON PACKAGES? (IF REQUIRED) CHECK IF SAME AS ABOVE ☐ _____

WHAT PLACARDS ON CONTAINER? (IF REQUIRED) SPECIFY _____

IS CONTAINER PLACARDED BOTH SIDES AND BOTH ENDS? _____

HAVE ALL UNAUTHORIZED PLACARDS BEEN REMOVED? YES ☐ NO ☐

OTHER CARGO IN CONTAINER _____

SECURING AND SEGREGATION SATISFACTORY ☐

SECURING AND SEGREGATION UNSATISFACTORY ☐ DESCRIBE CONDITION AND CORRECTIVE ACTION TAKEN _____

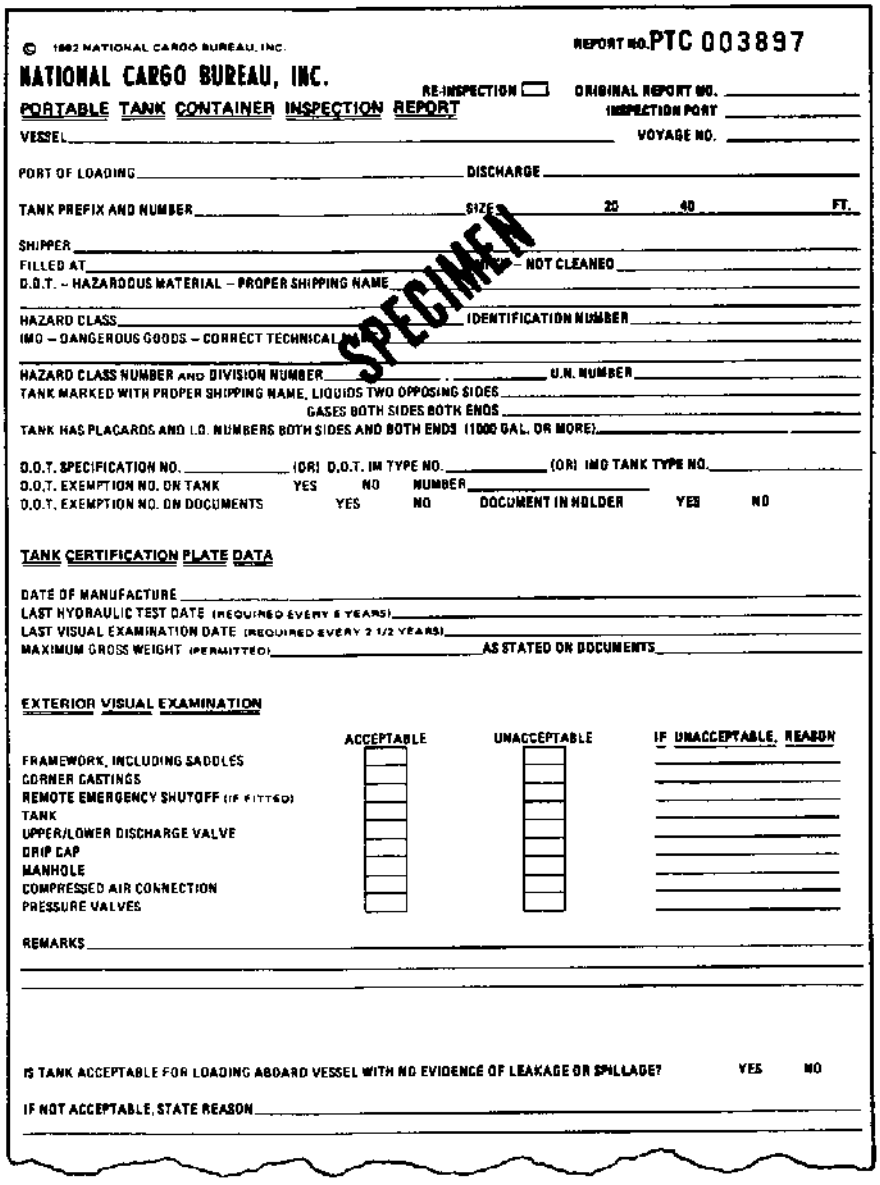
SECURING AND/OR SEGREGATION UNSATISFACTORY, COMPANY REPRESENTATIVE NOTIFIED.
REQUIRES ☐ DOES NOT REQUIRE ☐ RE-INSPECTION

SEAL NUMBERS: ORIGINAL _____ REPLACEMENT _____

Expert Advisor

NCB's regulatory expertise, it may be noted, is also updated constantly by its direct, active participation as a technical advisor at international conferences and working groups dealing with drafts of new rules or changes affecting, for example, the IMO International Maritime Dangerous Goods Code.

NCB's Captain Don Gates was one of the attendees at a Coast Guard-chaired meeting last year to discuss, with other industry advisors who form a SOLAS (Safety of Life at Sea) working group, a Dutch proposal to revise the IMO dangerous goods segregation tables. Such involvement is very much a part of the NCB participation effort that helps keep it well



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REPORT NO. PTC 003897

NATIONAL CARGO BUREAU, INC.

RE-INSPECTION ☐ ORIGINAL REPORT NO. _____

PORTABLE TANK CONTAINER INSPECTION REPORT INSPECTION PORT _____

VESSEL _____ VOYAGE NO. _____

PORT OF LOADING _____ DISCHARGE _____

TANK PREFIX AND NUMBER _____ SIZE 20 40 FT.

SHIPPER _____

FILLED AT _____ NOT CLEANED _____

D.O.T. – HAZARDOUS MATERIAL – PROPER SHIPPING NAME _____

HAZARD CLASS _____ IDENTIFICATION NUMBER _____

IMO – DANGEROUS GOODS – CORRECT TECHNICAL NAME _____

HAZARD CLASS NUMBER AND DIVISION NUMBER _____ . _____ U.N. NUMBER _____

TANK MARKED WITH PROPER SHIPPING NAME, LIQUIDS TWO OPPOSING SIDES _____

GASES BOTH SIDES BOTH ENDS _____

TANK HAS PLACARDS AND I.D. NUMBERS BOTH SIDES AND BOTH ENDS (1000 GAL. OR MORE) _____

D.O.T. SPECIFICATION NO. _____ (OR) D.O.T. IM TYPE NO. _____ (OR) IMO TANK TYPE NO. _____

D.O.T. EXEMPTION NO. ON TANK YES NO NUMBER _____

D.O.T. EXEMPTION NO. ON DOCUMENTS YES NO DOCUMENT IN HOLDER YES NO

SPECIMEN

TANK CERTIFICATION PLATE DATA

DATE OF MANUFACTURE _____

LAST HYDRAULIC TEST DATE (REQUIRED EVERY 5 YEARS) _____

LAST VISUAL EXAMINATION DATE (REQUIRED EVERY 2 1/2 YEARS) _____

MAXIMUM GROSS WEIGHT (PERMITTED) _____ AS STATED ON DOCUMENTS _____

EXTERIOR VISUAL EXAMINATION

	ACCEPTABLE	UNACCEPTABLE	IF UNACCEPTABLE, REASON
FRAMEWORK, INCLUDING SADDLES	☐	☐	
CORNER CASTINGS	☐	☐	
REMOTE EMERGENCY SHUTOFF (IF FITTED)	☐	☐	
TANK	☐	☐	
UPPER/LOWER DISCHARGE VALVE	☐	☐	
DRIP CAP	☐	☐	
MANHOLE	☐	☐	
COMPRESSED AIR CONNECTION	☐	☐	
PRESSURE VALVES	☐	☐	

REMARKS _____

IS TANK ACCEPTABLE FOR LOADING ABOARD VESSEL WITH NO EVIDENCE OF LEAKAGE OR SPILLAGE? YES NO

IF NOT ACCEPTABLE, STATE REASON _____

informed on regulations-related developments. Its representatives are also frequent speakers or panel members at hazardous materials seminars in the United States, and they're "regulars" at the international symposiums, as well. The NCB is an active participant on both the IMO (formerly IMCO) Subcommittee on Containers and Cargoes as well as the Subcommittee on the Carriage of Dangerous Goods.

Information Source

NCB's 17-page booklet entitled **National Cargo Bureau, Inc.,** recaps, briefly, its history and involvement with safety regulations and work with the international bodies, plus its inspection and certification services. (Copies are available from NCB surveyors in U.S. ports or from headquarters in New York: One World Trade Center, Suite 2757, New York, NY 10048; telephone (212) 432-1280.)

NCB also developed its own "Self Study Course in Ships' Stability" which focuses on the special problems of grain ship stability. It was the outgrowth of NCB's direct involvement with grain cargoes and related problems. Such direct contact with actual conditions also prompted the booklet **Shipper's Guide to Proper Stowage of Intermodal Containers with Emphasis on Ocean Transport,** presently being upated to reflect changes in the regulatory references since its last printing.

The NCB surveyors, too, are information sources not to be overlooked. They are often called into facilities that "stuff" containers for ocean shipment to offer advice on the techniques and materials suited to properly secure the cargo container contents. (The U.S. regulations, 49 CFR 176.76, also require that shippers of containerized hazardous materials secure them to prevent movement.)

Container Inspections

It has been demonstrated to a number of steamship lines that there is, indeed, good reason to check containers of hazardous materials/dangerous goods before they are loaded aboard. Simply stated, it is unrealistic to assume that every shipper/exporter of containerized hazardous materials has the skilled, trained personnel to properly pack and secure the variety of packaged, regulated commodities. As a matter of fact, the major, continuing problem in securing is that of determing the "how" and "with what?" Regulations state the requirement but not the methods or materials.

There are still containers being delivered to piers and terminals that, when opened for NCB inspection, are found to have totally inadequate securing, i.e., bracing and blocking. It is not unusual to find some with no securing whatever. It is also not unusual to find that some shippers who have consolidated individual lots of hazardous materials —sometimes with general cargo -- have no idea of what-can-go-with-what or that there are segregation requirements!

It is to address this problem and this significant risk to the ocean carrier, as well as to the onward carriers that must move the containers from the discharge port to the inland destination, that carriers utilize NCB's container inspection service. Considering that the ocean carrier's responsibility might include leak or spill clean-up costs and liability for inland portions of the move (under "micro" and point-to-point moves and bills of lading), a preventive, risk-minimizing philosophy takes on a new appeal. Often overlooked is the fact that the service also protects the shipper offering such containerized hazardous materials.

The National Cargo Bureau's Container Inspection Report form (see illustration) is prepared by the NCB surveyor for the container concerned either at the pier or marine terminal to which it was delivered for the vessel or, in some cases, at the shipper's plant or the "stuffing" facility concerned. When the inspection is conducted at the pier/terminal, the old and new seal numbers are, of course, recorded on the form. NCB's carrier client pays the NCB according to a schedule of fees. The shipper preferring that the recorded inspection be conducted at his facility would pay NCB, since this usually involves travel and time away from the port or terminals/piers the surveyor has to cover.

The Portable Tank Container Inspection Report form is a more recent development and is necessitated by the particularly important concerns about the tank type, exterior condition, and the dates of the tank's last hydrostatic test and last visual examination. Tanks also must be placarded to show the hazard class and the commodity's U.N. (identification) number on both sides and ends. The proper shipping name must also be shown on both sides and must agree with the shipping documents. All are checked by NCB and duly recorded. Both forms provide for reinspection if the first one indicated a reason for rejection.

If this were a two-part article, I could do justice to NCB's many functions and skills, perhaps. Suffice it to say that it focuses on the center of its name, the core of its purpose, and the heart of its service: **cargo.** *

Mr. Bohn is hazardous materials manager for Hapag-Lloyd Agencies, New York.

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Ship and Equipment Design

How well are mariners' requirements taken into account when ships are designed and fitted out? On the premise that feedback from professionals could forestall future problems, a London-based organization solicited the views of its seafaring members.

Part V
Firefighting

Compiled by E. J. Riley
from responses to the
Nautical Institute questionnaire

1. Access

Problem: Alleyways, companionways, holds, tanks, and stores accesses are too narrow to maneuver in while wearing a breathing apparatus or while carrying a stretcher. Fixed installations, such as the engine room, CO_2 room, etc., frequently have only one access, usually an internal one. The tripod rig system for tank rescues is too time-consuming to rig.

Remedy. Accesses and alleyways should be designed with adequate room for maneuverability, especially for use with emergency equipment, including lifejackets. Facilities should be provided to assist with handling equipment, stretchers, and personnel through accesses, and particular regard should be given to tank and hold accesses. A permanently rigged block-and-tackle type system in specific places could save lives. All fixed installations (engine room, hospital, etc.) ought to have internal and external access.

2. Alarm panels

Problem: The fire alarm panel is frequently sited in the wheelhouse. With bridge control, the engine room alarms sound on the bridge, as do the navigational alarms. Confusion results when all alarms ring simultaneously. Fire alarms are frequently heard only in the accommodation and not on deck.

Remedy. A fire alarm headquarters should contain fire alarms and a fire detector system for the entire vessel. It should be sited in a separate room incorporated into the wheelhouse with entrances via the wheelhouse and the accommodation alleyway. The entrance from the wheelhouse could be kept locked when the vessel is in port for security reasons, but the accommodation alleyway would still allow access. Fire alarms in headquarters should be sited on a central panel with one central bell. Each alarm should show a flashing light for ease of determining location. Repeaters should be placed throughout the accommodation, including the engine room, with cancellation coming from headquarters only. A flashing light should be provided on the outside of the

headquarters in the wheelhouse for visual warning. Alarm bells ought to sound throughout the entire vessel, not just within the accommodation area.

3. Breathing apparatus

Problem: Concern was expressed about using the bellows-type breathing apparatus, which is labor-intensive and tiring for the bellows operator.

Remedy. A compressed air breathing apparatus (CABA) should replace the bellows-type, particularly with reduced crews. The Code of Safe Working Practice recommends that personnel entering tanks should have two alternative systems of air supply; ideally, one of these should be a ship's air line. Higher bottle pressure should be investigated. The CABA should be stowed as one unit in specially designed lockers. The breathing apparatus should be stowed with its harness straps ready to be slipped on, and the lockers should be sited at a height suitable for the average crew member when donning the breathing apparatus. All equipment except the helmet should be permanently attached to the breathing apparatus, with the safety line (one end fastened to the breathing apparatus) neatly coiled and held in place with velcro straps, and the lamp and axe suitably attached to the belt of the breathing apparatus.

4. Detection

Problem: The smoke detectors/heat sensors provided on some vessels are insufficient. Alarm bells are designed to be heard in the accommodation only, and similarly, so is the public address system. Personnel working in tanks or cargo holds, on the fo'c'sle, and around the deck are frequently oblivious to the emergency arising.

Remedy. Site smoke detectors/heat sensors throughout the entire vessel—accommodation, engine room, cargo spaces, pump room, and fo'c'sle, with facilities to set off the alarms manually from all areas. Alarms and public address systems should be audible on the entire vessel, including over the noise of machinery (deck, engine room).

5. Escape portholes

Problem: A special key is generally required to open the portholes.

Remedy. The keys to portholes should be sited in "smash glass" lockers adjacent to portholes. A loud, audible alarm should sound when the glass locker is tampered with or broken.

6. Extinguishers

Problem: Portable extinguishers are often sited in awkward corners. They frequently jut out on the bulkhead and cause injury in heavy weather, and they are often inside and not outside the areas they protect. On some vessels, there is a lack of portable extinguishers for ready use—e.g., the steering gear is flat and has only a water connection. The large, mobile extinguishers often found in the engine room are too heavy and cumbersome to move.

Remedy. Portable extinguishers should be recessed into the bulkhead, with enough for ready-use purposes. All extinguishers and fire-fighting equipment should be sited in the vicinity of emergency lighting. Sprinkler sprays should be provided throughout the accommodation as should a water curtain across the bridge front.

7. Fire doors

Problem: Inside the accommodation, decks divided by bulkheads on the same deck level cause an avoidable fire hazard. Fire doors make a major contribution to the ability to escape from a fire.

Remedy. For the division of decks on the same level, fire doors should be designed and used to replace bulkhead division. All companionways and accommodation doors should double as fire doors. All fire doors which are hinged should open outward.

8. Fire pump

Problem: Fire pumps are frequently difficult to start and are time-consuming.

Remedy. Design a fire pump for unskilled operators which can be remotely started from the fire headquarters or wheelhouse.

9. Hoses

Problem: Fire hoses are often too large and too long for use in confined spaces.

Remedy. More "first aid" hose reels, as used in the accommodation, are required in confined spaces. Hoses and hose connections should be sited on every deck.

10. Hose fittings

Problem: Brass fittings (nozzles, etc.) are heavy and prone to pilferage and damage. Spray nozzles have been known to block as a result of salt deposits.

Remedy. Design hose connections from heavy-duty, heat-resistant plastic or some other suitable material. The design of the spray nozzle needs rethinking.

11. Isolating switches

Problem: These are not always clearly marked, particularly in the vicinity of the galley.

Remedy. Isolating switches should be sited where they are easily accessible and distinctly marked.

12. Materials and furnishings

Problem: Burning formica and PVC can be highly toxic and smoke-emitting.

Remedy. Due regard should be given to the fire risks when producing materials for shipbuilding and ship furnishing.

13. Rescue

Problem: Before anyone enters a tank, it is necessary to rig a tripod-and-block system in case of emergencies. It is very time-consuming and complicated to rig.

Remedy. Provide a simple design permanently rigged, or quick and easy to rig, over the tank.

14. Vertical fire shutters

Problem: With wear, fire shutters can work loose on their spindles. When operating the switch for vertical fire shutters, the "closed" position records immediately. Should the door jam during the operation, however, the switch will still read "closed."

Remedy. Incorporate a microswitch for the bottom of the door so that the closed position will show only when the shutter/door is actually closed. New legislation covers this point. *

Pocket Guide to SOLAS and MARPOL Conventions

The American Bureau of Shipping has made available a wallet-sized guide with the key dates and definitions of the SOLAS and MARPOL Conventions. The guide is arranged chronologically according to the earliest effective dates of each SOLAS, the SOLAS PROTOCOL, the MARPOL PROTOCOL ANNEX I, and the first and second set of SOLAS Amendments; the New Ship Defnintion of MARPOL and SOLAS with Amendments; and the New Tanker Definition SOLAS PROTOCOL 1978/MARPOL78. Contact the American Bureau of Shipping, Operations Division, 65 Broadway, New York, New York 10006, for a copy.

Keynotes

Faithful readers of the **Proceedings** know that the "Keynotes" section of the magazine gave notice of projects which had been published in the **Federal Register.** The "Actions of the Marine Safety Council" gave notice of items which had been cleared as a work plan by the Council. While the "Actions" feature did give advance notice of upcoming projects, many were at such a preliminary stage of development that there would be no notice in the **Federal Register** on the project for a year or longer. The "Keynotes," on the other hand, let you know about published proposals too late for you to comment on them if you so desired. In order to make this publication more responsive to your needs as the Coast Guard's regulated public, we are changing the "Keynotes."

From now on, the "Keynotes" will list those projects which are in internal clearance in the Coast Guard and should be ready for publication in the **Federal Register** about the time you receive the **Proceedings** in the mail. Please bear in mind that there can be a 6- to 8-week delay between the time the magazine goes to printing and the time it reaches the reader. There are always some projects which, for one reason or another, are delayed either in clearance in the Coast Guard, the Office of the Secretary of Transportation, or in the Office of Management and Budget. For this reason, readers must be cautious about assuming a proposal has actually been published.

If this new system does work as planned, you should be able to find a proposal in the **Federal Register** in time to make comments, something which was not previously possible for those who follow only the **Proceedings.** This benefit should more than offset the occasional "false alarms" which will inevitably occur.

Final Rules

CGD 77-084 — Licensing of Pilots; Manning of Vessels — Pilots

Abstract: This proposal would (1) set the minimum age requirement of 21 years, (2) reflect the statutory requirement that requires pilots to have an annual physical examination, (3) change the experience requirement for a tonnage endorsement of "any gross tons," (4) require pilots to maintain knowledge of the routes on thier licenses, (5) maintain the authority of the Coast Guard to establish limitations on licenses.

CGD 82-28 — Segregated Ballast, Dedicated Clean Ballast and Crude Oil Washing on Tankships of 20,000 DWT or more but less than 40,000 DWT Carrying Oil in Bulk

Abstract: These statutes require tank vessels of 20,000 to 40,000 dwt that are 15 years old or older to have segregated tanks or a crude oil washing system by January 1, 1986, or by the date they reach 15 years of age, whichever occurs later.

Notice of Proposed Rulemaking

CGD 77-069 — Proposed Safety Standards for Existing Self-Propelled Vessels Carrying Bulk Liquified Gases

CGD 81-104 — Discharge Review Board (DRB) Regulations

CGD 84-058 — River Service Dry Cargo Barges; Loadline Regulations

CGD 80-113 — Lifesaving Equipment; Improved Standards for the Stability of Inflatable Liferafts

CGD 84-026 — Imposition of User Fees for Certain Coast Guard Services

CGD 77-140 — Miscellaneous Changes to Part 56

Abstract: This proposed regulation would amend several sections of 46 CFR Part 56 of the Coast Guard's Marine Engineering Regulations for vessel piping systems to clarify technical requirements, correct errors, and revise the lists of acceptable standards and specifications.

CGD 83-005 — Sailing School Vessel Regulations

CGD 84-060 — Licensing of Pilots; Manning of Vessels - Pilots

Abstract: This proposal makes additional amendments to the regulations regarding the licensing of pilots and the manning of vessels - pilots. These proposals are closely related to but not within the scope of the Final Rule (CGD 77-084) being published simultaneously with this notice.

Single copies of individual rulemaking proposals are available free of charge after their publication in the **Federal Register.** Requests for copies should be directed to the Marine Safety Council at the following address:

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

The Marine Safety Council Office is located in room 2110 at Coast Guard Headquarters, 2100 Second Street, S.W., Washington, D.C. and is open between the hours of 7:00 A.M. and 4:00 P.M. Monday through Friday. Comments and rulemaking proposals are available for inspection or copying during those hours. The following items are in clearance and are expected to be published in the **Federal Register** about the time the **Proceedings** is delivered. However, due to the many difficulties that can surface in clearance, some projects may not make publication in the projected time. If in doubt about any item's publication, call the Executive Secretary at the number listed above.

Index to the PROCEEDINGS Available

An alphabetical index to all articles appearing in the **Proceedings of the Marine Safety Council,** June 1981 to August 1984, is now available. Please call or write the **Proceedings** editor to request a copy.

The index was prepared by Captain Kirk Greiner, USCG (Ret.), a former Executive Secretary of the Marine Safety Council. Captain Greiner now manages Maritime and Environmental Consultants, a company which recommends independent consultants in any maritime discipline to companies needing specialized services. MEC is located at 3107 NE 160th Street, Ridgefield, WA 98642; tel.: (206) 574-1100.

CAUSTIC SODA

Formula: **NaOH**

Synonyms: sodium hydroxide, sodium hydrate, lye, soda lye, white caustic

Physical Properties	Solid	50% solution	73% solution
boiling point:	1390°C (2534°F)	142°C (288°F)	190°C (374°F)
freezing point:	318°C (604°F)	12°C (54°F)	62°C (144°F)
vapor pressure at 20°C (68°F):	0 mm Hg	10 mm Hg @ 56°C (133°F)	10 mm Hg @ 114°C (237°F)
Threshold Limit Values (TLV)			
time weighted average:	2 mg/m^3	none established for solutions	none established for solutions
short term exposure limit:	- mg/m^3		
Flammability Limits in Air	not flammable	not flammable	not flammable
Combustion Properties	not flammable	not flammable	not flammable
Densities			
liquid (water = 1):	2.13	1.53 @ 15.5°C (60°F)	1.70 @ 100°C (212°F)
vapor (air = 1):	not applicable	not applicable	not applicable
Identifiers			
U.N. Number:	1823	1824	1824
CHRIS Code:	SHD	CSS	CSS
Cargo Compatibility Group:		5 (Caustics)	5 (Caustics)

Terance Keenan was a third-class Cadet at the Coast Guard Academy when he wrote this article. It was written under the direction of LCDR Thomas J. Haas for a class on hazardous materials transportation. Technical assistance was provided by personnel in the Cargo and Hazards Branch at Coast Guard Headquarters.

Within the past decade, caustic soda, also known as sodium hydroxide, has gone from a virtually unwanted co-product to one of the most in-demand materials in the chemical industry. Caustic soda has been used since the first century when it was mixed with animal fats or vegetable oils to make soap. Centuries later, natural deposits of soda (sodium compounds) were discovered in North Africa, and eventually these deposits were mined and sent to Europe. In 1791, the Leblanc soda ash manufacturing process made soda products purer and more plentiful, but it was not until 1861 that the Solvay process made possible the manufacture of a superior grade of caustic soda. Today, a very pure form of caustic soda is produced by electrolysis. (Electrolysis is the process of passing an electric current through a solution to break compounds into separate elements.)

Anhydrous (dry, without water) caustic soda is a white, semitransparent solid with a fibrous, crystalline structure. It is neither explosive nor combustible, but it does react violently with acids and some chlorinated hydrocarbons. When added to water, caustic soda generates considerable heat; boiling and spattering may result.

Caustic soda, liquid or dry, is an extremely alkaline material which is very destructive to human tissue. When it comes in contact with the skin, it causes severe burns. Contact with the eyes can cause permanent damage unless the eyes are deluged with water within 10 seconds. Obtain medical attention as soon as possible. Signs of contact with caustic soda are not immediately evident, and injury may result before one realizes that contact with the chemical has been made. If caustic soda dust mist, or spray is inhaled, it can damage the lungs and respiratory tract. Depending on the amount of exposure, acute inflammation of the lungs could occur.

Any area of the body that comes in contact with caustic soda should be flushed with water for at least 15 minutes. Ingested caustic soda should be diluted by drinking large quantities of milk or water. DO NOT induce vomiting. Obtain medical attention as soon as possible. Workers should avoid contact with caustic soda by wearing protective clothing, including eye goggles; a face shield; a hard hat; and rubber-covered pants, jacket, gloves, and boots. Emergency showers and eye fountains should be installed wherever caustic soda is handled.

Caustic soda is a corrosive material. It attacks wool, leather, and metals, such as aluminum, tin, zinc, and alloys made of those metals; it is slowly corrosive to copper, iron, and nickel. It does not affect rubber.

About one-half of the 11 million tons of caustic soda produced in the United States each year is used in the chemical industry. Other uses include the production of rayon, soap, pulp and paper, petroleum products, textiles, and explosives. Metal descaling and battery processing also use caustic soda.

Caustic soda is transported as a liquid in tank vessels which are regulated by the U.S. Coast Guard. Caustic soda solution is usually shipped in tank vessels as a 50-percent solution, but there is also a 73-percent solution. There are different grades of solution, such as the rayon grade, which has fewer impurities than regular grade. These solutions may be shipped as heated cargoes to keep them liquid.

In many instances, the solutions carried by the barges are transferred to tank cars or tank trucks. The tanks cars are constructed of nickel-clad steel or lined with rubber and equipped with heating coils. Tank trucks with a typical capacity of 15,000 liters are made of stainless steel without insulation because they are loaded and unloaded within a few hours.

Caustic soda is also transported in its anhydrous (dry) form to industries not capable of handling liquid caustic; molten caustic soda is poured into drums and allowed to form a solid block. It can also be shipped as powder, flakes, or pellets in steel

drums. (Pellets can also be packed in bags.) All containers must conform to Department of Transportation (DOT) specifications and regulations concerning handling and labeling.

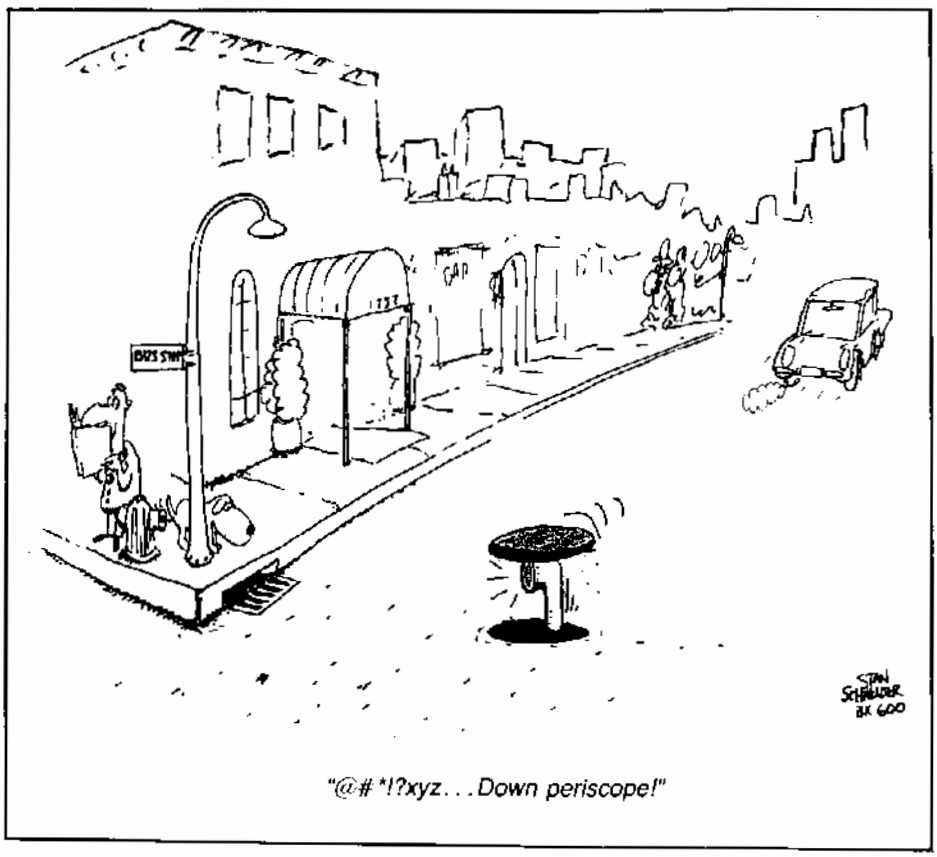
Stored drums of anhydrous caustic soda should be kept inside at a temperature above 18°C (64°F) and should be separated from materials that will react violently with it. Caustic soda solutions should be stored in steel or nickel-clad iron tanks and surrounded by a diked area capable of holding 125 percent of the tank's volume. Accidental spills of caustic soda can be soaked up with an absorbant, such as expanded clay. It can then be shoveled into drums and neutralized with acid.

Caustic soda is assigned the U.N. number 1823 for the solid and 1824 for the solution. It is regulated in the DOT regulations as a Corrosive material and in Subchapter O of the Coast Guard regulations for tank vessels. The International Maritime Organization (IMO) includes the solution in Chapter VI ("BCH")/17("IBC") Codes. The EPA regulations list solid caustic soda (sodium hydroxide) as a Catergory C pollutant, as does the IMO for the solutions. Caustic soda, as the solid, is found on page 8141 and as the solutions on page 8142 of the International Maritime Dangerous Goods (IMDG) Code and is classified by the IMO as Class 8, Corrosive. *

From the Editor

In each December issue of the ***Proceedings****, we include an annual index to all articles published in the magazine during the prior year. Due to the press of business, we were not able to compile the index in sufficient time for the December printing. However, look for the index to appear in the February 1985 issue of the* ***Proceedings****.*

Sharon Chapman



*"@# *!?xyz...Down periscope!"*

Explosion and Sinking of the Tankship POLING BROS. NO. 9

On February 26, 1982, at about 9:30 in the morning, the tankship POLING BROS. NO. 9 was proceeding southbound in the East River between Manhattan and Brooklyn, New York. Just after passing under the Williamsburg Bridge, a column of flame blew out of No. 3 starboard cargo tank forward of the pilot house. About 30 seconds later, a series of explosions occurred, which were of sufficient magnitude to hurl pieces of steel debris up onto the Williamsburg Bridge. The ship lost power and drifted over to the Brooklyn shore where it sank during firefighting operations. The ship was a total loss, and the hulk was removed as scrap in pieces. The chief engineer died from traumatic injuries received in one of the blasts while he was attempting to activate the CO_2 control in the compartment under the pilot house.

The POLING BROS. NO. 9 was a coastal tankship 251 feet long, 40 feet wide, 1,243 gross tons, diesel propelled, 1,600 horsepower, and built in 1934. It was extensively repaired in 1975, with the replacement of large portions of shell plating and internal structural members. Starting at the bow, the ship was divided into a forepeak tank, storage compartment, ballast tank, cargo tanks 1 through 7 port and starboard, bunker tank, engine room, and afterpeak tank. The pilot house was over No. 4 cargo tank, slightly forward of midship.

The POLING BROS. NO. 9 was in light condition at the time of the casualty. The last cargo consisted of three different grades of gasoline. An estimated 700 gallons of gasoline remained in the cargo piping and deep well pumps and 1 to 2 gallons in each of the cargo tanks. The crew indicated that the hatch covers for all cargo tanks were closed but not dogged. The flame screens for all ullage openings were in place, but the ullage covers were open. The master and the mate were unfamiliar with the provisions of 33 CFR 155.815 which requires that all closure mechanisms on expansion trunk hatches and ullage openings be properly secured while underway.

Shortly before the explosion, the ship was readying for the next cargo, which required the starboard cargo piping to be drained of the gasoline from the previous cargo. This was accomplished by opening valves and allowing gravity to drain the lines and deep well pumps into No. 7 port tank. The residue would then have been removed to the slop tank in No. 6 starboard by the hydraulic stripping pump located in No. 7 port. Two GM 8V 71 diesel engines were located on the main deck to drive the deep well pumps located in the after parts of No. 6 port and starboard tanks through intermediate clutch assemblies. These diesel engines also powered hydraulic drives used to power various equipment including the stripping pump located in No. 7 port tank. About 8 minutes before the first explosion, the chief engineer started the starboard diesel in preparation for using the hydraulic stripping pump in the No. 7 port tank. The stripping pump had not yet been engaged at the time of the explosion. The deep well pump had been disengaged after discharging the last cargo, and there was no apparent reason for the deep well pump to have been engaged during the stripping operation.

On the day of the casualty, major repairs were being performed on the Williamsburg

Bridge. Three crews were at work on the Manhattan side of the bridge under which the POLING BROS. NO. 9 passed, and a 2" x 2" mesh net was installed below the bridge to catch debris and protect the workmen. One of the crews was burning rivet heads off a structural member with an oxy-acetylene torch. The workman with the torch said he stopped burning when the POLING BROS. NO. 9 was about 200 feet north of the bridge. He watched the ship pass under the bridge about 100 feet away from him toward the Brooklyn side of the bridge, and he saw fire erupt from the 2' x 4' spill containment over No. 3 tank when the ship was about 100 feet south of the bridge. Moments later, the first explosion occurred. The burner's assistant had fire watch/safety observer duties in addition to construction duties. He was supposed to tell the burner to stop burning when a vessel was about to pass beneath them, but he had gone to the lavatory and was returning when the first explosion occurred. He saw large pieces of steel and other material from the POLING BROS. NO. 9 flying all around him, including a hatch cover that landed about 10 feet from him.

During the planning for this bridge repair project, the Coast Guard reviewed plans for the work and approved them subject to certain conditions which were stated in a letter in June 1981. The letter specifically prohibited the dumping or release of any material into the river or onto marine traffic and required the use of fine mesh nets to prevent even bolts and similar small items from accidentally falling. In spite of this, the Coast Guard received several reports of debris and hot slag falling from the bridge before the explosion. The Coast Guard notified the New York City Department of Transportation to prevent its contractor from continuing these dangerous practices. Coast Guard harbor patrols were alerted to keep a watch for material falling from the bridge. Ten days after the casualty, representatives of the Coast Guard, the City of New York which owned the bridge, and the construction company agreed to several measures designed to eliminate the potential hazard to shipping from debris or hot slag falling from the repair project. These measures included

- installing special fine mesh stainless steel netting and canvas dodgers on the bridge and work platforms,
- sounding an air horn by the fire watch to signal the cessation of operations when a vessel approached the bridge, and
- using whistle signals by vessels to signal their approach.

At the time of the casualty, the POLING BROS. NO. 9 was preparing to execute a port-to-port passing agreement with the loaded tank barge E-19, 230 feet and 1,278 gross tons, which was under tow by the tugs YANKEE and RED WING. When the fire first stared, the master of the POLING BROS. NO. 9 attempted to reach the engine controls to stop the ship, but he was knocked unconscious by an explosion. When he revived, the engines had stopped, probably because the mechanical throttle linkage was spring-loaded to the stop position in the event of failure. The tank barge flotilla passed safely, and the POLING BROS. NO. 9 drifted toward the Brooklyn shoreline. The master then tried to radio a "mayday," but all the raidos were dead. Next, he tried to activate the general alarm, but smoke and fire drove him from the pilot house to the main deck over No. 4 starboard. No. 4 tank was the only tank intact and not afire. He remained there until rescued.

The crew of the New York City Fireboat ARCHER, Marine Company No. 6, saw the explosion. Based nearby at Corlears Hook, the ARCHER responded immediately after notifying the Coast Guard. The 41-foot Coast Guard vessels CG-41411, and CG-41361 responded. The master of the POLING BROS. NO. 9 was rescued by the CG-41411 and the able seaman who had jumped over the side was rescued by the CG-41361. When the POLING BROS. NO. 9 drifted onto the Brooklyn shore, the other five survivors were rescued from the boat deck by

Ladder Company 104, a Brooklyn-based shore unit of the New York City Fire Department. Ladder Company 104 also located the chief engineer in the pilot house and removed him to the New York City Fireboat JOHN P. MCKEAN, Marine Company No. 1. The POLING BROS. NO. 9 sank about an hour after the first explosion during firefighting operations.

The cause of this casualty was that gasoline vapors ignited and spread first to No. 3 cargo tank, but the source of ignition could not be identified positively. The most probable ignition source is that

A piece of hot material large enough to tear a flame screen upon impact and hot enough to ignite the cargo tank contents fell from the Williamsburg Bridge into an ullage opening.

Evidence to support the hot material source begins with the testimony of a crew member aboard the tug YANKEE, but this was inconclusive. Calculations show that a particle of slag just 1/16th of an inch in diameter would cool enough (below 1,472°F) by the time it was about halfway to the water to cease glowing, but it would still be above the autoignition temperature of gasoline at the level of the ship deck (a 128-foot fall). A larger piece of material would retain more heat and, upon impact, could tear a flame screen in an ullage opening and ignite the contents of that cargo tank. Rivet heads large enough to do this were being burned off as part of the repairs.

Three other possible sources of ignition were investigated, as follows:

- A metal object falling from the bridge onto the deck generated an incendiary spark near gasoline vapors.
- Heat or a spark was generated inside the starboard deep well pump. (This assumes, contrary to testimony, that the pump was running and that the main discharge valve or the stripping valve was open to allow the flame front to pass.)
- A spark emitted from the stacks of the POLING BROS. NO. 9 or from the exhaust of the diesel engine running on deck ignited the vapors.

Regardless of the source of ignition, the undogged cargo hatches and open ullage covers were very significant contributing causes of the casualty. Had these fittings been properly secured at the conclusion of cargo discharge, a falling object would not have been able to penetrate a flame screen, the escape of flammable vapors on deck would have been minimized, and paths for ignition of the cargo tanks would have been eliminated. Additionally, the atmosphere in the cargo tanks would probably have been above the explosive range, i.e., too rich with gasoline vapor to explode.

This casualty indicated the danger of passing under a bridge on which unusual activities are taking place. The major repairs being performed made this particular bridge especially dangerous to pass under. If activities are noted which might endanger the vessel or its personnel when navigating under bridges, protective steps should be taken. *

Maritime Administration's Annual Report Released

In November 1984, the Maritime Administration published "MARAD '83," the agency's annual report for fiscal year 1983.

The agency also released an updated issue of "MARAD Publications," a 62-page catalog which lists reports and studies released in 1983 and the first seven months of 1984. The catalog also lists those MARAD publications released in prior years which are still available to the public.

Copies of the annual report and the new catalog are available from MARAD's Office of External Affairs, Room 7219, 400 7th Street, S.W., Washington, DC 20590.

Nautical Queries

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

ENGINEER

1. Which statement is true concerning journal bearing oil grooves?

A. They should run parallel to the crankshaft.
B. The groove initiates bearing movement around the journal.
C. They help to distribute oil over the bearing length.
D. The outer edge of the groove must be squared off.

Reference: Maleev, Diesel Engine Operation and Maintenance

2. Compared to four-stroke cycle engines, two-stroke cycle engines have the disadvantage of

A. less even torque.
B. higher cylinder head temperatures.
C. fewer power strokes per revolution.
D. greater weight/size requirements.

Reference: Maleev, Diesel Engine Operation and Maintenance

3. The purpose of a contaminated water evaporator is to

A. distill water from a harbor.
B. ensure heating coil drains from fuel tanks do not contaminate feedwater.
C. distill makeup feed for use as potable water.
D. ensure an uncontaminated source of feed for the makeup evaporator.

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

4. The distance a propeller would advance in one revolution if the water were solid is the

A. blade thickness fraction.
B. mean width ratio.
C. pitch.
D. skew back factor.

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I

5. Labyrinth seals, used to reduce leakage around a turbine shaft, are constructed of

A. spring bound carbon segments.
B. braided asbestos covered core segments.
C. staged rubber composition seal stripping.
D. machined packing strips or fins.

Reference: Harrington, Marine Engineering

DECK

1. If you are operating in restricted visibility and hear a signal of a rapidly ringing bell followed by the rapid sounding of a gong, it could be

A. a 30-meter, power-driven vessel at anchor.
B. A 150-meter, power-driven vessel aground.
C. a vessel in distress.
D. a 300-meter, power-driven vessel at anchor.

Reference: COMDINST. M16672.2

2. The range of tide is the

A. distance the tide moves out from the shore.
B. duration of time between high and low tide.
C. difference between the heights of high and low tide.
D. maximum depth of the water at high tide.

Reference: Bowditch, American Practical Navigator, Vol. I

3. What type of cargo venting is required for cargo tanks in which Grade B petroleum products are carried?

I. Branch vent lines from each cargo tank connected to a vent header.
II. Individual pressure-vacuum relief valves at each cargo tank.
III. Gooseneck vents and flame screens at each cargo tank.

A. I and II only
B. I and III only
C. II and III only
D. I, II, and III

Reference: 46 CFR 32.55-20(c)

4. What is the most important characteristic of the extinguishing agent in fighting a class "C" fire?

A. The weight of the extinguishing agent.
B. The temperature of the extinguishing agent.
C. The electrical conductivity of the extinguishing agent.
D. The cost of the extinguishing agent.

Reference: MTAB Firefighting Manual

5. The best treatment for a serious wound is

A. tourniquet use.
B. applying pressure to the pressure point near the wound.
C. cold ice packs.
D. direct pressure and elevation for the wound.

Reference: Red Cross First Aid Manual, 1982

ANSWERS

ENGINEER
1-C; 2-B; 3-B; 4-C; 5-D

DECK
1-D; 2-C; 3-A; 4-C; 5-D

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

Correction

Please note that "Nautical Queries" in the November issue contained several typographical errors. Our apologies to the Coast Guard Institute, Oklahoma City, and to our readers. The correct material is printed below:

ENGINEER
(p. 261)

4. Which operational precaution(s) is (are) necessary before you blow tubes?

A. Increased forced draft fan speed.
B. Open all drains in soot blower steam supply piping.
C. Thoroughly warm all soot blower steam supply piping.
D. All of the above.

Reference: Osbourne, Modern Marine Engineer's Manual, Vol. I.

The correct answer is D.

DECK
(pp. 261-262)

3. Which of the following conditions may cause a combustible gas indicator to give false readings?

I. Inert gas in the air sample.
II. Low oxygen content in the air sample.
III. Sampled air containing vapor concentrations greater than the lower flammable limit.

A. I or II
B. II only
C. II or III
D. I, II, or III

Reference: Page & Gardner, Petroleum Tankship Safety.

The correct answer is D.

Maritime Licensing, Certification, and Training

If you hold a valid Coast Guard license as an officer or operator, the Coast Guard's Licensing Information System (LIS) has your number! In 1981, the Merchant Vessel Personnel Division at Coast Guard Headquarters, Washington, DC, began storing vital licensing transaction records on an Inforex 5000 computer. Before the computer was installed, each transaction, recorded on a 3" x 5" card, was filed by hand; retrieval involved thumbing through the card files and manually removing the one needed. Because this operation required so much manpower and space, it was a system which begged for more efficient management.

Entering Data

As part of their daily routine, two Coast Guard yeomen key in to the computer each and every license transaction card received from the Coast Guard's Regional Examination Centers. All of the information contained on the cards is meticulously entered on the desktop terminals; the yeomen see the data displayed in the trademark green glow of the cathode ray tubes (CRTs) as they enter data. The cumbersome card files, tediously kept for years, will be phased out. At that time, all of the Coast Guard's records will be stored in the memory of the LIS. By 1988, all of the cards made obsolete by the LIS will be forwarded to the Federal Records Center for storage.

This transition to a paperless filing system dramatically decreases the amount of space and time the Coast Guard needs to use and maintain the voluminous files it is required to keep by law. Specifically, Title 46 of the U.S. Code, Section 7502 states:

The Secretary shall maintain records on the issuances, denials, suspensions, and revocations of licenses, certificates of registry, merchant mariner's documents, and endorsements on those licenses, certificates, and documents.

Consequently, a seaman's license record contains the name, social security number, and date of birth of the license holder; the port in which the license was issued; the type(s) of license(s) held and issue number(s); vessel tonnage or horsepower; route restrictions, if any; and mode of propulsion, if applicable. Examination failures are noted, as are any actions against one's license involving suspension and revocation proceedings (R.S. 4450).

Part of another law regarding seamen's records (46 U.S.C. 7319) states that the records are not open to general or public inspection. The Privacy Act and the Freedom of Information Act established guidelines for handling public inquiries and inspections. Requests for information contained in a seaman's file are usually in the form of an appropriate letter signed by an employer, the individual license holder, or by the next of kin. Historical records, old licenses, etc., are secured in this manner.

In the future, the computer will enable the Coast Guard to look at whole groups of license holders in ways which could not be done manually. Through electronic data processing (EDP), we will conduct statistical analyses to determine the nature of licensing activity, focusing on individual ports or all ports, and on certain age groups, types of licenses, etc.

As the Coast Guard incorporates more sophisticated software into the system, the preparation of the annual licensing statistics (usually published in the May issue of the Proceedings) will be much simpler, and certainly the statistics themselves will be more accurate.

But most important, the Coast Guard will have access to the kinds of information which can help improve service to the seafaring public. We hope this will eventually translate into a real improvement in marine safety. *

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United States
Coast Guard

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United States
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