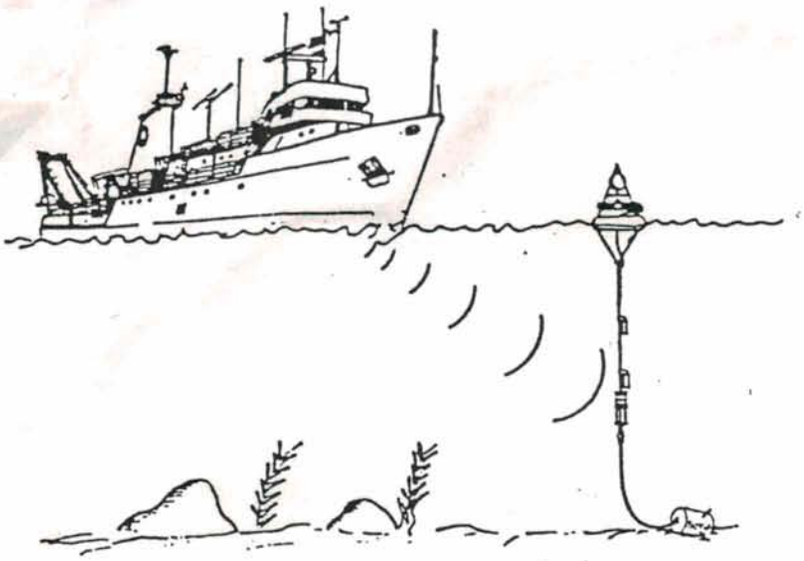

University-National Oceanographic Laboratory System

RESEARCH VESSEL OPERATORS COMMITTEE NEWSLETTER

30 July 1991
Volume 16, No. 2

EDITOR'S NOTE

Happy Summer!! Hope your weather hasn't been as hot and dry as it has been here in our area so far this summer.

This Newsletter is the second of two planned for 1991. Among other things, it contains information pertaining to the Annual Meeting in September.

The RVOC Operator's Directory has been included with the Newsletter (in the Clipping section) for several years. It provides the name, phone, fax and telemail box for all marine operations contacts, on a single page. I find it very useful. If the information listed for your institution is incorrect, or if you know in advance that it is going to change, please let me or Jim know.

Stay Cool.....Bruce Cornwall

ANNUAL RVOC MEETING

The RVOC 1991 Annual Meeting will be hosted by the Institute of Ocean Science (IOS), Sidney, B.C., Canada. Meeting dates are September 10-12, 1991.

By now you should have requested that accommodations be made for you by IOS if you plan to stay at the Empress Hotel in Victoria, which is the hotel of choice for attendees. If you haven't, and still plan to attend the meeting, you will be responsible for making your own hotel accommodations in Victoria.

Dale Gibb is in the process of working out the final details of the planned social activities. This information will be sent in a separate mailing.

AGENDA

RESEARCH VESSEL OPERATOR'S COMMITTEE
1991 ANNUAL MEETING
INSTITUTE OF OCEAN SCIENCES

0830 TUESDAY, 10 SEPTEMBER 1991

REGISTRATION AND COFFEE

WELCOMING REMARKS

Introduction
- Dale Gibb, Chief, Marine Division
- ???, Senior Director, IOS
- Jim Williams, Chairman, RVOC

OLD BUSINESS

- Minutes of the 1990 Meeting - Jim Williams
- RVOC Newsletter - Bruce Cornwall
- Wire Update - Don Moller
- Federal Register Monitor - Jack Bash
- Shipboard Diving Safety: Recommendations
- Alcohol/Drug Testing: One Year Later

NEW BUSINESS

- Manning Levels - Bill Jeffers
- Salary Survey - Bill Coste
- Safety Committee Report - Mike Prince
- Insurance - Dennis Nixon

AGENCY REPORTS

- National Science Foundation - Dolly Dieter
- Oceanographer of the Navy - Patrick Dennis
- Office of Naval Research - June Keller
- UNOLS - Jack Bash

SPECIAL REPORTS

- IOS Ship Operations - Dale Gibb
- KNORR/MELVILLE - ??
- OCEANUS Class Mid-life Refit - ??
- RIDGELY WARFIELD - Bruce Cornwall
- THOMAS G. THOMPSON - Bill Jeffers
- VICKERS - Don Newman
- DISCOVERY - NERC Representative

0830 WEDNESDAY, 11 SEPTEMBER 1991

INVITED SPEAKERS

- Telecommunications Systems and Related Equipment for the 90's; GMDSS — Joe Hersey, USCG Headquarters

- Report of Results of NSF/MARAD Material Condition Reviews of Research Vessels, 1982-91 — Sam Applegarth, ABSTECH

- Science Information Systems, Data Gathering, SAIL — Rich Findley, U. Miami

SAFETY SEMINAR

- UNOLS Research Vessel Safety Standards - Mike Prince

WORKSHOPS

- Hazardous Materials, Prevention of Shipboard Pollution - Mike Prince & Bruce Cornwall

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0830 THURSDAY, 12 SEPTEMBER 1991

ROUND TABLE DISCUSSION

- Marine Superintendents Will Select and Discuss Topics of Mutual Interest

BUSISNESS MEETING

- Election of Vice Chariman
- Suggestions for the 1992 Annual Meeting Agenda
- Selection of the 1992 Annual Meeting Location

SALARY SURVEY

Bill Coste has been tasked with doing another Salary Survey for shipboard employees. The questionnaires have been mailed. If you have yours, please respond as soon as possible, but no later than 9 August. If you haven't received this questionnaire, please contact Bill's office at (808) 847-2661 and ask that one be mailed. Your participation is appreciated. Many of us found the results from the 1987 survey quite useful in either defending present pay scales or supporting pay increases. The results will be discussed and distributed in September.

THE FOLLOWING PAGES OF THE NEWSLETTER ARE DEVOTED TO CLIPPINGS, FORMS, AND OTHER INFORMATION THAT MIGHT BE OF INTEREST

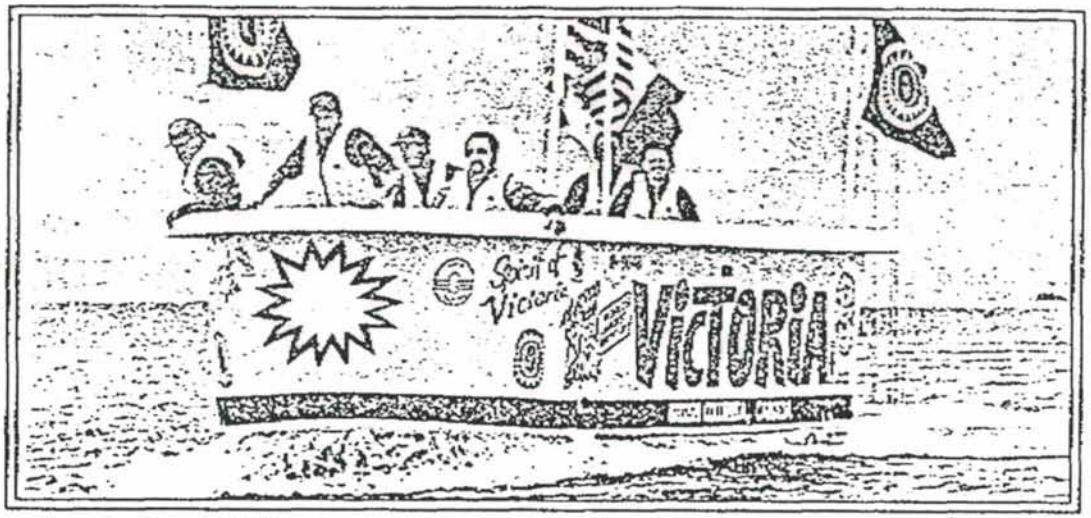
RVOC OPERATORS DIRECTORY

NAME	INSTITUTION	TEL. NO.	FAX NO.	TELEMAIL
Gene Allmendinger	UNH	(603)862-2997	----	---------
Tim Askew	Harbor Branch	(407)465-2400	(407)465-2446	HBOI.SHIPS
Harry Barnes	Bermuda, BBS	(809)297-1880	(809)297-8143	BDA.BIOSTATION
Bruce Cornwall	CBI	(301)867-7550	(301)269-5785	CHESAPEAKE.BAY
Bill Coste	HIG	(808)847-2661	(808)848-5451	UH.SNUG.HARBOR
Dick Dimmock	WHOI	(508)548-1400	(508)540-8675	WHOI.SHIPS
Don Gibson	U of Texas	(512)749-6735	(512)749-6777	T.WHITLEDGE
Linda Goad	U of Michigan	(313)763-5393	(313)747-2748	T.MOORE
Bill Hahn	U of RI	(401)792-6203	(401)792-6574	RHODE.ISLAND
Ron Hutchinson	U of Miami	(305)361-4880	(305)361-0546	U.MIAMI.SHIPS
Bill Jeffers	U of WA	(206)543-5062	(206)543-6073	K.JEFFERS
Dean Letzring	Texas A&M	(409)740-4469	(409)740-4456	RV.GYRE
Paul Ljunggren	Lamont	(914)359-2900	(914)359-6817	LAMONT
Lee Knight	Skidaway	(912)598-2486	(912)598-2751	D.MENZEL
Quentin Lewis	Duke	(919)728-2111	(919)728-2154	DUKE.UNC
Don Newman	USC	(213)830-4570	(213)830-6328	R.PIPER
Waddy Owen	U of Delaware	(302)645-4320	(302)645-4006	W.OWEN
Ken Palfrey	OSU	(503)867-0224	(503)867-0294	OSU.SHIPS
Mike Prince	Moss Landing	(408)633-3534	(408)633-4580	MLML.SHIPS
Steve Rabalais	LUMCON	(504)851-2800	(504)851-2874	LUMCON
Tom Smith	U of Alaska	(907)224-5261	(907)224-3392	T.SMITH
Jim Williams	SIO, UCSD	(619)534-1643	(619)534-1635	SCRIPPS.MARFAC

How to get to Victoria if your bathtub doesn't have an outboard.

Victoria on Vancouver Island, is one of those magic places you'll want to get to any way you can.

It's an historic, gracious city full of century-old character and charm, Victorian homes (of course) and window boxes overflowing with flowers.



Best of all, it's easy to get to Vancouver Island without getting wet. Here are a number of options from four locations in Washington and British Columbia.

Option #1: B.C. Ferries, which operates a modern fleet of 38 vehicle-carrying ferries, has a handy port just south of Vancouver, in Tsawwassen, B.C. (2 hours north of Seattle on I-5. Look for the signs after you cross the border. The fare is about $21 U.S. for car and driver.) After a beautiful, relaxing 90-minute ferry ride you'll dock at Swartz Bay just outside Victoria

During the summer, B.C. Ferries sail 36 times a day (5:30 a.m. to 11:00 p.m.) seven days a week. For times call (604) 669-1211.

Super, Natural British Columbia
CANADA

Option #2: You can depart for Nanaimo from the same terminal in Tsawwassen. After a scenic two-hour ride on the Mid-Island Express enjoy a leisurely drive down the island to Victoria.

Option #3: Drive onto one of the Washington State Ferries, which depart twice a day from Anacortes, and sail to Sidney on Vancouver Island. For times call (206) 464-6400 in Seattle or (800) 542-7052 state-wide.

Option #4: The Blackball Ferry carries passengers and vehicles from Port Angeles right to Victoria. Four sailings a day during the summer. For times call (206) 457-4491 in Port Angeles or (206) 622-2222 in Seattle.

Option #5: If you're travelling without the car, you may prefer the Victoria Rapid Transit passenger ferry, which departs out of Port Angeles for Victoria. Call (800) 663 1589 for schedules.

Option #6: The Victoria Clipper, another passenger-only ferry, departs from Seattle for Victoria three times daily and is perhaps the most convenient from Seattle. For times call (206) 888-2535. All in all, there are over 45 sailings a day to Vancouver Island during summer, starting as early as 5:30 a.m. and continuing through until midnight.

Option #7: For those who'd rather fly, Lake Union Air offers four 40 minute flights a day from downtown Seattle to Victoria's Inner Harbour. Reservations can be made on 1-800-826-1890 or (206) 284-0300. Air B.C. and Horizon Air also offer airlinks to Vancouver Island.

Now that you know how easy it is to get to Victoria and Vancouver Island, there's nothing stopping you. So gather your friends and family, board a ferry and sit back and relax. The ferry journey's most enjoyable.

And considerably easier than trying to fit everyone in the bathtub.

Victoria. One of the great cities of the western world. For accommodation and information call (604) 382-1131 or write to Tourism Victoria, 6th Floor, 612 View Street, Victoria, British Columbia, V8W 1J5. For information on travel throughout British Columbia, call 1-800-663-6000.

VICTORIA
ONE OF THE GREAT CITIES OF THE WESTERN WORLD.

FROM:OCEAN-ADMIN TO: 3012695785 JUN 4, 1991 2:30PM #550 P.02

Smaller Crews Improve Ship Safety Records

Three years ago, the United States Coast Guard requested the National Research Council to assess the possible effects on ship safety brought about by the reduction of crew sizes over the past twenty years.

The results of the study have been published, and they are surprising in that they seem to run counter to "conventional wisdom", at least as reported by a recent American Bureau of Shipping Activity Report.

"There has been a measurable and substantial improvement in the rate of both vessel casualties (accidents) and personnel injuries during the past twenty years," it says in Chapter 2 of the study, Safety Experience with smaller crews.

"More specifically, there has been a declining rate of vessel casualties, a declining rate of vessel losses as a result of accidents, and a declining rate of personnel injuries."

The National Research Council claims the improvements measured in their study are "consistent whether one considers statistics published by the International Maritime Organization (IMO) of the United Nations, by Lloyd's Casualty Reports, by the Marine Index Bureau, or by the United States Coast Guard."

In addition, it was noted that during the same 20-year period, other factors also changed, as the average crew size of US and other fleets declined. For example, technology has improved, operating procedures have been refined, and the scrutiny of maritime operations by government and industry agencies has increased. However, the safety data available from various worldwide sources are not sufficiently detailed to correlate vessel casualties and personnel injuries with crew size.

The National Research Council also discovered that the number of reported oil spills, from tankers and barges, has shown a decreasing trend, since 1975, but the volume of spills has remained about the same.

ABS has excerpted relevant sections of the study and they are available in a booklet titled "Safety Record of Ships Over A Twenty-Year Period" from the Publications Department of ABS. The full publication is available from the National Research Council.

Supreme Court defines "seaman"

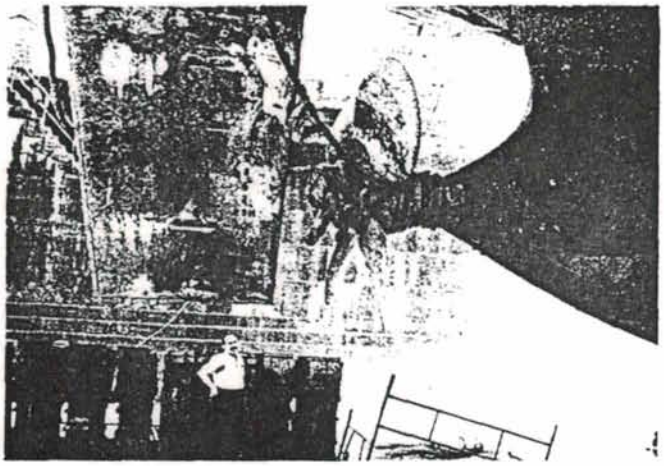
The Supreme Court allowed a wide definition of "seaman" in an appeals decision on McDermott International Inc. vs. Willander. McDermott sought a narrow definition of the term under the Jones Act, but the Supreme Court included welders, painters, pipefitters and other offshore workers under the word. "All who work at sea in the service of a ship face those particular perils to which the protection of maritime law is protected," said Justice Sandra Day O'Connor, who wrote the unanimous decision. These types of workers normally fall under the definition of harbor workers. In this case, the injured party was working on an offshore oil rig.

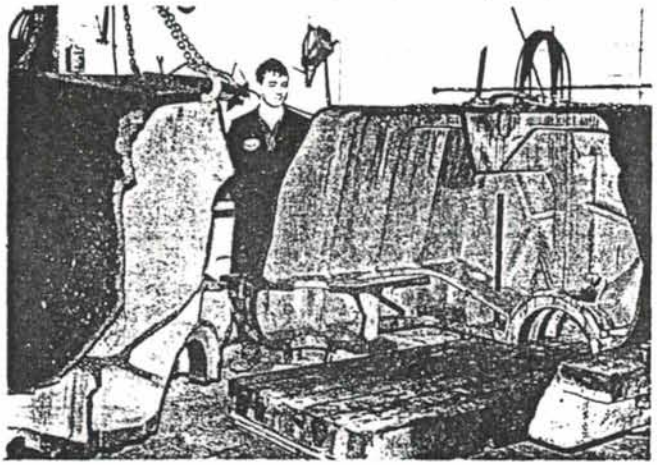
Major gearbox repair by Technistitch

A rope wrapped around the propeller of the Algerian gas tanker *Barouda* during a berthing manoeuvre last year in Naples caused a major engineering problem for SMTM Hyproc, owner of the 8,078dwt vessel – the reaction of the fouled rope shattered the propulsion gearbox casing. Since the capital cost and waiting time for a new box were prohibitive, the owner arranged for the tanker to be towed to Malta Drydocks where the gearbox was dismantled and transported to England. Here, engineers from Technistitch, of Coalville, repaired the casing in 50 days with the assistance of subcontractor Wyko Power Plant Gears, a specialist in refurbishing gears and boxes.

The cast iron sump, split in two by the force of the accident, was invisibly welded using Technistitch's unique repair system, and the damaged internal ribs were replaced and metal-stitched. After this, the upper gearbox thrust housing, decapitated by pressure, was also welded and re-stitched.

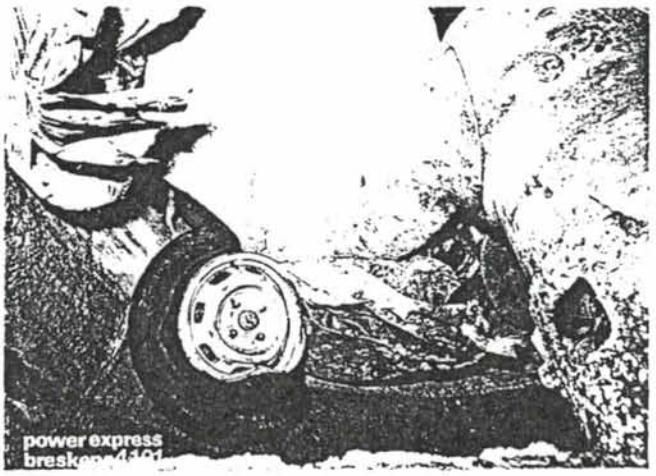
At Wyko's plant at Netherton, Dudley, the repaired gearbox was re-machined, assembled and test run in accordance with the original manufacturer's specification; it was then returned to Malta for re-fitting into *Barouda*. Sea trials, carried out in poor weather conditions, included a crash stop, and the classification society accepted the repair as permanent.





Above left: Algerian gas tanker Barouda *immobilised in dry dock in Naples, due to the entangling of a rope around its propeller during a berthing manoeuvre. Above right:* Barouda's *gearbox housing (which was broken in two due to the accident) awaiting casting repair at Technistitch.*

The remains of a car, jammed between the propeller blades and nozzle of anchor-handling tug, Power Express, *which occurred while the vessel was manoeuvring near Beverwijk in The Netherlands.*



Car stuck in propeller

ONE of the more extraordinary tales of modern shiprepairing must be that told by the Vlaardingen Oost repair yard at Rotterdam. At the very beginning of 1991, the captain of the anchor-handling tug *Power Express* noted when manoeuvring near the offshore base at Beverwijk in The Netherlands that the port propeller was not working properly and soon afterwards stopped, appearing to be jammed.

The most common cause of such problems is, of course, wire or rope fouling the shaft and/or blades; however, the diver sent down to cure the jam reported, on returning to the surface, that a car was stuck between the propeller blades and the nozzle. Needless to say, he received some strange looks from disbelieving staff.

Power Express sailed to Rotterdam on her starboard engine only, and, as the floating dock at Vlaardingen Oost later lifted the hull clear of the water, amazed shipyard and owner's staff were able to confirm that the remains of a dark blue metallic Toyota saloon, complete with perfect tyres, was indeed jammed in the nozzle! After the wreck had been removed and the propeller and nozzle repaired, *Power Express* was able to return to duty.

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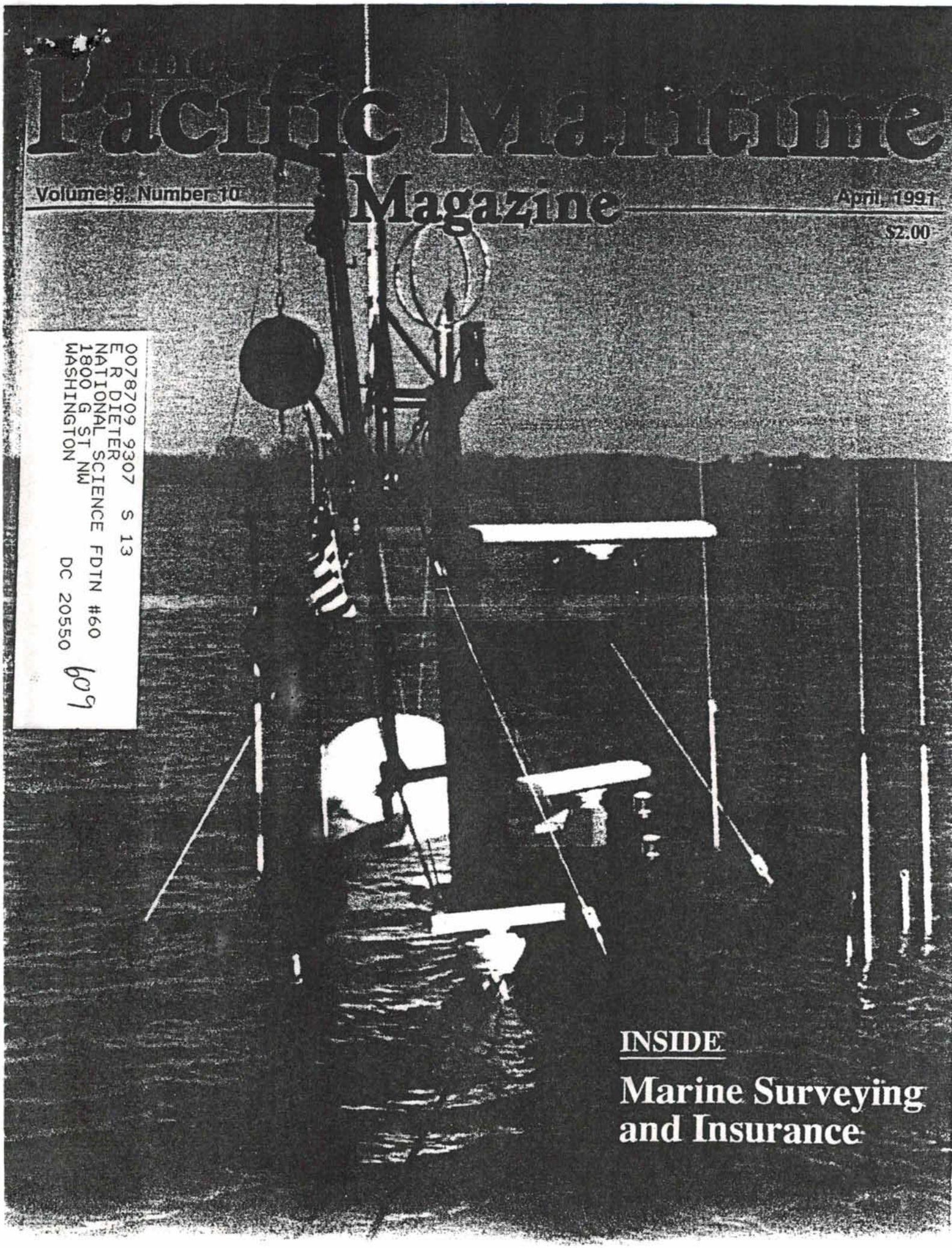


INSIDE

Marine Surveying and Insurance

Marine Surveying and Insurance

Vital segments of maritime commerce, survey firms and insurance agencies work together to protect shippers and carriers alike.

A simplistic way to look at the contract of insurance is to liken it to a bet. The *insurer* or *underwriter*, who may be a firm, an individual or group of individuals, bets the amount of the insurance coverage that no covered losses will be sustained during the policy period. The *insured* or *assured* bets the premium amount that a covered loss will be sustained, in which case the insurer will have to pay out much more than the insured paid in premiums.

The insurer wants to win the bet, keeping the premium without having to pay out anything. The insured is not interested in winning the bet by sustaining a loss, even if it is eventually covered.

No insurance coverage ever completely pays for the time, trouble, and disruption attendant to a loss, even if the insurable financial portions are completely covered, and, anyway, there is usually a deductible. The insured makes the bet with the insurer on a "just in case" basis: some recovery is better than no recovery, and a predictable premium amount is better than an unpredictable and perhaps disastrous loss.

If the odds of loss are low, so are the premiums. The lowest possible risk occurs when nobody does anything, but that is not a viable business proposition.

This is where risk managers like Foss Maritime Company's Dean Hunter come in.

Hunter's job includes buying all of the firm's insurance, overseeing claims administration and claims handling, in conjunction with brokers, and responsibility for loss control and safety procedures. When a loss occurs, Hunter investigates the cause, and, if it is something that can be corrected or prevented in the future, makes sure that it is done. He also analyzes the company's claims history so that special efforts can be given to improving the firm's safety record in those areas, and he develops and manages safety incentive programs.

Hunter has spent many years dealing with marine insurance as an underwriter and broker. Now, as risk manager, he plays the role of professional insurance customer working within a large firm. The things that Hunter does to improve his company's safety record also reduce its claims and, consequently, its insurance premiums. All of these things can, and should, be done by owners, operators and managers of firms which do not require a full-time risk manager. It takes time and trouble, but it isn't onerous. Hunter says his job is "fun".

Brokers like John Carroll and John Baynes, of The Unity Group, make the connections between the customers and the underwriters. An insurance broker differs from an insurance agent, Carroll says, because an agent represents only one insurance company, whereas a broker has access to the insurance services of many companies, and can place the customer's coverage with the company, or combination of companies, that will give the customer the best coverage at the best price.

In a marine insurance context, the term "agent" usually means someone who works for the insurer—Lloyd's, for example, maintains agents all over the world for claims purposes—while the broker most often acts as the representative of the insured, and is, thus, the insured's legal "agent". Under agency law, the broker can be the legal agent of the insured, or the insurer, of both, or of neither. This can get confusing, particularly in the claims process.

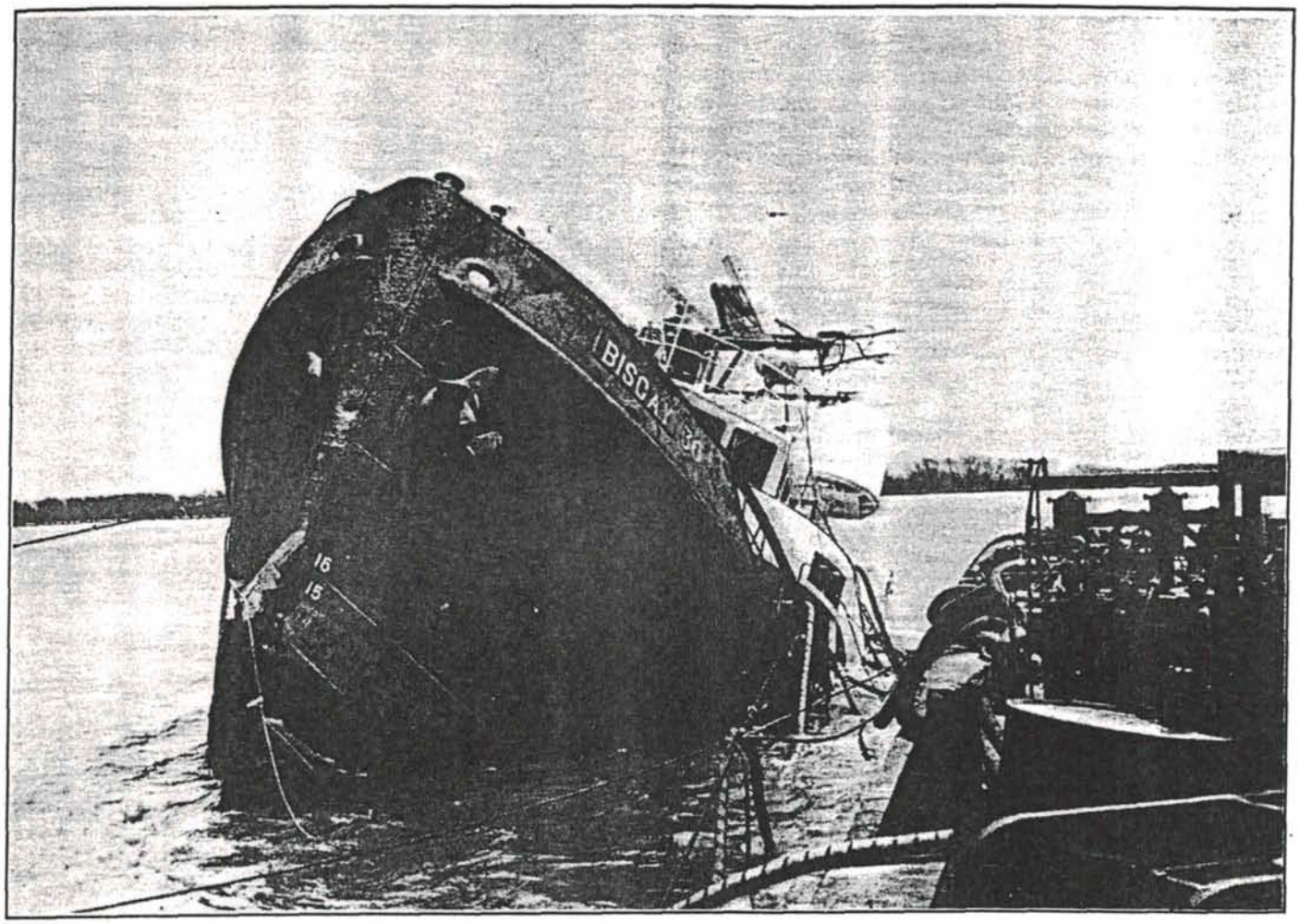
Marine policies, like most insurance policies, require the insured to notify the insurer promptly when a loss occurs. The usual practice is for the insured to notify the broker who, acting as the insured's agent, then notifies the insurer's representative, or agent, on behalf of the insured.

Brokers assist their customers with applications, in determining the kind of coverage the customer needs, and will do their best to review and explain policy coverage and exclusions, and, when and if the need arises, help in the claims process.

The Policies

The marine insurance consumer tends

By Claire Youmans



to be more sophisticated than the average business-insurance customer. The number of losses a marine consumer experiences over time is probably higher than that experienced by shoreside businesses, and insurance considerations are a routine factor in maritime commercial life. Marine insurance is usually customized to the specific needs of the consumer, but this lack of standardization, coupled with the many different kinds of available coverage, creates pitfalls. There are also significant differences between marine insurance and other kinds of insurance, which arise because of the subject matter and history of marine insurance, its international character, and its links to maritime law.

Shipowner's Insurance Hull and Machinery

Hull and Machinery Insurance is the basic coverage a shipowner buys to insure his interest in the vessel. Two basic forms of policy predominate, worldwide: the Hull Institute Time Clauses (English) and the American Hull Institute Clauses (American). Both forms are available in the United States. These policies generally cover damages for a total or constructive total loss of the vessel and its equipment, due to perils of the sea, fire, lightning, earthquake, volcanic action, some kinds of nuclear accidents, violent theft by persons outside the vessel, and other causes as stated in the policy. Although these enumerated risks, in the perils clause of a policy may appear to cover everything, in practice this is not correct. Other policy language often eliminates coverage for specific risks, or all risks occuring under specific circumstances.

Secondary perils are covered under what is known as an "Inchmaree" clause, named after the vessel *Inchmaree*, which was found to have no coverage, under the basic perils insurance for damage caused by a broken shaft.

A typical Inchmaree clause will name, as covered-perils, accidents in bunkering, loading, discharging or handling cargo, while the vessel is in drydock or similar structures, explosions, mechanical breakdowns, and damages resulting from latent defects in the machinery or hull, but not the repair or replacement of the defective part. Inchmaree clauses can also cover casualties resulting from contact with aircraft or land conveyances, or things falling from them, and damages caused by the negligence of masters, officers, pilots or crew, provided that the shipowners or the insured parties are not personally negligent.

Biscay 30 tripped on her own tow line, which cut this hole in her bow and sent her to the bottom of the Missippi, just outside of New Orleans.

A separate clause covers losses caused by governments which damage or destroy a vessel as a pollution hazard, provided the owners are not negligent. For the purpose of these clauses, crew members are not considered "owners", simply because they may own shares in the vessel, or in the company which owns the vessel.

Collision coverage, to pay for the damage to another vessel or vessels in-

A Brief History of Marine Insurance

By Debra R. Rake
St. Paul Fire and Marine Insurance Company

Marine insurance is the oldest known form of insurance. Although vague in origin, evidence exists that "general average", a well-known marine-insurance term, was provided for and described by Rhodian Law around 900 BC.

The first statute of the English Parliament relating to marine insurance was enacted in 1601, and read, in part:

"...And whereas it has been tyme out of mynde an usage amongste merchantes...when they make any great adventure...to give some consideracion of money to other persons...to have from them assurance made of their goodes, merchandizes, ships and things adventured,...at suche rates and in suche sorte as the parties assurers and the parties assured can agree, which course of dealings is commonlie termed a policie of assurance..."

Commercial insurances are largely written on forms that have changed little since the 18th century. The now-archaic wording of marine policies has met with persistent legal criticism. Such forms have been described as "an absurd and incoherent instrument,"... "so prolix, diffuse and confused that it is a mystery how business can be conducted with such a verbal mishmash," and "like a woman, 'fearfully wondrously wrought'".

Much of the phraseology in marine policies is derived from usage over the years, originating primarily from the Lloyds policy form. In many instances, litigation has clarified the policy so that wording is then retained in later policies. Despite modern criticism, the substantial body of case law interpreting the terms prevents existing forms from being significantly altered.

volved, is provided, up to 75 percent of the insured value in English form policies, and up to the full insured value in American policies. The insured value is established either by agreement, or by a Condition and Value Survey, made at the time the insurance is procured.

Generally, only someone who has an interest in a vessel can get insurance on the vessel. This "insurable interest" requirement no longer exists, and is sometimes even illegal, with respect to many other kinds of insurance, but persists in marine insurance law. The concept of insurable interest is complex, and insurance is available for additional amounts, or to other parties, on a "Policy Proof of Interest" (PPI) or "Full Interest Admitted" (FIA) basis. Such policies have no legal standing, although they are regularly written and paid as a matter of honor. The coverage is most often used to cover items of a shipowner's damages which are not easy to value or to prove, such as disbursements, lost profits and commissions, and are sometimes known as "increased value" insurance policies. They are permitted by most Hull and Machinery policies, to the extent the risks are enumerated therein.

PPI or FIA insurance, which does not cover any specific risk or interest is limited by Hull and Policy terms to a portion of

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the total value insured, generally 25 percent, a limitation designed to prevent unscrupulous people from insuring themselves excessively, then creating a loss.

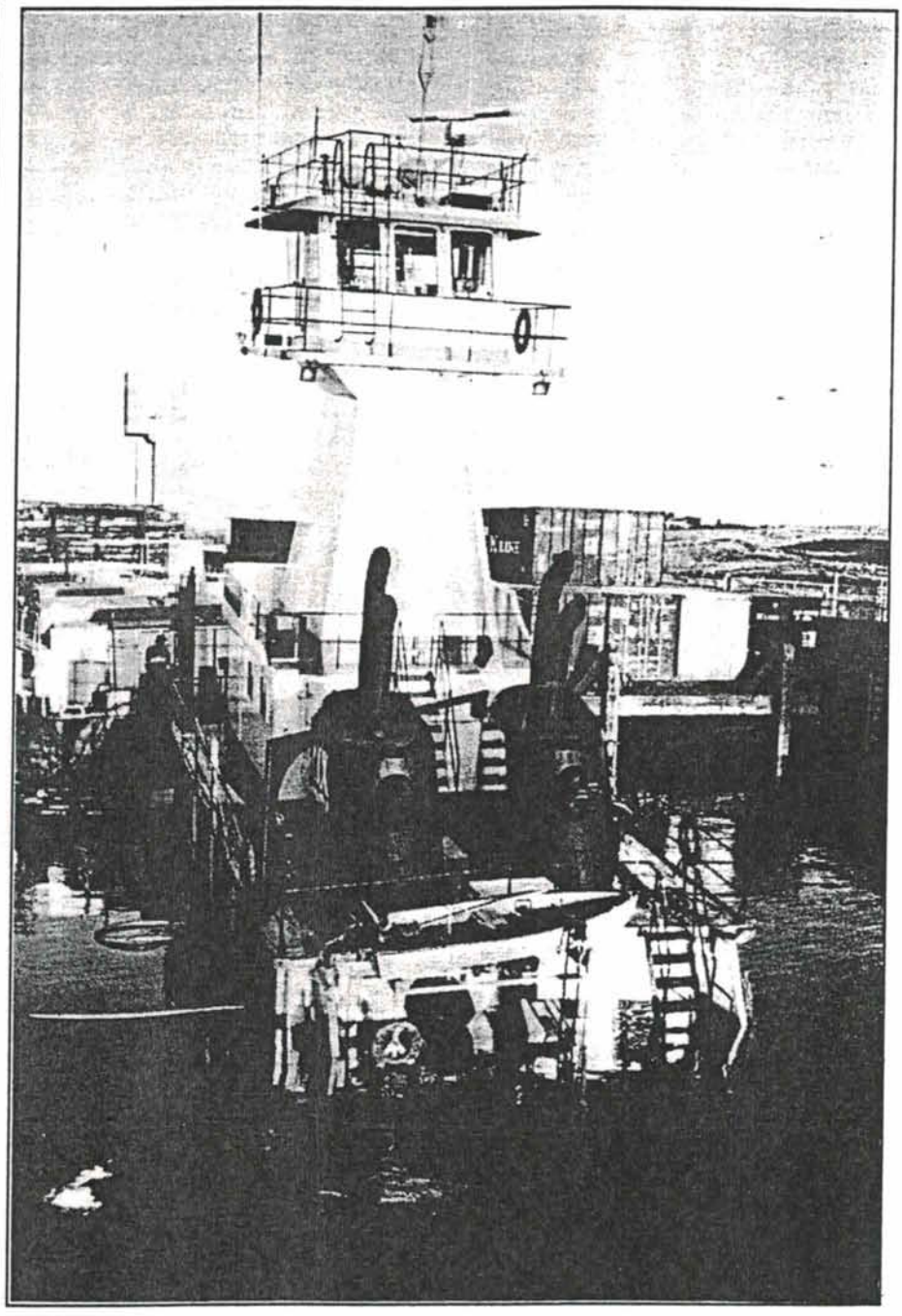
Most policies are written on a "time" basis, usually one year. Because of the confusion and litigation concerning which insurer must pay for what portion of a claim, if coverage changes while a vessel is in the midst of a voyage, it is considered prudent to keep an outdated policy in force until the end of a voyage. The extension is allowed under the terms of a "continuation clause", but additional premiums must be paid.

Coverage is also available on a "voyage" basis; voyage coverage is usually obtained when a vessel is operated under a demise (or bareboat) charter.

Hull and Machinery policies also cover partial losses to the vessel. The amounts covered in Particular Average are usually either the reasonable cost of repairs, if the repairs have been performed, or the lesser of the estimated cost of repair, or the decrease in the vessel's insured value (English), or market value (American), if unrepaired. Assessment of damage and cost of repair is normally determined by survey, and actual repair bills are submitted to the insurer. Particular Average claims also include ancillary shipyard or drydock charges. Some, or all, of the ancillary charges and other expenses incurred, may be divisible as General Average expenses among all the affected interests. This is done by an Average Adjuster.

General Average and salvage expenses attributable to the vessel are, in most cases, covered. Overtime, riding repairs, air-freight charges for parts, temporary repairs, costs of removing the vessel from one port to another, and the costs of surveys and other investigation charges can also be covered, if required by the underwriters, or if they will ultimately save costs, or are done for a reasonable purpose related to minimizing damages. The insured always has a duty to minimize losses, and expenses incurred in doing so, popularly known as "Sue and Labor" charges, are covered.

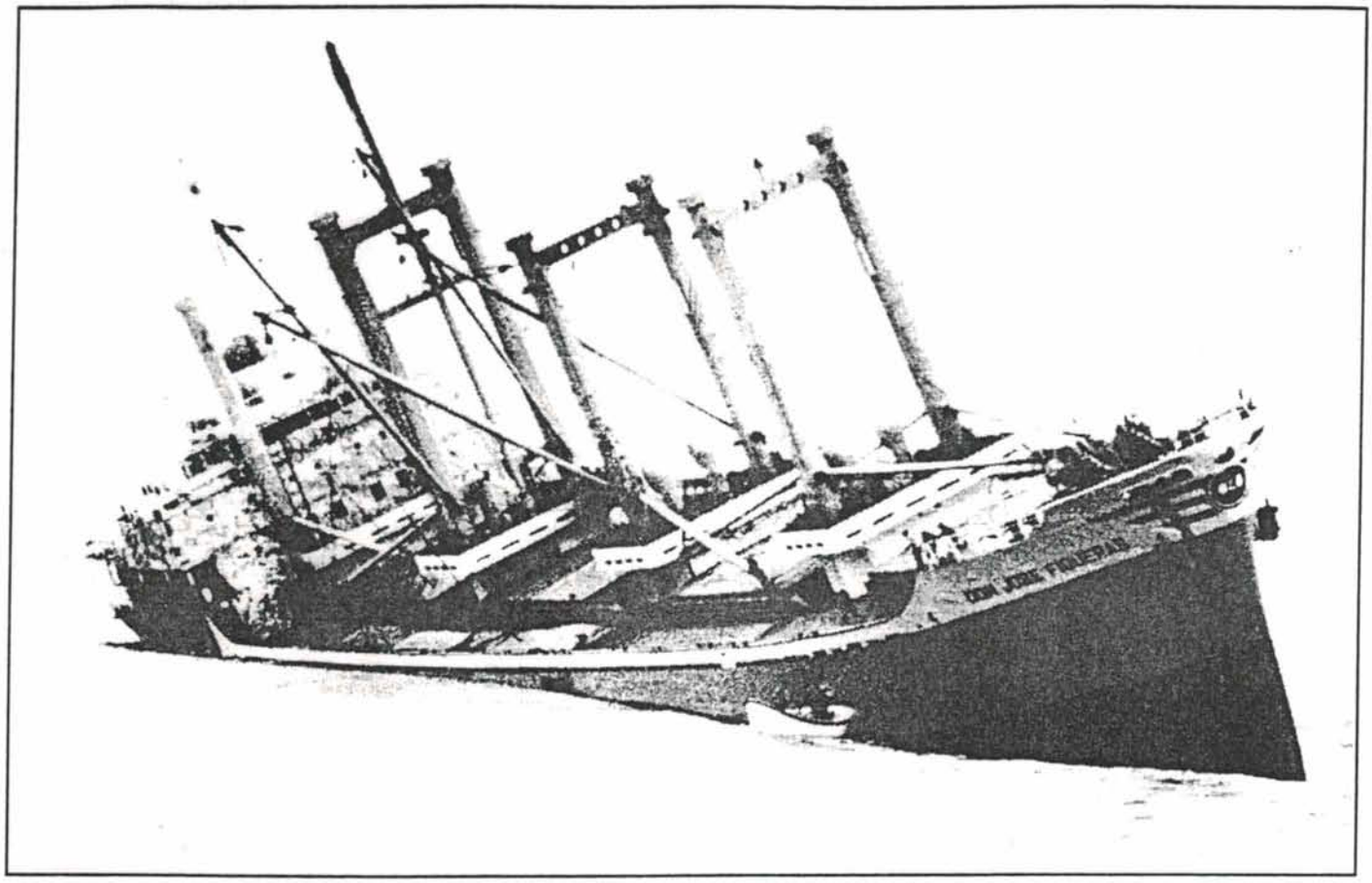
Repairs done on the owner's behalf, at the same time as repairs caused by an insured peril, will generally not be covered, and some expenses connected with Particular Average repairs may be divided between the owner and the insurer. For example, drydock charges will be paid by the insurers if the drydocking is necessary to make covered repairs, even though the owners, at the same time, take the opportunity to make incidental repairs not immediately necessary for seaworthiness of the vessel. However, if the owners postpone the Particular Average repairs until a routine drydocking, the drydocking costs will normally be divided between the insurers and the owners.



The Brix Maritime tug Clarkston *was holed by a gate on a Columbia River lock, late last year, and was saved from sinking by the quick action of the skipper, who backed the tug onto the gate, to keep her afloat.*

Warranties are special limitations on the contract of insurance. Breach of warranty will cause coverage to cease, or suspend, from the time of the breach. Coverage may, under some circumstances, resume when the breach no longer exists. Claims which occur while the vessel is in breach of warranty will not be covered, even if the warranty has nothing to do with the cause of the claim.

Some warranties are promissory: the insured agrees to do, or not do, something, or claims some state of fact does, or does not, exist. Other warranties serve to limit the coverage provided by excluding certain situations. Hull policies generally contain provisions allowing certain breaches of warranties to occur,



The 500-foot, four-hold freighter Don Jose Fugeuras *was on fire and listing 32.5 degrees when the Fred Devine Salvage crew arrived on the scene.*

provided the underwriters are notified and additional premiums are paid, in advance, or as soon as possible. This proviso applies to warranties as to cargo, trade, locality, date of sailing, towage or salvage services.

Implied warranties of seaworthiness and of the legality of the venture appear nowhere in the policy, but exist as part of statute in England, and general maritime law in the United States. Consequences of unseaworthiness for the insured vary, depending on whether the policy is a time or voyage policy, whether is an English or American form, when the unseaworthy conditon arose, and whether or not the insured knew about the unseaworthy condition. If the venture is illegal, coverage will probably be void.

Specific Breach of Warranty coverage is available through a separate policy. It insures the financing institution which has a mortgage on the vessel to the extent of its interest in the vessel, if a claim is refused because of breach of warranty.

When the vessel is sold, chartered on a demise (bareboat) basis, or changes management, including by requisition, or if the vessel changes class, or loses her classification, coverage is terminated either immediately or in fifteen days, or, if the vessel is at sea, when she reaches port.

The basic perils clause, read together with the Inchmaree clause, seem to provide coverage for almost anything that may occur. But there are perils that appear to be covered that are, in fact, specifically excluded by language that appears later in the policy. These exclusions are set forth in bold type as "paramount", and by their terms, override anything else in the policy.

The ITCH clauses exclude damage caused by wars, warring powers, or internal conflicts, any captures and seizures, except barratry or piracy, derelict weapons, mines, torpedoes or bombs. Damages, liabilities or expenses caused by strikers, locked out workers, persons taking part in labor disturbances, riots or civil commotions, or terrorists or persons acting from political motives are excluded from coverage. No coverage exists for damages caused by explosives or weapons, or by persons acting maliciously or, again, for a political motive. Damage from nuclear weapons is also specifically excluded.

The AIHC clause is worded differently. No damages are covered which are caused by capture, seizure, arrest, restraint, or detainment, any taking of the vessel, by requisition or otherwise, whether in time of peace or war and whether lawful or otherwise. Further, damage caused by any mine, bomb or torpedo not carried as cargo aboard the vessel is not covered, nor is damage caused by civil war or other internal strife, piracy, strikes, lockouts, labor disturbances, civil commotions, riots, martial law, military or usurped power, malicious acts of vandalism not commited by the master or mariners, and not excluded elsewhere in the clause. However, collision or contact with aircraft, rockets or similar missiles, or with any fixed or floating object or stranding, heavy weather, fire or explosion, is covered, unless caused directly by a hostile act by, or against, a belligerant power, if the act is independent of the nature of the voyage or service which the vessel, or the vessel it collides with, in the case of a collision, is performing.

The language of exclusion is significantly different in these two forms of policy, more here than anywhere else. Additional coverage to insure against some, or all, of these risks can be obtained, at additional cost. Depending

on the specific state of world affairs, and the vessel's planned activities, the coverage may be indicated. Carroll and Baynes told of a vessel which was forced to make an unplanned bunkering stop in Mexico, where it was seized and searched by Mexican police as a suspected smuggler. No evidence of smuggling was discovered, and the vessel was ultimately released, but it had been heavily damaged by the Mexican police. The vessel would have been an uninsured constructive total loss, but the owner had purchased War Risk coverage, because the vessel had transitted the Panama Canal during the height of the tension between the US and Panama. The War Risk coverage paid for repairs well in excess of $100,000.

For any claim less than a total loss, a deductible applies. Premiums must always be paid for coverage to be effective, although premiums can be refunded in certain circumstances. In the event of a constructive total loss, where the costs of repairs will exceed the insured value, the owners must tender notice of abandonment to the insurers. The insurers may reject their rights to take over the vessel, due to potential liabilities for pollution or wreck removal, but it is the tender that triggers coverage for a constructive total loss.

A major difference between marine policies and other kinds of insurance, lies in the payment procedure. Marine policies reimburse the insured for whatever the insured has had to pay out, either in costs of repairs, or through legal liability. Baynes points out that in practice, actual payment by the insured is often not required. The existence of legal liability, in the form of a judgement or duly authorized repair bills, is generally sufficient to trigger payment.

In most kinds of shoreside insurance, the insurers provide legal defense to liability actions, over and above the limits of the policy, so that they can control the defense and choose the attorneys. Marine insurance is different. Legal defense costs are usually covered, but within the limits of the policy, not in addition to the face amount of the insurance. The attorneys are chosen by the insured, and paid by the insured, who is then reimbursed by the insurer.

Under many circumstances, a vessel owner can limit the amount of liability to third parties to the value of the vessel. In the US, this is done through a Federal Court and generally applies for cargo damage, collision, personal injury or death, which occur "without the privity and knowledge of the owner."

Limited coverage hull and machinery insurance is also available. Financing institutions generally require full coverage to protect their interests, and are usually named as additional insureds. Common limitations on coverage include "Fire and Total Loss Only," which will pay only partially if the loss is caused by fire, lightning, earthquake or explosion, and "crew coverage excluded," which eliminates coverage for losses caused by crew members, under general maritime law.

Baynes and Carroll also see policies written with "Machinery Damages Excluded," or with higher deductibles for machinery damage. If coverage is limited, it is usually so indicated on the face of the policy. Limited coverages cost less, but the savings may prove to be a false economy if a non-covered loss occurs.

Insurance on the vessel does not cover loss of income resulting from an insured loss. Loss of Earnings insurance, however, is available.

Shipowner's Liabilities

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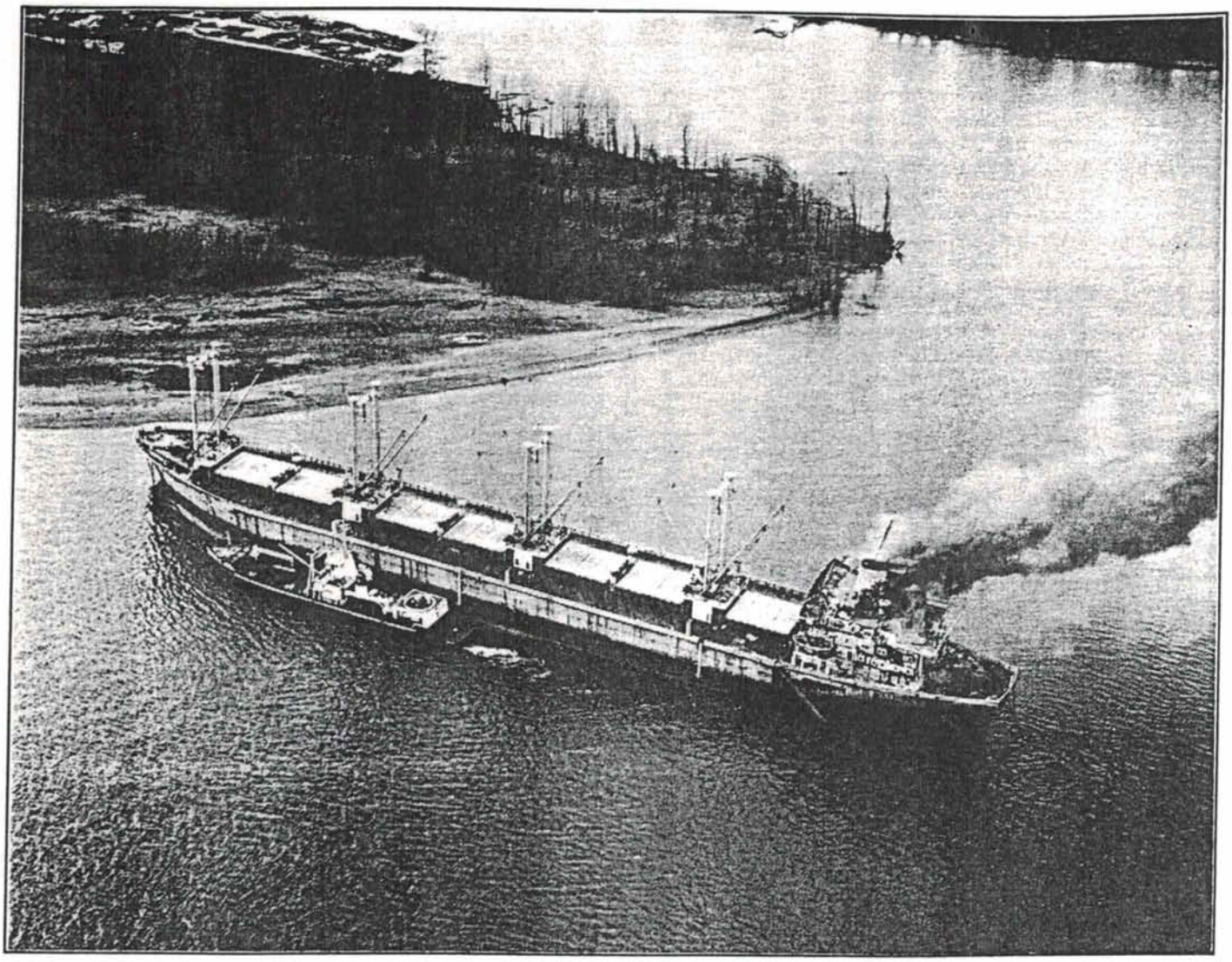


The 600-foot Protector Alpha *was intentionally beached after she exploded at Kalama, Washington, in 1982.*

tice of insuring only 3/4 of the vessel's value for collision liability purposes under Hull and Machinery policies. To insure the remaining 1/4, vessel owners established "clubs" which were mutual risk associations, into which they paid premiums, and from which, if necessary, they collected benefits. In time, the risk assumed by P&I insurance grew, and it is now available through clubs, mutual associations of various types, and insurance companies.

Like Hull and Machinery insurance, P&I protects the shipowner, but is specifically directed toward the shipowner's legal liability to third parties. It, too, is an indemnification coverage, reimbursing the insured for any amounts he is legally liable to pay, up to policy limits. Defense costs are also paid, but, again, within the limits of the policy.

Liabilities covered under P&I can include portions of collision liability not covered by Hull and Machinery Insurance, personal injury and death claims of crew, of longshore workers, of passengers, and of other people who come aboard.

Non-collision damage to other vessels, such as might be caused by a wake, is also covered.

"Allison" damage, which is caused by a ship when it collides with a fixed object like a pier or bridge, is also covered by P&I Insurance, as is wreck removâl. P&I policies often provide some kind of pollution-damage coverage, especially for pollution damages caused by a collision. Additional coverage areas typically include the costs of supressing mutinies, quarantine expenses, deviation expenses under certain circumstances, and uncollectable General Average contributions due from cargo interests.

Coverage of liabilities the vessel owner may incur toward cargo is also customarily provided by P&I Insurance. A common carrier, which accepts anyone's goods for carriage at established tariff rates, uses a bill of lading as a contract. The bill of lading generally limits the common carrier's liability to the cargo to the maximum amounts established by the relevant statutes, such as the Harter Act and the Carriage of Goods by Sea Act (COGSA). The carrier's bill of lading and its insurance coverage are carefully coordinated, so that the insurance covers all or most of the carrier's liabilities.

The act provides that the carrier may legally limit its liability to a maximum of $500 per "package" or "customary freight unit," but the shipper must be given an opportunity to declare a higher value, and pay for the corresponding increase in coverage.

Contracts of affreightment are used in private carriage, when the vessel's complete cargo capacity is filled by one shipper, or in towing situations. Contracts of affreightment are not standard

forms, but individually negotiated agreements.

The insurance aspects of these contracts are carefully worked out between parties to provide maximum coverage with minimum duplication and expense, and to avoid litigation if something goes wrong.

A popular clause in a towage contract is "naming and waiving." Under the terms of the contract of affreightment, the tow owner obtains hull insurance on the tow, names the tower as an additional insured, and waives subrogation...the right of the insurer to be reimbursed by the tower for sums paid out under the policy because of the tower's misconduct. While the tower may still be exposed to liability for deductibles and non-covered peril damages, this practice provides fairly comprehensive coverage that protects all parties, and eliminates a lot of expensive litigation.

Cargo Insurance

Cargo insurance protects that portion of the shipper's interests which are not covered by the carrier's P&I policy. This coverage will most often include losses caused by non-covered perils, consequential damages, and damages for which the cargo interest itself is liable.

A shipper of valuable cargo, particularly heavy equipment, may believe that its shoreside insurance policies cover the equipment wherever it is located. Charles Nalen, vice president of risk management and environmental affairs at Crowley Maritime Corporation's Pacific Division, cautions that this is probably not true. Most shoreside insurance policies have a "waterborne" exclusion that makes coverage ineffective as soon as the cargo leaves land. Policies covering these risks can be obtained, but must be arranged by the cargo interests.

Shorebased Liabilities

Stevedoring firms or other non-vessel owners, which have employees who work, however minimally, aboard vessels, have exposure to claims for injury or death, under Federal Laws like the Jones Act and the Longshore and Harbor Workers Act, which protect maritime workers.

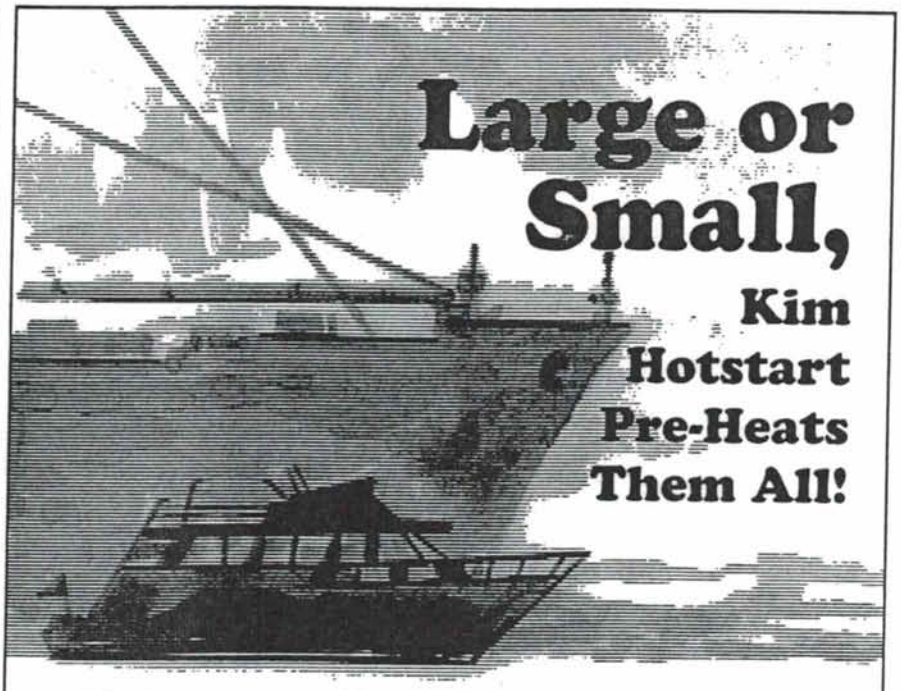
Unlike state worker's compensation acts, the amounts of compensation available to maritime workers are not set by statute, but by the courts on a case-by-case basis, and the potential liability is very high. Most employers are able to buy comprehensive policies that cover their liabilities to their workers regardless of the compensation law that applies.

Employers in the State of Washington face a different situation. Washington State law forbids private insurance firms from covering state workers' compensation claims; only payment into the State Compensation Fund, or self-insurance is permitted. Separate coverage is available for maritime employee claims, but is very expensive. Large firms avoid the problem by self-insuring, but smaller firms, which cannot afford to self-insure, face either great costs or great potential risks, particularly if their employees' maritime activity is minimal.

Shorebased businesses should also review their premises liability policies to make sure their coverage extends beyond the shoreline for damage done to vessels, waterborne equipment or cargo, by their facilities, equipment or employees. As a general rule, Carroll says, the shoreline is the cut-off point, with landbased insurance covering the dry side, and marine insurance covering the wet. Businesses which have operations on both sides of the shoreline need to make sure their insurance coverage is equally versatile.

Pollution

The number of federal and state laws regulating pollution and establishing clean-up procedures and liabilities, is



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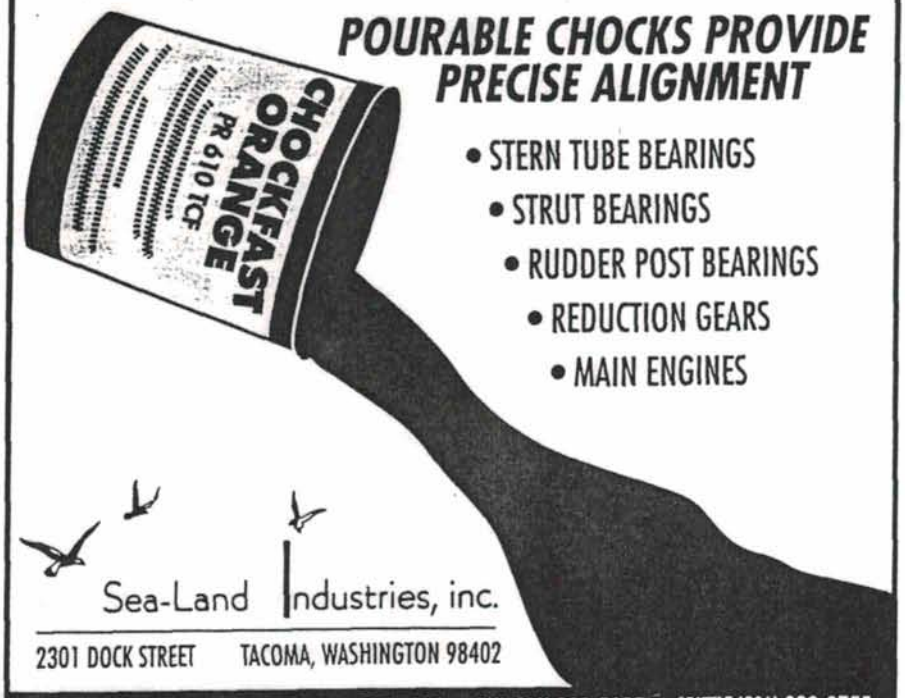

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growing rapdily, and the laws are often inconsistent. Court actions interpreting and clarifying them will take years to resolve.

Petroleum products, hazardous materials, garbage and sewage, are all covered by various statutes, but petroleum-product discharge is of primary concern because of its horrendous effect on the environment, and the enormous expense of cleanup.

Alaska, Canada, Washington, Oregon and California, all impose liability on the polluter for removal and clean-up costs on a "strict liability" basis...without regard to fault or negligence. Liability also exists for damages to third parties and to the environment. Canada limits consequential damage liability to a set amount per vessel ton. In all of these jurisdictions, civil penalties can also be assessed.

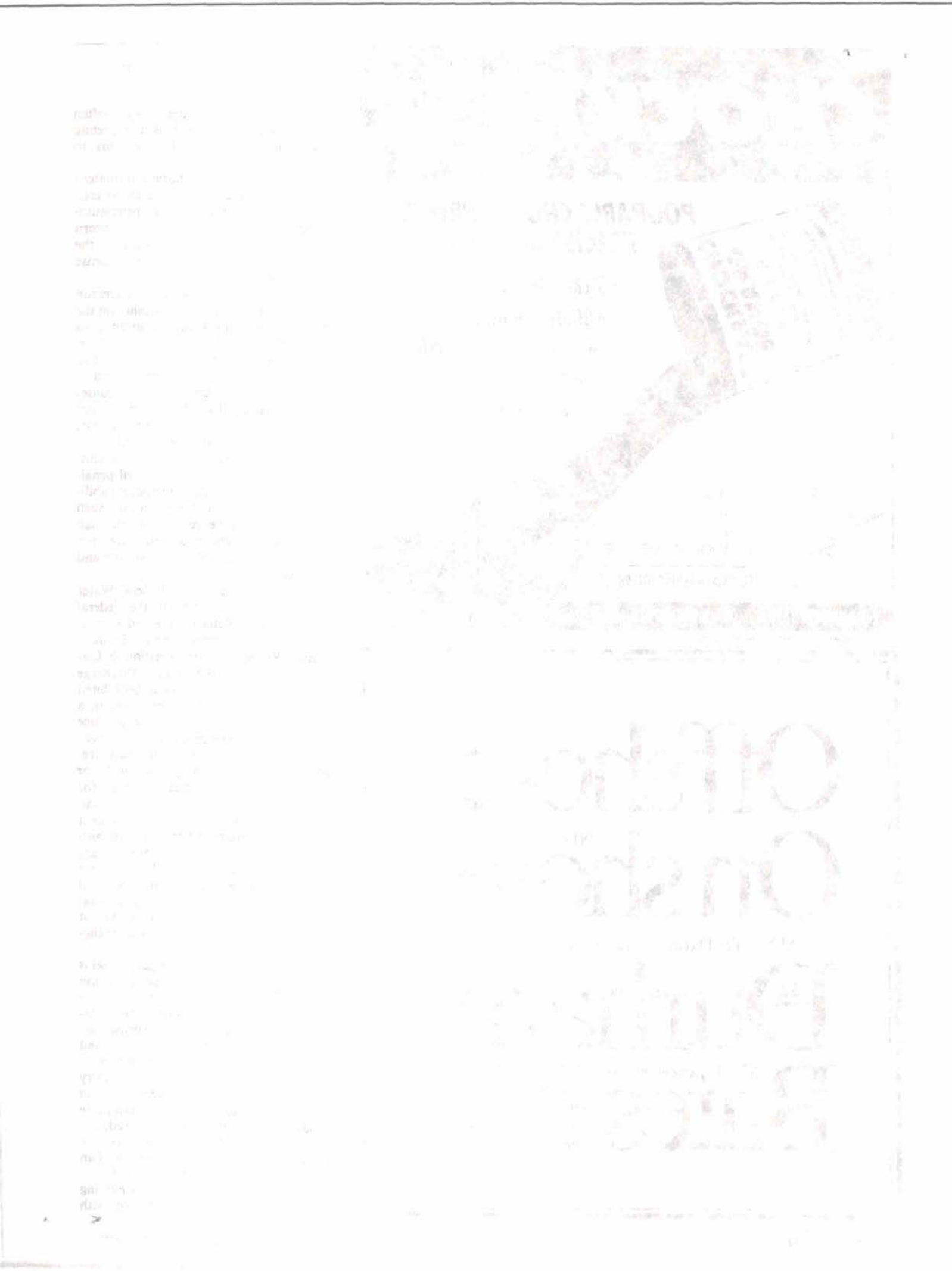
Hawaii prohibits discharge of pollutants by statute, and provides civil penalties, but no specific statute imposes liability for damages or for clean-up. Such damages would be recoverable through the courts, on a theory of negligence "per se", on proof of violation of statute and the resulting damage.

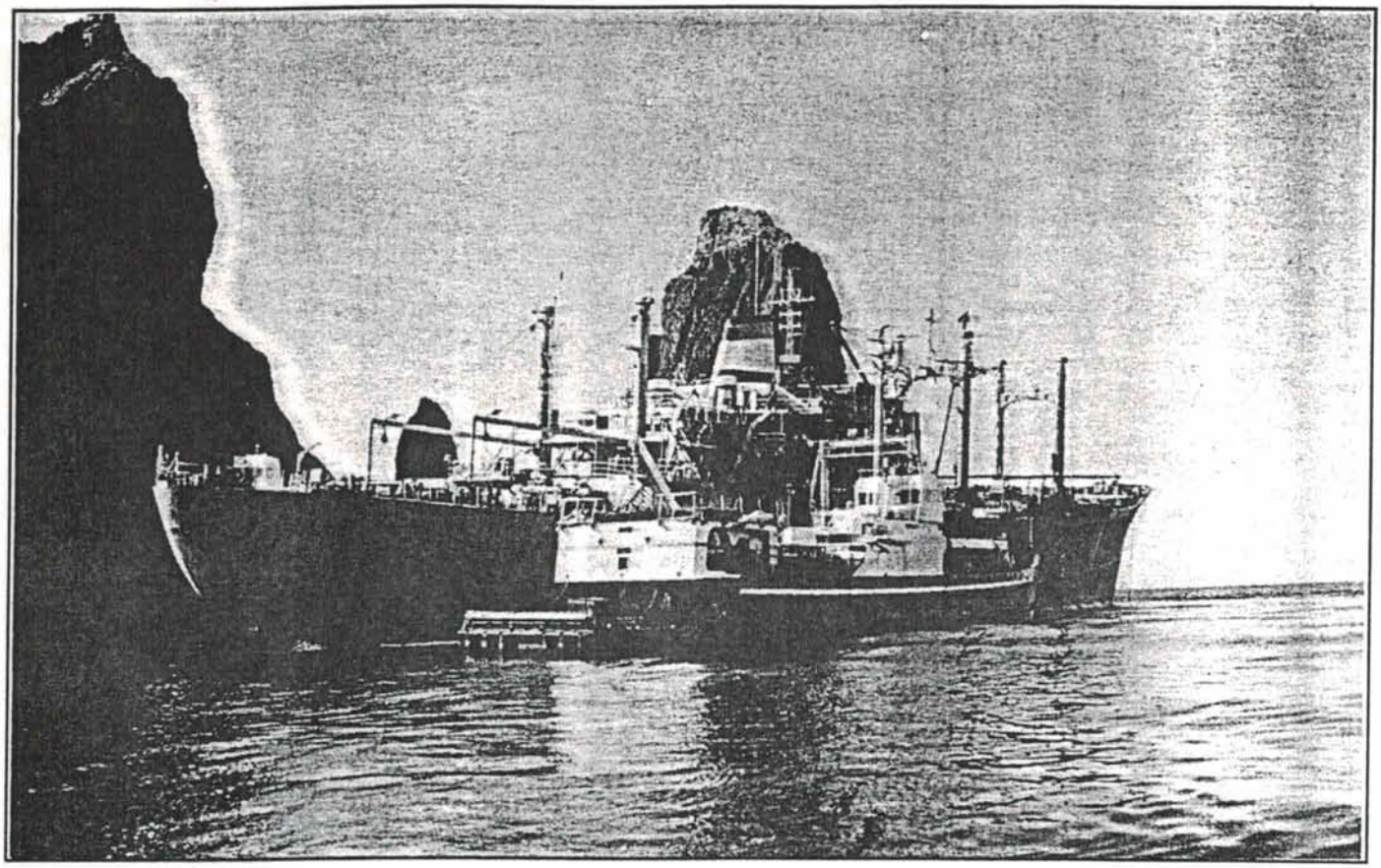
The Clean Water Act (Federal Water Pollution Control Act) is the federal statute that regulates marine pollution. It is part of the Comprehensive Environmental Response, Compensation & Liability Act of 1980 (CERCLA). Discharge of many listed pollutants is prohibited without a permit. Discharge of oil in a "harmful quantity"...enough to produce a sheen...is likewise prohibited. Civil penalties are provided, which increase dramatically, if the discharge was willful or willfully negligent. Actual expenses for the recovery and clean-up of the spill can be recovered by the Federal Government from the discharging party, who is also liable for environmental damages. Fault, again, is not an issue. Like the state statutory schemes, liability can be avoided under certain very specific circumstances: if the discharge is caused by an Act of God, act of war, or governmental negligence.

The liability of the discharging vessel is limited to a dollar amount per gross ton under CERCLA. The amount varies with the classification of the vessel. The limitation covers only clean-up expenses incurred by the Federal Government, and not those of a state or private parties.

Most vessels are required to carry insurance to cover clean-up expenses, and the Water Quality Insurance Syndicate (WQIS) was set up to meet this need, but it does not address all the risks or liabilities attendant to the possibility of an oil spill, however innocently caused.

A third party, (not the discharging vessel) which is in any way at fault, with





Bunker fuel and other contaminants were removed from the Milos Reefer, *aground on St. Mathew Island, by Fred Devine salvage crews.*

respect to a polluting discharge, is faced with unlimited liability. Such third parties could include another vessel, a contractor, a shoreside facility, or an assist tug. As a result, the discharging veseel, which may be 99 percent responsible, has limited liability, while another vessel, only 1 percent at fault, has virtually limitless liability. While P&I insurance may cover some of these costs, and WQIS insurance may cover others, this is a rapidly developing area, with many inherent perils, and coverages should be reviewed.

Other Coverages

Anyone who puts a defective or hazardous product into the stream of commerce is strictly liable for the damage it causes. All manufacturers, including shipyards, are liable if their negligence causes damage, so specific Products Liability and Builder's Risk policies are available.

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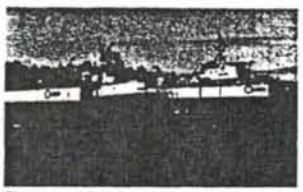
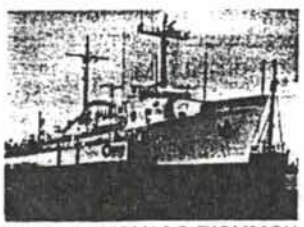


Fire boat DUWAMISH, tug ADVENTURER



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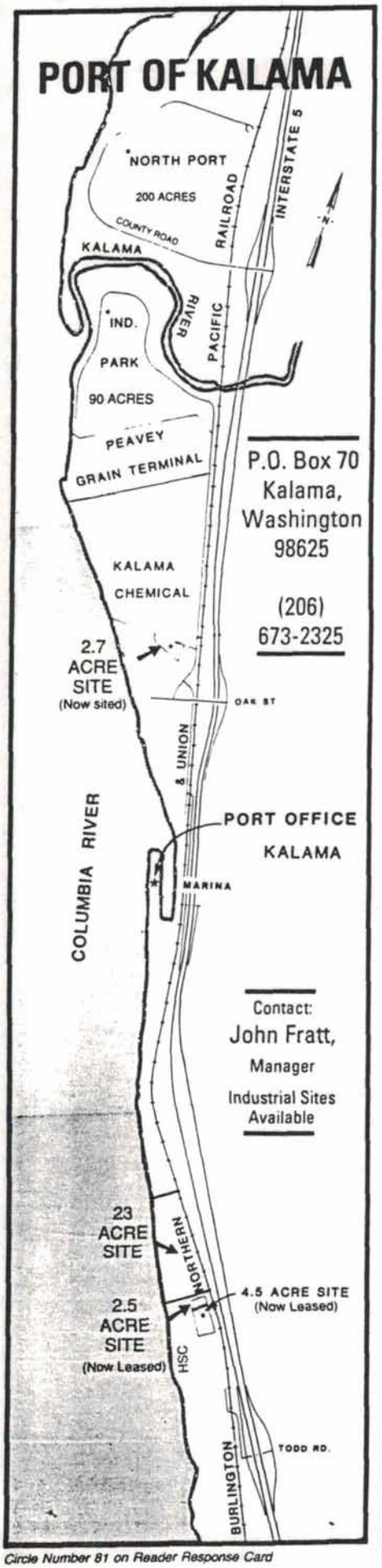

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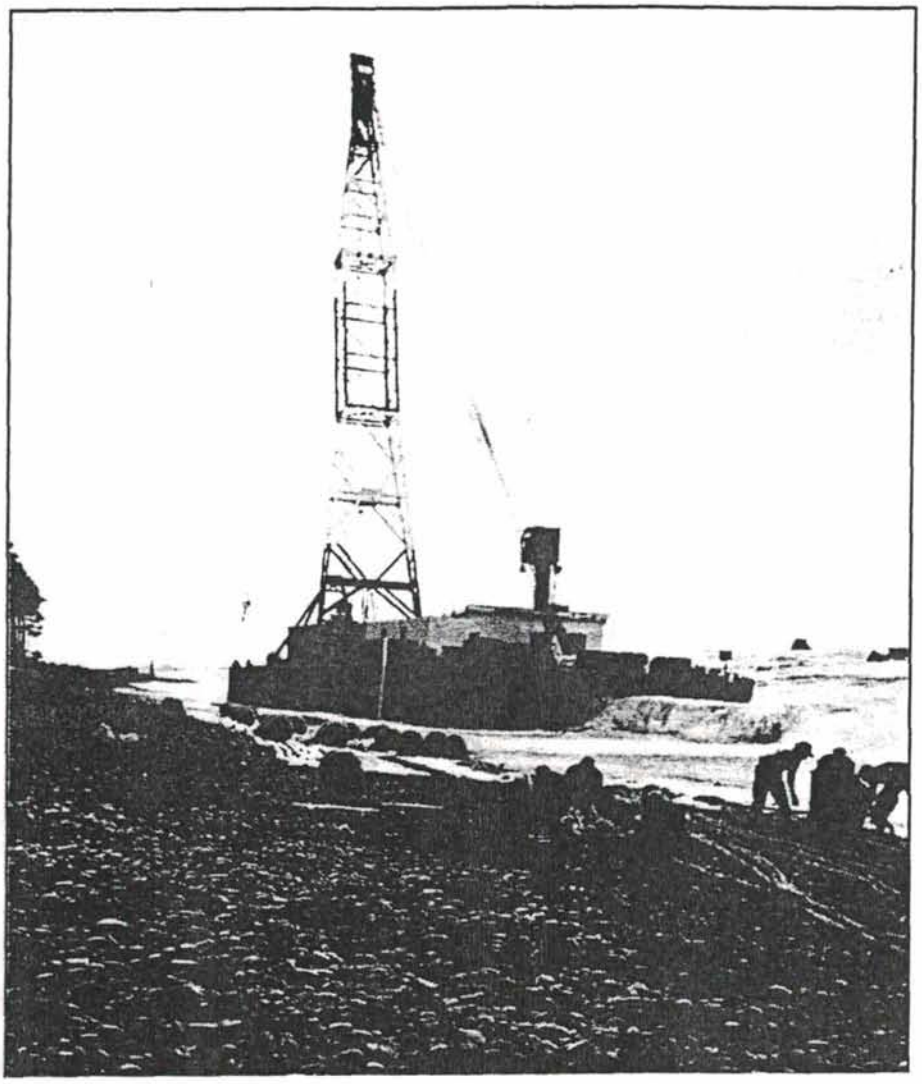


The stiff-leg, heavy-lift crane Jan B *went ashore on Washington's rugged north coast, in 1985 and was hauled off after 6000 feet of 10-inch nylon hawser was flown from the barge to the* Salvage Chief, *anchored offshore.*

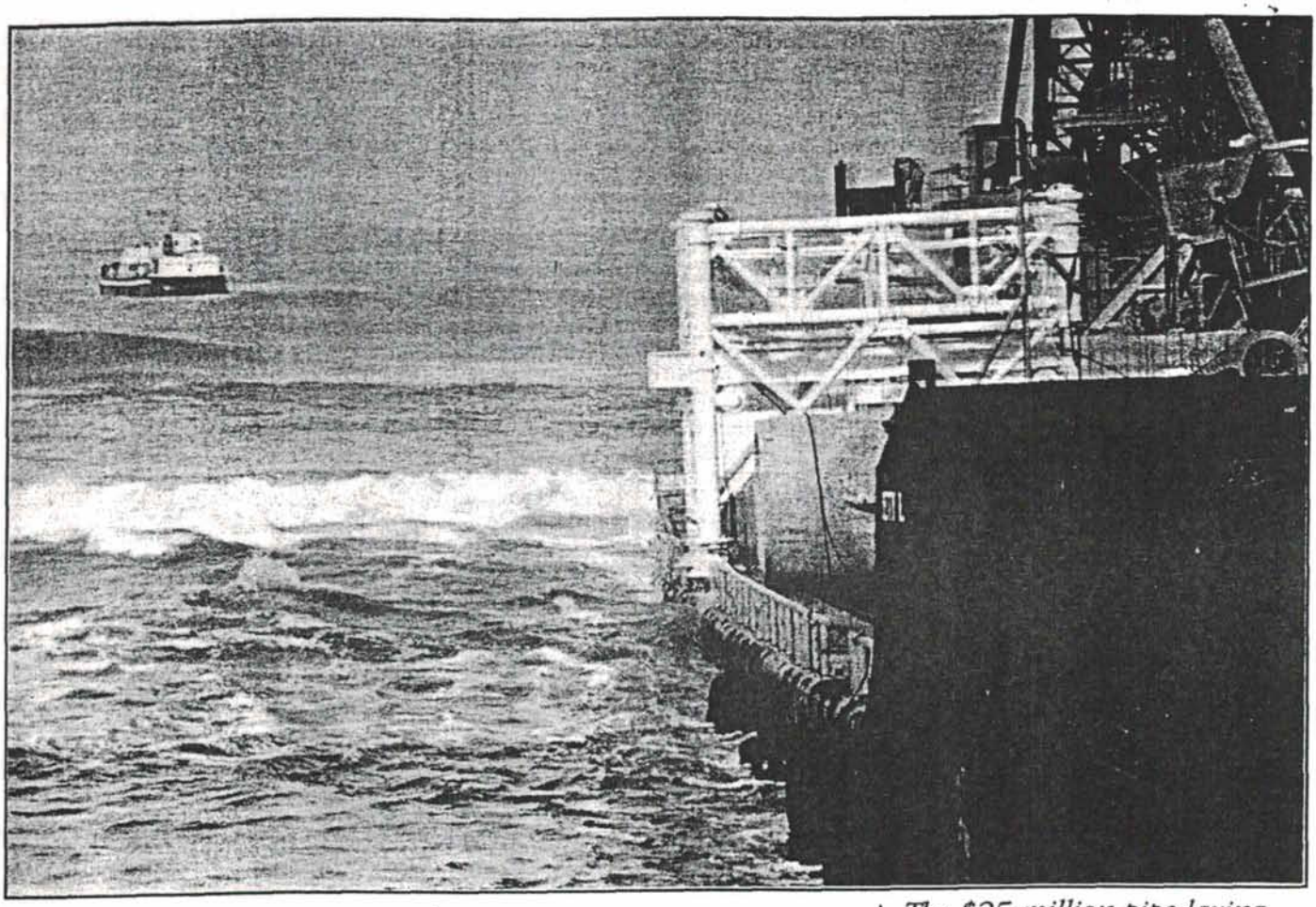
chief engineers, towboat operators, pilots and deck officers, can also find themselves in uncomfortable positions, following a casualty, so insurance exists to cover legal expenses, pay penalties, and replace lost income, in the unhappy event a license is suspended, or revoked.

Surveyors

Dean Hunter describes surveyors as the eyes and ears of the parties they represent, providing information and expertise for both insured and insurers in Condition and Valuation surveys are conducted to establish the value of a vessel for insurance purposes. Surveyors also assess the cause of damage after an accident, determine what repairs are necessary, and the reasonable costs of repairs.

Classification surveys make sure a vessel meets the standards of her class, as established by the American Bureau of Shipping, De norske Veritas, Bureau Veritas, and other classification societies.

The National Cargo Bureau, an association of cargo surveyors, sets standards for certification of ship's gear, and standards for the safe handling of cargo, including hazardous materials. Cargo surveyors insure that cargo is properly stowed and that the various cargos aboard are compatible. Surveyors can also issue Certificates of Loading, which establish a presumption of compliance with various regulations. Average adjusters assess and apportion General Average claims under the York-Antwerp Rules and the Rules of Practice of the Association of Average Adjusters.



The $25-million pipe-laying barge Betty L *went aground off San Francisco Bay, in 1983, just 5 days along her maiden voyage. She was pulled off the beach by Fred Devine Diving and Salvage Company's* Salvage Chief.

Insurance policies generally provide that several surveyors can be involved in the settlement of a claim. Surveyors representing the owners, underwriters, and the classification society work together, and attempt to reach agreement in preparing their reports, and disagreements go to arbitration.

There are no national standards for the licensing of marine surveyors, John Carroll cautions, and many surveyors are specialists. A surveyor with a mechanical or yacht specialty may not be the ideal person to evaluate hull damage on a ship. Underwriters frequently employ surveyors from the Salvage Association, an international organization specializing in hull and machinery, with offices through out the world.

Sometimes an insured needs to obtain a voyage policy, that is coverage for a specific voyage not covered under ordinary policies. In such cases, a survey will probably be required, says Foss's Hunter, and the surveyor will examine the vessel, the cargo, the stowage, the route, the weather, the season, and all other pertinent factors, to assist the underwriters in issuing appropriate coverage, at an appropriate price.

The insured who gets the best results is an informed consumer, says Carroll, who advises a new marine insurance customer to learn and remember the differences between marine and shoreside insurance, particularly the fact that marine insurance coverages are policies of indemnity.

Nalen, Crowley's professional customer, recommends searching out and using a good broker. He also recommends "doing your homework", attending industry seminars, learning to ask the right questions, and following the industry to keep up with the changing liabilities facing an operator today.

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The United States Law Week

Extra Edition No. 1
Supreme Court Opinions

November 6, 1990 • THE BUREAU OF NATIONAL AFFAIRS, INC., WASHINGTON, D.C. • Volume 59, No. 18

OPINION ANNOUNCED November 6, 1990

The Supreme Court decided:

SHIPS AND SHIPPING—Wrongful Death

General maritime cause of action for wrongful death of seaman exists, but damages recoverable in such action do not include loss of society; decedent's lost future earnings are not recoverable in general maritime survival action. (*Miles v. Apex Marine Corp.*, No. 89-1158) Page 4001

Full Text of Opinions

No. 89-1158

MERCEDEL W. MILES, INDIVIDUALLY AND AS ADMINISTRATRIX OF THE SUCCESSION OF LUDWICK ADAM TORREGANO, PETITIONER *v.* APEX MARINE CORPORATION ET AL.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

Syllabus

No. 89-1158. Argued October 3, 1990—Decided November 6, 1990

Petitioner Miles, the mother and administratrix of the estate of a seaman killed by a fellow crew member aboard the vessel of respondents (collectively Apex) docked in an American port, sued Apex in District Court, alleging negligence under the Jones Act for failure to prevent the assault and breach of the warranty of seaworthiness under general maritime law for hiring a crew member unfit to serve. After the court ruled, *inter alia*, that the estate could not recover the son's lost future income, the jury found that the ship was seaworthy but that Apex was negligent. Although it awarded damages on the negligence claim to Miles for the loss of her son's support and services and to the estate for pain and suffering, the jury found that Miles was not financially dependent on her son and was therefore not entitled to damages for loss of society. The Court of Appeals affirmed the judgment of negligence by Apex. As to the general maritime claim, the court ruled that the vessel was unseaworthy as a matter of law, but held that a nondependent parent may not recover for loss of society in a general maritime wrongful death action and that general maritime law does not permit a survival action for decedent's lost future earnings.

Held:

1. There is a general maritime cause of action for the wrongful death of a seaman. The reasoning of *Moragne* v. *States Marine Lines, Inc.*, 398 U. S. 375, which created a general maritime wrongful death cause of action, extends to suits for the death of true seamen despite the fact that *Moragne* involved a longshoreman. Although true seamen, unlike longshoremen, are covered under the Jones Act provision creating a negligence cause of action against the seaman's employer for wrongful death, *Moragne*, *supra*, at 396, n. 12, recognized that that provision is preclusive only of state remedies for death from unseaworthiness and does not pre-empt a general maritime wrongful death action. The Jones Act evinces no general hostility to recovery under maritime law, since it does not disturb seamen's general maritime claims for injuries resulting from unseaworthiness, and does not preclude the recovery for wrongful death due to unseaworthiness created by its companion statute, the Death On the High Seas Act (DOHSA). Rather, the Jones Act establishes a uniform system of seamen's tort law. As the Court concluded in *Moragne*, *supra*, at 396, n. 12, that case's extension of the DOHSA wrongful death action from the high seas to territorial waters furthers rather than hinders uniformity in the exercise of admiralty jurisdiction. There is also little question that *Moragne* intended to create a general maritime wrongful death action applicable beyond the situation of longshoremen, since it expressly overruled *The Harrisburg*, 119 U. S. 199, which held that maritime law did not afford a cause of action for the wrongful death of a seaman, and since each of the "anomalies" to which the *Moragne* cause of action was directed—particularly the fact that recovery was theretofore available for the wrongful death in territorial waters of a longshoreman, but not a true seaman—involved seamen.

2. Damages recoverable in a general maritime cause of action for the wrongful death of a seaman do not include loss of society. This case is controlled by the logic of *Mobil Oil Corp.* v. *Higginbotham*, 436 U. S. 618, 625, which held that recovery for nonpecuniary loss, such as loss of society, is foreclosed in a general maritime action for death on the high seas because DOHSA, by its terms, limits recoverable damages in suits for wrongful death on the high seas to "*pecuniary* loss sustained by the persons for whose benefit the suit is brought" (emphasis added). *Sea-Land Services, Inc.* v. *Gaudet*, 414 U. S. 573, which allowed recovery for loss of society in a general maritime wrongful death action, applies only in territorial waters and only to longshoremen. The Jones Act, which applies to deaths of true seamen as a result of negligence, allows recovery only for pecuniary loss and not for loss of society in a wrongful death action. See *Michigan Central R. Co.* v. *Vreeland*, 227 U. S. 59, 69–71. The Jones Act also precludes recovery for loss of society in this case involving a general maritime claim for wrongful death resulting from unseaworthiness, since it would be inconsistent with this Court's place in the constitutional scheme to sanction more expansive remedies for the judicially-created unseaworthiness cause of action, in which liability is without fault, than Congress has allowed in cases of death resulting from negligence. This holding restores a uniform rule applicable to all actions for the wrongful death of a seaman, whether under DOHSA, the Jones Act, or general maritime law.

3. A general maritime survival action cannot include recovery for decedent's lost future earnings. Even if a seaman's personal cause of action survives his death under general maritime law, the income he would have earned but for his death is not recoverable because the Jones Act's survival provision limits recovery to losses suffered during the decedent's lifetime. See, *e. g.*, *Van Beeck* v. *Sabine Towing Co.*, 300 U. S.

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NOTE: Where it is deemed desirable, a syllabus (headnote) will be released * * * at the time the opinion is issued. The syllabus constitutes no part of the opinion of the Court but has been prepared by the Reporter of Decisions for the convenience of the reader. See *United States v. Detroit Lumber Co.*, 200 U.S. 321, 337.

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342, 347. Since Congress has limited the survival right for seamen's injuries resulting from negligence, this Court is not free, under its admiralty powers, to exceed those limits by creating more expansive remedies in a general maritime action founded on strict liability.

882 F. 2d 976, affirmed.

O'CONNOR, J., delivered the opinion of the Court, in which all other Members joined, except SOUTER, J., who took no part in the consideration or decision of the case.

JUSTICE O'CONNOR delivered the opinion of the Court.

We decide whether the parent of a seaman who died from injuries incurred aboard respondents' vessel may recover under general maritime law for loss of society, and whether a claim for the seaman's lost future earnings survives his death.

I

Ludwick Torregano was a seaman aboard the vessel *M/V Archon*. On the evening of July 18, 1984, Clifford Melrose, a fellow crew member, stabbed Torregano repeatedly, killing him. At the time, the ship was docked in the harbor of Vancouver, Washington.

Mercedel Miles, Torregano's mother and administratrix of his estate, sued Apex Marine Corporation and Westchester Marine Shipping Company, the vessel's operators, Archon Marine Company, the charterer, and Aeron Marine Company, the *Archon's* owner (collectively Apex), in United States District Court for the Eastern District of Louisiana. Miles alleged negligence under the Jones Act, 46 U. S. C. App. § 688, for failure to prevent the assault on her son, and breach of the warranty of seaworthiness under general maritime law for hiring a crew member unfit to serve. She sought compensation for loss of support and services and loss of society resulting from the death of her son, punitive damages, and compensation to the estate for Torregano's pain and suffering prior to his death and for his lost future income.

At trial, the District Court granted Apex's motion to strike the claim for punitive damages, ruled that the estate could not recover Torregano's lost future income, and denied Miles' motion for a directed verdict as to negligence and unseaworthiness. The court instructed the jury that Miles could not recover damages for loss of society if they found that she was not financially dependent on her son.

The jury found that Apex was negligent and that Torregano was 7% contributorily negligent in causing his death, but that the ship was seaworthy. After discounting for Torregano's contributory negligence, the jury awarded Miles $7,254 for the loss of support and services of her son and awarded the estate $130,200 for Torregano's pain and suffering. The jury also found that Miles was not financially dependent on her son and therefore not entitled to damages for loss of society. The District Court denied both parties' motions for judgment notwithstanding the verdict and entered judgment accordingly.

The United States Court of Appeals for the Fifth Circuit affirmed in part, reversed in part, and remanded. 882 F. 2d 976 (1989). The court affirmed the judgment of negligence on the part of Apex, but held that there was insufficient evidence to support the contributory negligence finding. *Id.*, at 983–985. Miles was therefore entitled to the full measure of $7,800 for loss of support and services, and the estate entitled to $140,000 for Torregano's pain and suffering. The court also found that Melrose's extraordinarily violent disposition demonstrated that he was unfit, and therefore that the Archon was unseaworthy as a matter of law. *Id.*, at 983. Because this ruling revived Miles' general maritime claim, the court considered two questions concerning the scope of damages under general maritime law. The court reaffirmed its prior decision in *Sistrunk* v. *Circle Bar Drilling Co.*, 770 F. 2d 455 (CA5 1985), holding that a nondependent parent may not recover for loss of society in a general maritime wrongful death action. 882 F. 2d, at 989. It also held that general maritime law does not permit a survival action for decedent's lost future earnings. *Id.*, at 987.

We granted Miles' petition for certiorari on these two issues, 494 U. S. —— (1990), and now affirm the judgment of the Court of Appeals.

II

We rely primarily on *Moragne* v. *States Marine Lines, Inc.*, 398 U. S. 375 (1970). Edward Moragne was a longshoreman who had been killed aboard a vessel in United States and Florida territorial waters. His widow brought suit against the shipowner, seeking to recover damages for wrongful death due to the unseaworthiness of the ship. The District Court dismissed that portion of the complaint because neither federal nor Florida statutes allowed a wrongful death action sounding in unseaworthiness where death occurred in territorial waters. General maritime law was also no help; in *The Harrisburg*, 119 U. S. 199 (1886), this Court held that maritime law does not afford a cause of action for wrongful death. The Court of Appeals affirmed.

This Court overruled *The Harrisburg*. After questioning whether *The Harrisburg* was a proper statement of the law even in 1886, the Court set aside that issue because a "development of major significance ha[d] intervened." *Moragne, supra*, at 388. Specifically, the state legislatures and Congress had rejected wholesale the rule against wrongful death. Every State in the Union had enacted a wrongful death statute. In 1920, Congress enacted two pieces of legislation creating a wrongful death action for most maritime deaths. The Jones Act, 46 U. S. C. App. § 688, through incorporation of the Federal Employers' Liability Act (FELA), 35 Stat. 65, as amended, 45 U. S. C. §§ 51–59, created a wrongful death action in favor of the personal representative of a seaman killed in the course of employment. The Death on the High Seas Act (DOHSA), 46 U. S. C. App. §§ 761, 762, created a similar action for the representative of anyone killed on the high seas.

These statutes established an unambiguous policy in abrogation of those principles that underlay *The Harrisburg*. Such a policy is "to be given its appropriate weight not only in matters of statutory construction but also in those of decisional law." *Moragne, supra*, at 391. Admiralty is not created in a vacuum; legislation has always served as an important source of both common law and admiralty principles. 398 U. S., at 391, 392, citing Landis, Statutes and the Sources of Law, in Harvard Legal Essays 213, 214, 226–227 (1934). The unanimous legislative judgment behind the Jones Act, DOHSA, and the many state statutes created a strong presumption in favor of a general maritime wrongful death action.

But legislation sends other signals to which an admiralty court must attend. "The legislature does not, of course,

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merely enact general policies. By the terms of a statute, it also indicates its conception of the sphere within which the policy is to have effect." *Moragne*, *supra*, at 392. Congress, in the exercise of its legislative powers, is free to say "this much and no more." An admiralty court is not free to go beyond those limits. The Jones Act and DOHSA established a policy in favor of maritime wrongful death recovery. The central issue in *Moragne* was whether the limits of those statutes proscribed a more general maritime cause of action. 398 U. S., at 393.

The Court found no such proscription. Rather, the unfortunate situation of Moragne's widow had been created by a change in the maritime seascape that Congress could not have anticipated. At the time Congress passed the Jones Act and DOHSA, federal courts uniformly applied state wrongful death statutes for deaths occurring in state territorial waters. Except in those rare cases where state statutes were also intended to apply on the high seas, however, there was no recovery for wrongful death outside territorial waters. See *Moragne*, *supra*, at 393, and n. 10. DOHSA filled this void, creating a wrongful death action for all persons killed on the high seas, sounding in both negligence and unseaworthiness. Congress did not extend DOHSA to territorial waters because it believed state statutes sufficient in those areas. 398 U. S., at 397–398.

And so they were when DOHSA was passed. All state statutes allowed for wrongful death recovery in negligence, and virtually all DOHSA claims sounded in negligence. Unseaworthiness was "an obscure and relatively little used remedy," largely because a shipowner's duty at that time was only to use due diligence to provide a seaworthy ship. See G. Gilmore & C. Black, The Law of Admiralty 383, 375 (2d ed. 1975). Thus, although DOHSA permitted actions in both negligence and unseaworthiness, it worked essentially as did state wrongful death statutes. DOHSA created a near uniform system of wrongful death recovery.

"The revolution in the law began with Mahnich v. Southern S.S. Co., [321 U. S. 96 (1944)]", in which this Court transformed the warranty of seaworthiness into a strict liability obligation. Gilmore & Black, *supra*, at 384, 386. The shipowner became liable for failure to supply a safe ship irrespective of fault, and irrespective of the intervening negligence of crew members. *Mahnich*, *supra*, at 100 ("[T]he exercise of due diligence does not relieve the owner of his obligation to the seaman to furnish adequate appliances. . . . If the owner is liable for furnishing an unseaworthy appliance, even when he is not negligent, *a fortiori* his obligation is unaffected by the fact that the negligence of the officers of the vessel contributed to the unseaworthiness"). The Court reaffirmed the rule two years later in *Seas Shipping Co.* v. *Sieracki*, 328 U. S. 85, 94–95 (1946) ("[Unseaworthiness] is essentially a species of liability without fault"). As a consequence of this radical change, unseaworthiness "[became] the principal vehicle for recovery by seamen for injury or death." *Moragne*, 398 U. S., at 399. DOHSA claims now sounded largely in unseaworthiness. "The resulting discrepancy between the remedies for deaths covered by [DOHSA] and for deaths that happen to fall within a state wrongful-death statute not encompassing unseaworthiness could not have been foreseen by Congress." *Ibid.*

The emergence of unseaworthiness as a widely used theory of liability made manifest certain anomalies in maritime law that had not previously caused great hardship. First, in territorial waters, general maritime law allowed a remedy for unseaworthiness resulting in injury, but not for death. Second, DOHSA allowed a remedy for death resulting from unseaworthiness on the high seas, but general maritime law did not allow such recovery for a similar death in territorial waters. Finally, in what *Moragne* called the "strangest" anomaly, in those States whose statutes allowed a claim for wrongful death resulting from unseaworthiness, recovery was available for the death of a longshoreman due to unseaworthiness, but not for the death of a Jones Act seaman. See *Moragne*, *supra*, at 395–396. This was because wrongful death actions under the Jones Act are limited to negligence, and the Jones Act pre-empts state law remedies for the death or injury of a seaman. See *Gillespie* v. *United States Steel Corp.*, 379 U. S. 148, 154–156 (1964).

The United States, as *amicus curiae*, urged the *Moragne* Court to eliminate these inconsistencies and render maritime wrongful death law uniform by creating a general maritime wrongful death action applicable in all waters. The territorial limitations placed on wrongful death actions by DOHSA did not bar such a solution. DOHSA was itself a manifestation of congressional intent "to achieve 'uniformity in the exercise of admiralty jurisdiction.'" *Moragne*, *supra*, at 401, quoting *Gillespie*, *supra*, at 155. Nothing in that Act or in the Jones Act could be read to preclude this Court from exercising its admiralty power to remedy nonuniformities that could not have been anticipated when those statutes were passed. *Moragne*, *supra*, at 399–400. The Court therefore overruled *The Harrisburg* and created a general maritime wrongful death cause of action. This result was not only consistent with the general policy of both 1920 Acts favoring wrongful death recovery, but also effectuated "the constitutionally based principle that federal admiralty law should be 'a system of law coextensive with, and operating uniformly in, the whole country.'" *Moragne*, *supra*, at 402, quoting *The Lottawanna*, 21 Wall. 558, 575 (1875).

III

We have described *Moragne* at length because it exemplifies the fundamental principles that guide our decision in this case. We no longer live in an era when seamen and their loved ones must look primarily to the courts as a source of substantive legal protection from injury and death; Congress and the States have legislated extensively in these areas. In this era, an admiralty court should look primarily to these legislative enactments for policy guidance. We may supplement these statutory remedies where doing so would achieve the uniform vindication of such policies consistent with our constitutional mandate, but we must also keep strictly within the limits imposed by Congress. Congress retains superior authority in these matters, and an admiralty court must be vigilant not to overstep the well-considered boundaries imposed by federal legislation. These statutes both direct and delimit our actions.

Apex contends that *Moragne*'s holding, creating a general maritime wrongful death action, does not apply in this case because Moragne was a longshoreman, whereas Torregano was a true seaman. Apex is correct that *Moragne* does not apply on its facts, but we decline to limit *Moragne* to its facts.

Historically, a shipowner's duty of seaworthiness under general maritime law ran to seamen in the ship's employ. See *Sieracki*, 328 U. S., at 90. In *Sieracki*, we extended that duty to stevedores working aboard ship but employed by an independent contractor. *Id.*, at 95. As this was Moragne's situation, Moragne's widow was able to bring an action for unseaworthiness under general maritime law. In a narrow sense, *Moragne* extends only to suits upon the death of longshoremen like Moragne, so-called *Sieracki* seamen. Torregano was a true seaman, employed aboard the *Archon*. Were we to limit *Moragne* to its facts, Miles would have no general maritime wrongful death action. Indeed,

were we to limit *Moragne* to its facts, that case would no longer have any applicability at all. In 1972, Congress amended the Longshore and Harbor Workers' Compensation Act (LHWCA), 86 Stat. 1251, as amended, 33 U. S. C. §§ 901–950, to bar any recovery from shipowners for the death or injury of a longshoreman or harbor worker resulting from breach of the duty of seaworthiness. See 33 U. S. C. § 905(b); *American Export Lines, Inc.* v. *Alvez*, 446 U. S. 274, 282, n. 9 (1980). If Moragne's widow brought her action today, it would be foreclosed by statute.

Apex asks us not to extend *Moragne* to suits for the death of true seamen. This limitation is warranted, they say, because true seamen, unlike longshoremen, are covered under the Jones Act. The Jones Act provides a cause of action against the seaman's employer for wrongful death resulting from negligence that Apex contends is preclusive of any recovery for death from unseaworthiness. See 46 U. S. C. App. § 688.

This Court first addressed the preclusive effect of the Jones Act wrongful death provision in *Lindgren* v. *United States*, 281 U. S. 38 (1930). Petitioner, who was not a wrongful death beneficiary under the Jones Act, attempted to recover for the negligence of the shipowner under a state wrongful death statute. The Court held that the Jones Act pre-empted the state statute: "[The Jones] Act is one of general application intended to bring about the uniformity in the exercise of admiralty jurisdiction required by the Constitution, and necessarily supersedes the application of the death statutes of the several States." *Id.*, at 44. The Court also concluded that the Jones Act, limited as it is to recovery for negligence, would preclude recovery for the wrongful death of a seaman resulting from the unseaworthiness of the vessel. *Id.*, at 47–48. In *Gillespie* v. *United States Steel Corp.*, 379 U. S. 148 (1964), the Court reaffirmed *Lindgren*, and held that the Jones Act precludes recovery under a state statute for the wrongful death of a seaman due to unseaworthiness. *Id.*, at 154–156.

Neither *Lindgren* nor *Gillespie* considered the effect of the Jones Act on a general maritime wrongful death action. Indeed, no such action existed at the time those cases were decided. *Moragne* addressed the question explicitly. The Court explained there that the preclusive effect of the Jones Act established in *Lindgren* and *Gillespie* extends only to state remedies and not to a general maritime wrongful death action. See *Moragne*, 398 U. S., at 396, n. 12.

The Jones Act provides an action in negligence for the death or injury of a seaman. It thereby overruled *The Osceola*, 189 U. S. 158 (1903), which established that seamen could recover under general maritime law for injuries resulting from unseaworthiness, but not negligence. The Jones Act evinces no general hostility to recovery under maritime law. It does not disturb seamen's general maritime claims for injuries resulting from unseaworthiness, *Pacific Steamship Co.* v. *Peterson*, 278 U. S. 130, 139 (1928), and it does not preclude the recovery for wrongful death due to unseaworthiness created by its companion statute DOHSA. *Kernan* v. *American Dredging Co.*, 355 U. S. 426, 430, n. 4 (1958). Rather, the Jones Act establishes a uniform system of seamen's tort law parallel to that available to employees of interstate railway carriers under FELA. As the Court concluded in *Moragne*, the extension of the DOHSA wrongful death action to territorial waters furthers rather than hinders uniformity in the exercise of admiralty jurisdiction. *Moragne*, *supra*, at 396, n. 12.

There is also little question that *Moragne* intended to create a general maritime wrongful death action applicable beyond the situation of longshoremen. For one thing, *Moragne* explicitly overruled *The Harrisburg*. *Moragne*, *supra*, at 409. *The Harrisburg* involved a true seaman. *The Harrisburg*, 119 U. S., at 200. In addition, all three of the "anomalies" to which the *Moragne* cause of action was directed involved seamen. The "strangest" anomaly—that recovery was available for the wrongful death in territorial waters of a longshoreman, but not a true seaman—could only be remedied if the *Moragne* wrongful death action extended to seamen. It would be strange indeed were we to read *Moragne* as not addressing a problem that in large part motivated its result. If there has been any doubt about the matter, we today make explicit that there is a general maritime cause of action for the wrongful death of a seaman, adopting the reasoning of the unanimous and carefully crafted opinion in *Moragne*.

IV

Moragne did not set forth the scope of the damages recoverable under the maritime wrongful death action. The Court first considered that question in *Sea-Land Services, Inc.* v. *Gaudet*, 414 U. S. 573 (1974). Respondent brought a general maritime action to recover for the wrongful death of her husband, a longshoreman. The Court held that a dependent plaintiff in a maritime wrongful death action could recover for the pecuniary losses of support, services, and funeral expenses, as well as for the nonpecuniary loss of society suffered as the result of the death. *Id.*, at 591. *Gaudet* involved the death of a longshoreman in territorial waters.[1] Consequently, the Court had no need to consider the preclusive effect of DOHSA for deaths on the high seas, or the Jones Act for deaths of true seamen.

We considered DOHSA in *Mobil Oil Corp.* v. *Higginbotham*, 436 U. S. 618 (1978). That case involved death on the high seas and, like *Gaudet*, presented the question of loss of society damages in a maritime wrongful death action. The Court began by recognizing that *Gaudet*, although broadly written, applied only in territorial waters and therefore did not decide the precise question presented. *Id.*, at 622–623. Congress made the decision for us. DOHSA, by its terms, limits recoverable damages in wrongful death suits to "*pecuniary* loss sustained by the persons for whose benefit the suit is brought." 46 U. S. C. App. § 762 (emphasis added). This explicit limitation forecloses recovery for nonpecuniary loss, such as loss of society, in a general maritime action.

Respondents argued that admiralty courts have traditionally undertaken to supplement maritime statutes. The Court's answer in *Higginbotham* is fully consistent with those principles we have here derived from *Moragne:* Congress has spoken directly to the question of recoverable damages on the high seas, and "when it does speak directly to a question, the courts are not free to 'supplement' Congress' answer so thoroughly that the Act becomes meaningless." *Higginbotham*, *supra*, at 625. *Moragne* involved gap-filling in an area left open by statute; supplementation was entirely appropriate. But in an "area covered by the statute, it would be no more appropriate to prescribe a different measure of damages than to prescribe a different statute of limitations, or a different class of beneficiaries." *Higginbotham*, *supra*, at 625.

The logic of *Higginbotham* controls our decision here. The holding of *Gaudet* applies only in territorial waters, and

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[1] As with *Moragne*, the 1972 amendments to LHWCA have rendered *Gaudet* inapplicable on its facts. See *supra*, at ——; 33 U. S. C. § 905(b). Suit in *Gaudet* was filed before 1972. *Gaudet* v. *Sea-Land Services, Inc.*, 463 F. 2d 1331, 1332 (CA5 1972).

it applies only to longshoremen. *Gaudet* did not consider the preclusive effect of the Jones Act for deaths of true seamen. We do so now.

Unlike DOHSA, the Jones Act does not explicitly limit damages to any particular form. Enacted in 1920, the Jones Act makes applicable to seamen the substantive recovery provisions of the older FELA. See 46 U. S. C. App. § 688. FELA recites only that employers shall be liable in "damages" for the injury or death of one protected under the Act. 45 U. S. C. § 51. In *Michigan Central R. Co.* v. *Vreeland*, 227 U. S. 59 (1913), however, the Court explained that the language of the FELA wrongful death provision is essentially identical to that of Lord Campbell's Act, 9 & 10 Vict. ch. 93 (1846), the first wrongful death statute. Lord Campbell's Act also did not limit explicitly the "damages" to be recovered, but that Act and the many state statutes that followed it consistently had been interpreted as providing recovery only for pecuniary loss. *Vreeland*, *supra*, at 69–71. The Court so construed FELA. *Ibid.*

When Congress passed the Jones Act, the *Vreeland* gloss on FELA, and the hoary tradition behind it, were well established. Incorporating FELA unaltered into the Jones Act, Congress must have intended to incorporate the pecuniary limitation on damages as well. We assume that Congress is aware of existing law when it passes legislation. See *Cannon* v. *University of Chicago*, 441 U. S. 677, 696–697 (1979). There is no recovery for loss of society in a Jones Act wrongful death action.

The Jones Act also precludes recovery for loss of society in this case. The Jones Act applies when a seaman has been killed as a result of negligence and it limits recovery to pecuniary loss. The general maritime claim here alleged that Torregano had been killed as a result of the unseaworthiness of the vessel. It would be inconsistent with our place in the constitutional scheme were we to sanction more expansive remedies in a judicially-created cause of action in which liability is without fault than Congress has allowed in cases of death resulting from negligence. We must conclude that there is no recovery for loss of society in a general maritime action for the wrongful death of a Jones Act seaman.

Our decision also remedies an anomaly we created in *Higginbotham*. Respondents in that case warned that the elimination of loss of society damages for wrongful deaths on the high seas would create an unwarranted inconsistency between deaths in territorial waters, where loss of society was available under *Gaudet*, and deaths on the high seas. We recognized the value of uniformity, but concluded that a concern for consistency could not override the statute. *Higginbotham*, 436 U. S., at 624. Today we restore a uniform rule applicable to all actions for the wrongful death of a seaman, whether under DOHSA, the Jones Act, or general maritime law.

V

We next must decide whether, in a general maritime action surviving the death of a seaman, the estate can recover decedent's lost future earnings. Under traditional maritime law, as under common law, there is no right of survival; a seaman's personal cause of action does not survive the seaman's death. *Cortes* v. *Baltimore Insular Line, Inc.*, 287 U. S. 367, 371 (1932); *Romero* v. *International Terminal Operating Co.*, 358 U. S. 354, 373 (1959); *Gillespie*, 379 U. S., at 157.

Congress and the States have changed the rule in many instances. The Jones Act, through its incorporation of FELA, provides that a seaman's right of action for injuries due to negligence survives to the seaman's personal representative. See 45 U. S. C. § 59; *Gillespie*, *supra*, at 157. Most States have survival statutes applicable to tort actions generally, see 1 S. Speiser, Recovery for Wrongful Death 2d § 3.2, (1975 and Supp. 1989), 2 *id.*, §§ 14.1, 14.3, App. A., and admiralty courts have applied these state statutes in many instances to preserve suits for injury at sea. See, *e. g.*, *Just* v. *Chambers*, 312 U. S. 383, 391 (1941). See also *Kernan* v. *American Dredging Co.*, 355 U. S. 426, 430, n. 4 (1958); *Kossick* v. *United Fruit Co.*, 365 U. S. 731, 739 (1961); *Gillespie*, *supra*, at 157; Comment, Application of State Survival Statutes in Maritime Causes, 60 Colum. L. Rev. 534, 535, n. 11 (1960); Nagy, The General Maritime Law Survival Action: What are the Elements of Recoverable Damages?, 9 U. Haw. L. Rev. 5, 27 (1987). Where these state statutes do not apply,[2] however, or where there is no state survival statute, there is no survival of unseaworthiness claims absent a change in the traditional maritime rule.

Several Courts of Appeals have relied on *Moragne* to hold that there is a general maritime right of survival. See *Spiller* v. *Thomas M. Lowe, Jr., & Assocs., Inc.*, 466 F. 2d 903, 909 (CA8 1972); *Barbe* v. *Drummond*, 507 F. 2d 794, 799–800 (CA1 1974); *Law* v. *Sea Drilling Corp.*, 523 F. 2d 793, 795 (CA5 1975); *Evich* v. *Connelly*, 759 F. 2d 1432, 1434 (CA9 1985). As we have noted, *Moragne* found that congressional and state abrogation of the maritime rule against wrongful death actions demonstrated a strong policy judgment, to which the Court deferred. *Moragne*, 398 U. S., at 388–393. Following this reasoning, the lower courts have looked to the Jones Act and the many state survival statutes and concluded that these enactments dictate a change in the general maritime rule against survival. See, *e. g.*, *Spiller*, *supra*, at 909; *Barbe*, *supra*, at 799–800, and n. 6.

Miles argues that we should follow the Courts of Appeals and recognize a general maritime survival right. Apex urges us to reaffirm the traditional maritime rule and overrule these decisions. We decline to address the issue, because its resolution is unnecessary to our decision on the narrow question presented: whether the income decedent would have earned but for his death is recoverable. We hold that it is not.

Recovery of lost future income in a survival suit will, in many instances, be duplicative of recovery by dependents for loss of support in a wrongful death action; the support dependents lose as a result of a seaman's death would have come from the seaman's future earnings. Perhaps for this reason, there is little legislative support for such recovery in survival. In only a few States can an estate recover in a survival action for income decedent would have received but for death.[3] At the federal level, DOHSA contains no survival provision. The Jones Act incorporates FELA's survival provision, but, as in most States, recovery is limited to losses suffered during the decedent's lifetime. See 45 U. S. C. § 59; *Van Beeck* v. *Sabine Towing Co.*, 300 U. S. 342, 347 (1937); *St. Louis, I. M. & S. R. Co.* v. *Craft*, 237 U. S. 648, 658 (1915).

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[2] In *Offshore Logistics, Inc.* v. *Tallentire*, 477 U. S. 207, 215, n. 1 (1986), we declined to approve or disapprove the practice of some courts of applying state survival statutes to cases involving death on the high seas.

[3] See Mich. Comp. Laws §§ 600.2921, 600.2922 (1986); *Olivier* v. *Houghton County St. R. Co.*, 134 Mich. 367, 368–370, 96 N. W. 434, 435 (1903); 42 Pa. Cons. Stat. § 8302 (1988); *Incollingo* v. *Ewing*, 444 Pa. 263, 307–308, 282 A. 2d 206, 229 (1971); Wash. Rev. Code § 4.20.060 (1989); *Balmer* v. *Dilley*, 81 Wash. 2d 367, 370, 502 P. 2d 456, 458 (1972). See generally 2 S. Speiser, Recovery for Wrongful Death 2d § 14.7, App. A (1975 and Supp. 1989). Speiser explains that many states do not allow any recovery of lost earnings in survival, and that among those that do, recovery is generally limited to earnings lost from the time of injury to the time of death. *Ibid.*

This state and federal legislation hardly constitutes the kind of "wholesale" and "unanimous" policy judgment that prompted the Court to create a new cause of action in *Moragne*. See *Moragne*, *supra*, at 388, 389. To the contrary, the considered judgment of a large majority of American legislatures is that lost future income is not recoverable in a survival action. Were we to recognize a right to such recovery under maritime law, we would be adopting a distinctly minority view.

This fact alone would not necessarily deter us, if recovery of lost future income were more consistent with the general principles of maritime tort law. There are indeed strong policy arguments for allowing such recovery. See, *e. g.*, R. Posner, Economic Analysis of Law 176–181 (3d ed. 1986) (recovery of lost future income provides efficient incentives to take care by insuring that the tortfeasor will have to bear the total cost of the victim's injury or death). Moreover, Miles reminds us that admiralty courts have always shown a special solicitude for the welfare of seamen and their families. "[C]ertainly it better becomes the humane and liberal character of proceedings in admiralty to give than to withhold the remedy." *Moragne*, *supra*, at 387, quoting Chief Justice Chase in *The Sea Gull*, 21 F. Cas. 909, 910 (No. 12,578) (CC Md. 1865). See also *Gaudet*, 414 U. S., at 583.

We are not unmindful of these principles, but they are insufficient in this case. We sail in occupied waters. Maritime tort law is now dominated by federal statute, and we are not free to expand remedies at will simply because it might work to the benefit of seamen and those dependent upon them. Congress has placed limits on recovery in survival actions that we cannot exceed. Because this case involves the death of a seaman, we must look to the Jones Act.

The Jones Act/FELA survival provision limits recovery to losses suffered during the decedent's lifetime. See 45 U. S. C. § 59. This was the established rule under FELA when Congress passed the Jones Act, incorporating FELA, see *St. Louis, I. M. & S. R. Co.*, *supra*, at 658, and it is the rule under the Jones Act. See *Van Beeck*, *supra*, at 347. Congress has limited the survival right for seamen's injuries resulting from negligence. As with loss of society in wrongful death actions, this forecloses more expansive remedies in a general maritime action founded on strict liability. We will not create, under our admiralty powers, a remedy disfavored by a clear majority of the States and that goes well beyond the limits of Congress' ordered system of recovery for seamen's injury and death. Because Torregano's estate cannot recover for his lost future income under the Jones Act, it cannot do so under general maritime law.

VI

Cognizant of the constitutional relationship between the courts and Congress, we today act in accordance with the uniform plan of maritime tort law Congress created in DOHSA and the Jones Act. We hold that there is a general maritime cause of action for the wrongful death of a seaman, but that damages recoverable in such an action do not include loss of society. We also hold that a general maritime survival action cannot include recovery for decedent's lost future earnings. Accordingly, the judgment of the Court of Appeals is

Affirmed.

JUSTICE SOUTER took no part in the consideration or decision of this case.

ALLAIN F. HARDIN, New Orleans, La. (A. REMY FRANSEN JR., and FRANSEN & HARDIN on the briefs) for petitioner; GERARD T. GELPI, New Orleans, La. (RANDALL C. COLEMAN III, C. GORDON STARLING JR., GELPI, SULLIVAN, CARROLL & LABORDE, GRAYDON S. STARING, and LILLICK & CHARLES, on the briefs) for respondents.

U.S. Department of Transportation
United States Coast Guard

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NAVIGATION AND VESSEL INSPECTION CIRCULAR NO.

Subj: Fire Drills and On-Board Training

1. PURPOSE. The purpose of this Circular is to call attention to and endorse IMO MSC/Circular 544, "Fire Drills and On-Board Training," which was approved by the Maritime Safety Committee (MSC) on 5 June 1990 pending introduction into the SOLAS Convention.

2. BACKGROUND. IMO has been putting great emphasis on the role of human factor considerations. To this end, Assembly Resolution A.647(16) was adopted in 1989 to provide guidelines to ship owners and operators for improving operating practices and developing company policies on safe ship operation and pollution prevention. This in turn has been endorsed by the Coast Guard in NVIC 1-90. In addition, IMO issued an information circular MSC/Circ.544 in 1990, to provide recommendations and guidance for the proper conduct and recording of fire drills and on-board crew training.

3. DISCUSSION.

   a. The U.S. Coast Guard endorses the proposed amendments for drills and on-board training set out in MSC/Circ.544. Use of these recommendations by ship owners and operators in conjunction with IMO Resolution A.647(16) will increase the level of safety aboard ships, reduce pollution, and improve the overall preparedness of the crews in the event of an emergency.

   b. Owners and operators can improve the safety of their vessels with company policy which states the importance of vessel safety, and then putting company policy into practice by holding drills and on-board training as delineated in MSC/Circ.544.

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NON-STANDARD DISTRIBUTION: (See page 2.)

4. IMPLEMENTATION.

a. Officers in Charge, Marine Inspection are urged to bring enclosure (1) to the attention of appropriate individuals in the marine industry in their zones.

b. Owners and operators should implement the recommendations of enclosure (1) in order to enhance the safety of their vessels.

J. D. SIDES
Rear Admiral, U.S. Coast Guard
Chief, Office of Marine Safety,
Security and Environmental Protection

Encl: (1) MSC/Circ.544, "Fire Drills and On-Board Training"

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Encl. (1) to NVIC
MSC/Circ.544
19 July 1990

Ref. T1/2.04

FIRE DRILLS AND ON-BOARD TRAINING

1 The Organization has been informed that in a number of recent passenger ship fires, some of which have resulted in a high number of fatalities, the crew's performance during fire emergencies has been inadequate.

2 On-board personnel should receive periodic training and drills to become well versed in fire-fighting and fire safety measures. Resolution A.437(XI) "Training of crews in fire-fighting" contains information on land-based fire-fighting training for marine personnel. Land training is essential, but by itself insufficient. The crew should know how to deal with fires on their ship because even the location of fire-fighting equipment on "sister" ships may vary from ship to ship. The common practice of transferring crew members from one ship to another at frequent intervals means that without on-board training and drills they may not become sufficiently familiar with the fire safety features of the ship on which they are serving.

3 Current regulations in chapter II-2 of the 1974 SOLAS Convention, as amended, do not require on-board training or drills for fire emergencies and although chapter III requires that fire drills be held at monthly intervals in cargo ships, at weekly intervals in passenger ships, and lays down various other requirements regarding the conduct and recording of fire drills (see regulations 18, 25, 51 and 52), its detailed requirements for fire drills are not considered sufficient.

4 The Maritime Safety Committee, at its fifty-eighth session, agreed that the SOLAS Convention, as amended, should be further amended to contain a new regulation covering on-board training and fire drills.

5 Further, the Maritime Safety Committee, recognizing the need to increase the state of awareness on board ships, instructed the Sub-Committee to prepare appropriate guidance for Governments and owners and operators in the conduct of on-board fire training and fire drills.

6 Annex 1 shows amendments to the Convention concerning fire drills and on-board training approved by the Committee, at its fifty-eighth session. Annex 2 provides guidance for incorporating these requirements into the crew's routine through minimum standards for on-board fire training and drills.

W/6253X/EWP

7 Member Governments are invited to give effect, as early as possible, to the draft new regulation to the 1974 SOLAS Convention, as amended, as contained in annex 1, pending the adoption of an amendment to the Convention, and additionally to encourage shipowners, ships' crews and port fire brigades to co-operate in practising fire drills in port locations to ensure more efficient fire-fighting arrangements at such locations.

***

ANNEX 1

DRAFT NEW REGULATION OF THE 1974 SOLAS CONVENTION

Fire drills and on-board training

1 Fire drills

1.1 Each member of the crew shall participate in at least one fire drill every month. A drill shall take place within 24 h of the ship leaving port if more than 25% of the crew have not participated in a fire drill on board that particular ship during the previous month. The Administration may accept other arrangements that are at least equivalent for those classes of ships for which this is impracticable.

1.2 In passenger ships, a fire drill with the participation of the crew shall take place weekly.

1.3 Each fire drill shall include:

.1 reporting to stations and preparing for the duties described in the fire muster list required by regulation III/8;

.2 starting of a fire pump, using at least the two required jets of water to show that the system is in proper working order;

.3 checking fireman's outfit and other personal rescue equipment;

.4 checking the relevant communication equipment;

.5 checking the operation of watertight doors, fire doors and fire dampers;

.6 checking the necessary arrangements for subsequent abandoning of the ship.

1.4 Fire drills shall, as far as practicable, be conducted as if there were an actual emergency.

1.5 Fire drills should be planned in such a way that due consideration is given to regular practice in the various emergencies that may occur depending on the type of ships and the cargo.

2 On-board training and instructions

On-board training and instruction in the use of the ship's fire-extinguishing appliances shall be given at the same intervals as the drills. Individual instruction may cover different parts of the ship's fire-extinguishing appliances, but all the ship's fire-extinguishing appliances shall be covered within a period of two months. Each member of the crew shall be given the necessary instructions for their assigned duty.

3 Availability of fire-extinguishing appliances

3.1 Fire-extinguishing appliances shall be kept in good order and be available for immediate use at all times.

3.2 The equipment used during drills shall immediately be brought back to fully operational condition and any faults and defects discovered during the drills shall be remedied as soon as possible.

4 Records

The date and details of the fire drills shall be recorded as prescribed in regulation III/18.5.

***

ANNEX 2

MINIMUM STANDARDS FOR ON-BOARD FIRE TRAINING AND DRILLS

1 Owners and operators are urged to take measures to improve crew performance during shipboard emergencies. The human factor is very important. Each member of the crew should be instructed to recognize the importance of the emergency organization procedure and should take their role in this organization procedure seriously. Guidance should be given to each employee crew member to highlight the importance of this philosophy.

Fire drills

2 An emergency organization procedure should be established to fight fires and deal with abandon ship emergencies, which should include all members of the crew and there should be one organizational structure for both fire and abandon ship situations, since both may occur during the same incident. This procedure should include:

.1 conduct of fire drills as if an actual emergency existed, all hands reporting to their respective stations prepared to perform the duties specified in the station bill;

.2 starting the fire pumps using a sufficient number of outlets to show that the system is in proper working order;

.3 bringing all rescue and safety equipment from the emergency equipment lockers and designated crew members demonstrating their ability to use the equipment;

.4 operating all watertight doors and all fire doors; and

.5 making an entry into the log for each drill, including the date and hour, length of time of the drill, the number of lengths of hose used and a statement of the condition of all fire equipment, watertight door mechanisms and valves. If at any time the required fire drills are not held, or only partial drills are held, an entry should be made stating the circumstances and extent of the drills held.

On-board training

3 On-board training should include:

.1 instruction on:

.1.1 the purpose and meaning of the ship's station bill, fire control plans and muster stations;

.1.2 each individual's assigned duties and the equipment issued;

.1.3 the meaning of the ship's many alarms;

.2 on-board refresher training, including lectures, training books and equipment demonstrations, including warnings on ways to prevent fires (good housekeeping, smoking, etc.), fire hazards from common shipboard supplies (paints, cooking oil, lubricants, etc.) and first aid techniques (burns, broken bones, cardiopulmonary resuscitation);

.3 learning to work within the emergency organization/procedure, including working with individual's superiors, his co-workers and his subordinates, as applicable, and for those in charge exercising leadership;

.4 instruction on the purpose of the ship's passive fire protection design features and the purpose and requirements of the shipboard fire patrol;

.5 location and operation of shut-downs for ventilation fans, fuel and lubricants; the manual fire alarm boxes and the ship's fire-fighting equipment; and the fire doors and ventilation dampers;

.6 instruction and drills on extinguishing fires including:

.6.1 how a single crew member can extinguish small fires;

.6.2 special measures needed to combat fires involving dangerous goods, electrical installations and liquid hydrocarbons;

.6.3 use of the ship's fire-fighting equipment (e.g. fire hoses, fire nozzles, portable and semi-portable fire extinguishers and fire axes) including any post-drill clean-up and equipment stowage;

.6.4 dangers from fire-fighting systems, e.g. carbon dioxide system discharges;

.6.5 use of breathing apparatus, fireman's outfits and personal equipment, including lifeline and harness;

.7 instruction on:

.7.1 means of escape from any location in the ship, including all stairways, ladders and emergency exits;

.7.2 procedures covering the search and evacuation of passengers from all locations in the ship;

.7.3 the importance of closing doors after searching staterooms, not leaving fire hoses in doorways and not using elevators;

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.8 location of first-aid equipment and of medical facilities;

.9 how to transport injured individuals;

.10 first-aid techniques, including treatment for burns, bleeding and broken bones and cardiopulmonary resuscitation.

Availability of fire-extinguishing appliances

4 The following equipment should be tested periodically:

.1 detection systems, alarm systems, walkie-talkies, public address and other communications systems;

.2 fixed fire-extinguishing connections (e.g. fire hydrants);

.3 watertight doors and self-closing fire doors;

.4 pressure of portable and semi-portable fire extinguishers and shut-downs for ventilation, fuel and lubrication systems;

.5 fire pumps, emergency fire pump, emergency generator and the pressurized water tank, as appropriate;

.6 international shore connections;

.7 fire main system, hoses and nozzles;

.8 inventory and condition of the contents of repair lockers.

However, only a portion of each type of fire-fighting and fire-detection equipment, e.g. some and not all of the fire hoses, need to be tested during each drill. A plan for periodically exercising each piece of equipment should be developed.

Records

5 The date and details of the fire drills should be recorded, as prescribed in SOLAS regulation III/18.5.

6 Records of crew members who participated in the training sessions and drills should be kept by date. An assessment of new crew members should be made prior to departure and the main office notified of their training status.

7 Records of the equipment tested at each drill should be kept by date.

U.S.Department of Transportation
United States Coast Guard

APRIL 1991

Boating Safety Circular 71

COAST GUARD APPROVAL IS NOT A PRODUCT ENDORSEMENT

Along with all the boat shows in major cities this time of year we get the usual number of enterprising marine product inventors who mistakenly believe that getting an item of equipment "Coast Guard Approved" will help boost sales. Many people mistakenly believe Coast Guard approval is a product endorsement, which may be obtained for any device, as long as there is a potential for improving boating safety. Actually, the Coast Guard approval process involves very different criteria.

A manufacturer's inability to obtain . . . approval for a "pocket-size folding boathook" . . . does not indicate that such devices do not improve boating safety; only that there are no Coast Guard regulations requiring them on any vessel

First of all, products which may receive Coast Guard approval are limited to various items of lifesaving, firefighting, pollution abatement and miscellaneous equipment required to be used aboard U.S. registered vessels.

The Federal equipment carriage requirements are set forth in the Code of Federal Regulations. Subchapter S of Title 33 - Boating Safety, for example, contains the Coast Guard regulations covering the minimum Federal equipment carriage requirements for recreational boats. Those regulations require recreational boaters to carry Personal Flotation Devices and Visual Distress Signals. By definition, a "Personal Flotation Device" means a device that is approved by the Commandant, and Visual Distress Signals, according to the regulations, must be "of an approved type."

Subchapter C of Title 46 - Uninspected Vessels - contains the operator regulations covering fire extinguishing equipment, backfire flame control and ventilation. Fire extinguishers must also "be of an approved type" and most backfire flame arrester installations must be specifically approved by the Commandant of the Coast Guard.

The purpose of Coast Guard approval is not to provide marketing assistance to manufacturers, but to provide information to owners about safety equipment which has been found to meet the regulatory requirements, i.e., approved equipment has been determined to be in compliance with Coast Guard standards relating to performance, construction or materials. Standards for Coast Guard approved equipment are developed in the same way as they are for recreational boats — through the notice and public comment procedure in the Federal Register.

According to the summary in a Federal Register notice published January 9, 1991, for example, *The Coast Guard seeks to establish standards and procedures for approving gaseous-type fixed fire-extinguishing systems for pleasure craft and other uninspected vessels. Its current rules do allow certain fixed systems, but the ones they allow are too complex and expensive for most uninspected vessels."*

The Coast Guard establishes technical specifications and testing requirements for approved equipment. Equipment manufacturers are responsible for having the testing done, often by an independent laboratory. Coast Guard engineers from the Office of Marine Safety, Security and Environmental Protection evaluate the design features of the device and the laboratory's test report.

If the device passes the tests and meets all of the other requirements, the Coast Guard issues a formal approval certificate with a number that the manufacturer will affix to each approved device of the same design. Coast Guard Approved fire extinguishers, for example, are identified by the following marking on the label: "Marine Type USCG Approved, Size . . ., Type . . .,M162.028/ ... /," etc.

Inside:

After a design is formally approved, the manufacturer conducts certain inspections and tests to make sure that production runs of approved items continue to meet the requirements for the device that was originally approved. If the manufacturer changes any part of an approved item, the Coast Guard evaluates the changes before they are included in any device which is claimed to be Coast Guard approved. Sometimes this means that additional testing is required.

In order to keep approvals and certifications current, most are limited to a definite period of time -- usually five years. If there have been no changes in Coast Guard requirements and a manufacturer still produces an item of equipment without modification, the Coast Guard normally grants a five year extension on request.

Periodically, the Coast Guard publishes a book, "Equipment Lists" (COMDTINST M16714.3C is the latest issue) which identifies all of the equipment approved or certified by the Commandant of the Coast Guard for use on commercial vessels and recreational boats. Copies are available from the Superintendent of Documents, U.S. Government Printing Office.

The object of the Coast Guard approval process is to develop safety equipment regulations based on an expected benefit which is justified by the cost. A manufacturer's inability to obtain Coast Guard approval for a "pocket-size folding boathook" or some other such product does not indicate that such devices do not improve boating safety; only that there are no Coast Guard regulations requiring them on any vessel.

Editor's Note: The material for the previous article came from: Coast Guard Approval -- What Does It Mean?" by R.L. Markle which appeared in the Nov/Dec 1988 issue of *Proceedings of the Marine Safety Council*

VHF RADIO LICENSES REQUIRED

Because of hoaxes, interference, and other radio communications problems, the Federal Communications Commission (FCC) and the Coast Guard have agreed to cooperate in a joint effort to improve maritime safety involving the use of radio communications by enforcing existing regulations and increasing public awareness of the rules involving radio.

Problems often occur because mariners are unaware that maritime radio licensing and usage rules even exist. The FCC has agreed to prosecute radio violations based upon evidence supplied by the Coast Guard.

Under 47 CFR 80.405, operators of VHF maritime radios, VHF handheld radios, EPIRBs, radar units or radiotelephones, must have a clearly legible copy of a ship's station license "posted at the principal control point of each station" or, if it cannot be posted, "kept where it will be readily available for inspection." "If a copy is posted, it must indicate the location of the original." CB radios, cellular telephones and receive-only equipment are exempted.

Beginning in October 1991, Coast Guard boarding officers will include a check for the presence of an FCC ship's station license on all boarded vessels equipped with maritime radio and, in the case of no license, will look for evidence that radio equipment was operated, e.g., the boater was heard over VHF radio or observed transmitting. Violations will be reported to the FCC.

Ship's station license applications (FCC Form 506) and information about the operation of maritime radio may be obtained from any FCC field office (listed in the phone books of most major cities). The location of the nearest FCC field office is also available through the Boating Safety Hotline (800-368-5647).

Failure to obtain the proper FCC licensing can result in a criminal misdemeanor with penalties up to $10,000, one year in prison or both.

STANDARDIZATION OF HOLDING TANK PUMPOUT FITTINGS

All vessels which are equipped with an installed toilet system must have a Type I, II or III Marine Sanitation Device (MSD) certified to meet Coast Guard standards attached to the toilet. When the MSD regulations were published in 1975, the intention was to eventually require all vessels to be equipped with a Type II or Type III MSD; however, because of their size, weight and added power requirements, few Type II MSDs are available for small boats (65 feet or less in length).

On January 3, 1977 the Coast Guard published amendments to the MSD regulations:

"§159.12 Certification of certain Type III devices.

(a) The purpose of this section is to provide regulations for certification for certain Type III devices.

(b) Any Type III device is considered certified under this section if:

(1) It is used solely for the storage of sewage and flushwater at ambient air pressure and temperature; and

(2) It is in compliance with §159.53(c).

(c) Any device certified under this section need not comply with the other regulations in this part except as required in paragraphs (b)(2) and (d) of this section and may not be labeled under §159.16.

(d) Each device certified under this section which is installed aboard an inspected vessel must comply with §159.97."

An accidental effect of the amendments was to remove other requirements concerning holding tanks, particularly the need for standardized fittings intended for the removal of wastes at marine pumpout stations. As a result, pumpout facility operators have had to

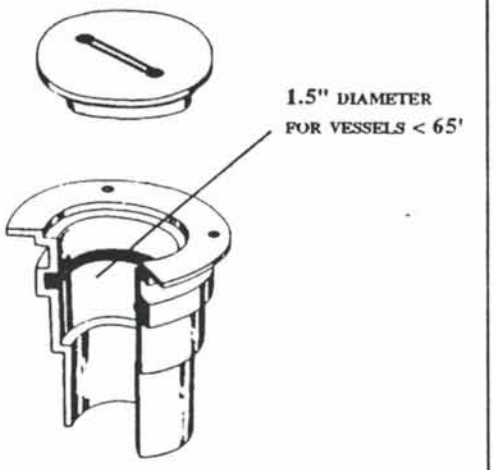
carry a number of different sized fittings and change fittings to fit the particular vessel, or use a universal fitting which increases the potential for accidental overboard spillage of wastes and odor seepage.

When the MSD regulations were published, the Coast Guard's original intent was to require the use of standardized sewage discharge fittings on all vessels:

"§159.87 Removal fittings.
If sewage removal fittings are provided with the device, they must be of either 1.5 inch or four inch nominal pipe size."

The 1.5 inch fittings were intended for use aboard small boats (65 feet or less in length) and the four inch fittings aboard larger vessels. The expected types of acceptable fittings included threaded, flanged or quick-disconnect fittings

Improved water quality in our lakes, rivers, bays and other estuaries is in everyone's best interests. Efforts are underway to increase the available numbers of marine pumpout facilities and to improve the ease in which wastes are removed from holding tanks. When an opportunity arises, the Coast Guard plans to propose additional amendments to the MSD regulations which will reinstate the requirement for Type III devices to comply with 33 CFR 159.87. In the interim, all boat manufacturers and owners are urged to begin installing holding tank pumpout fittings with inside diameters which are consistent with the intent of the existing regulations. This in turn will enable the industry manufacturing holding tank pumpout fittings to standardize accordingly.



HOLDING TANK PUMPOUT FITTING

FUEL TANK SELECTOR VALVES

Reports from standards personnel from the Coast Guard Marine Safety Office, Los Angeles/Long Beach indicate that some builders of boats with inboard gasoline engines are installing electric solenoid fuel tank selector valves which do not meet the ignition-protection requirements in 33 CFR 183.410(a) or the fire test in 33 CFR 183.590.

Some inboard boats with dual fuel tank installations have a "T" in their fuel distribution lines designed to enable even withdrawal of fuel from both tanks. Many others utilize manual or electric switching fuel valves that designate which tank supplies the fuel inlet on the engine(s).

Some builders in the Los Angeles/ Long Beach area who utilize an *electric* fuel selector valve for this purpose are installing valves intended for the automotive and recreational vehicle market. The particular fuel tank selector valves installed by these manufacturers were not designed for use in marine applications.

Coast Guard regulations require the boat manufacturer to certify that a boat complies with applicable Coast Guard safety standards when sold to the public. In so doing, the boat manufacturer certifies that all of the components on the boat meet the requirements of the regulations.

All boat manufacturers are encouraged to obtain a similar certification or documentation from suppliers of electrical and fuel system components (such as manual and electric fuel tank selector valves), that representative samples of such components have been tested, and will comply with applicable portions of the Coast Guard Electrical and Fuel System Standards.

COMPARING A CME TO THE MINIMUM EQUIPMENT CARRIAGE REQUIREMENTS

From time to time we receive inquiries from boat owners and operators who were surprised to discover that although they carried the minimum number of PFDs, fire extinguishers and Visual Distress Signals required by the Federal regulations, their boats did not pass a Coast Guard Auxiliary Courtesy Marine Examination (CME). Perhaps they were influenced by the fact that some insurance companies reportedly offer reduced rates to owners of boats which have passed the Auxiliary CME.

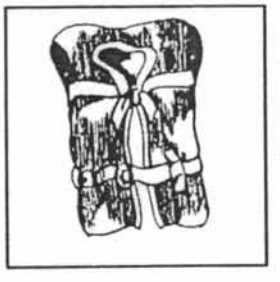
A Courtesy Marine Examination is a check of a boat's safety related equipment by specially trained members of the Coast Guard Auxiliary with the consent of a boat owner or operator. The CME covers both the requirements of Federal and State law and certain additional criteria for safety which have been adopted by the Auxiliary. Boats meeting the Courtesy Marine Examination criteria are awarded an Auxiliary CME "Seal of Safety" decal for the current year.

For the benefit of readers who think their boat's are up to snuff, here's a look at just what the differences are between the minimum Federal equipment carriage requirements and those the Auxiliary uses during a Courtesy Marine Examination.

PFDs

MINIMUM FEDERAL REQUIREMENT

Under the Federal regulations, boats less than 16 feet in length must have one Type I, II, III or IV PFD of a suitable size for each person on board. Boats 16 feet or longer in length must have one Type I, II, or III (wearable) PFD* of a suitable size for each person on board and one Type IV (throwable).



CME REQUIREMENT

For a CME decal boats less than 16 feet in length must be equipped with at least two PFDs, regardless of the number of persons on board. Boats 16 feet or longer in length must have a minimum of three PFDs, two wearable and one throwable, regardless of the number of persons on board. Wearable PFDs must be readily accessible* and throwable PFDs must be immediately available for use.

*Because they come in sizes designed to fit the user, a Type V Personal Flotation Device (hybrid PFD) must be worn by the intended user

Fire Extinguishers

MINIMUM FEDERAL REQUIREMENT

Under the Federal regulations, all motorboats must carry the minimum number of approved hand portable fire extinguishers shown below. Motorboats powered by outboards which are less than 26 feet in length and not carrying passengers for hire need not carry them if their construction will not permit the entrapment of explosive flammable gases or vapors.

CME REQUIREMENT

CME requirements exceed the Federal regulations by requiring that all vessels carry a minimum of one B-1 fire extinguisher. Only sailboats less than 16 feet without mechanical propulsion are exempt. To be counted, all HALON extinguishers must have an inspection tag showing that they were inspected within six months of the CME.

VESSEL LENGTH	NO FIXED SYSTEM	WITH FIXED SYSTEM
Less than 26 ft.	1 - B-I	0* (*1 - B-I for CME)
26 ft. to less than 40 ft.	2 - B-I or 1 - B-II	1 - B-I
40 ft. to 65 ft.	3 - B-I or 1 - B-I and 1 - B-II	2 - B-I or 1 - B-II

Numbering

MINIMUM FEDERAL REQUIREMENT

A boat's number must be permanently attached to each side of the forward half of the vessel. Characters read left to right, are plain block letters which contrast with the backgound color, are distinctly visible and legible and no less than 3 inches in height. A space or dash must separate letters from numbers.

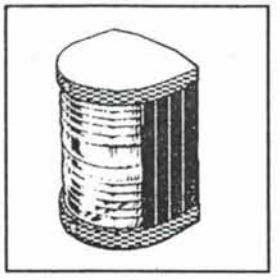
CME REQUIREMENT

CME requirements are the same as the Federal requirements.

Navigation Lights

MINIMUM FEDERAL REQUIREMENT

The Federal regulations do not require a boat that is operated only in the daytime to have navigation lights. See the "Navigation Rules, International - Inland" for a complete explanation of the navigation light requirements.



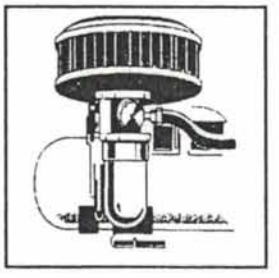
CME REQUIREMENT

If a boat less than 16 feet in length is equipped with navigation lights, they must be properly located. All other vessels must have operable navigation lights of proper configuration to receive a CME decal.

Backfire Flame Arrester

MINIMUM FEDERAL REQUIREMENT

According to Federal regulations, gasoline engines installed in a vessel after April 25, 1940, except outboard motors, must be equipped with an acceptable means of backfire flame control. The device must be suitably attached to the air intake with a flame-tight connection and is required to be Coast Guard approved.



CME REQUIREMENT

Under the CME requirements, all gasoline motorboats, regardless of date of construction or engine installation, must be equipped with a suitable means of backfire flame control.

Dewatering Device

MINIMUM FEDERAL REQUIREMENT

The Federal regulations do not require a bucket or other bailer on unpowered boats or electric bilge pumps on boats with engines; however, they are items of recommended equipment.

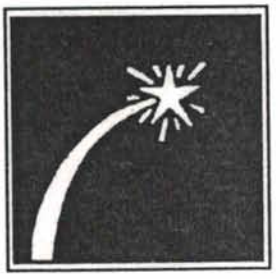
CME REQUIREMENT

All boats must carry at least one effective manual dewatering device (bucket, bailer, scoop, etc.). *This requirement is in addition to* any installed electrical bilge pump that the vessel may have on board. An installed electrical or mechanical bilge pump is not a requirement for award of the CME decal; however, if such a pump is installed it must be in satisfactory operating condition.

Visual Distress Signals

MINIMUM FEDERAL REQUIREMENT

All recreational boats used on coastal waters, the Great Lakes, territorial seas and those waters connected directly to them, up to a point where a body of water is less than two miles wide, must be equipped with Coast Guard approved Visual Distress Signals. Vessels owned in the U.S. operating on the high seas, are also required to carry approved Visual Distress Signals.



CME REQUIREMENT

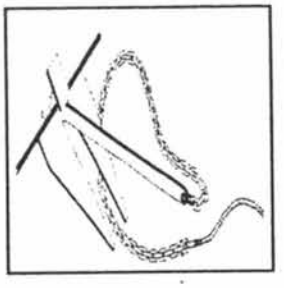
Same as Federal requirements except for vessels operating on inland waters, the Auxiliary CME requires some means of making a suitable day and night visual distress signal. Recommended equipment could include one or more of the following:

NIGHT	DAYLIGHT
Strobe Light	Signal Mirror
Flashlight	Red or Orange Flags
Lantern	

Anchor and Anchor Line

MINIMUM FEDERAL REQUIREMENT

The Federal regulations do not require carriage of an anchor or anchor line; however, they are recommended equipment.



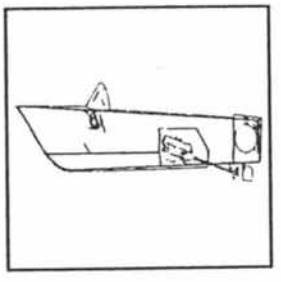
CME REQUIREMENT

To qualify under a CME, the boat must be equipped with an adequate anchor and line of suitable size and length for the particular locality.

Ventilation

MINIMUM FEDERAL REQUIREMENT

The Federal requirements for both natural ventilation and powered ventilation systems are dependent upon when the boat was built, and whether or not a compartment contains an engine, a fuel tank, or an electrical component which is not ignition-protected. See Boating Safety Circular 69 for a complete explanation of the ventilation requirements.



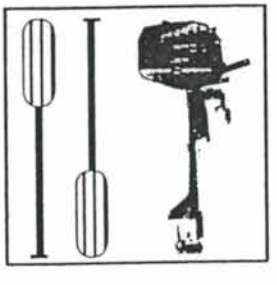
CME REQUIREMENT

CME requirements are the same as the Federal requirements.

Alternate Means of Propulsion

MINIMUM FEDERAL REQUIREMENT

The Federal regulations do not require an alternate means of propulsion; however, an oar or paddle is recommended for vessels which can be propelled by such equipment.



CME REQUIREMENT

All boats less than 16 feet in length must carry a second method of propulsion. A paddle, oar or other suitable device meets this requirement. If an alternate means of *mechanical* propulsion is carried (another outboard or trolling motor), it must use a different fuel tank and starting source from those which are used by the main propulsion motor.

MINIMUM FEDERAL REQUIREMENT	Sound Signals	CME REQUIREMENT
Vessels less than 12 meters (39.4 ft.) are required to carry some means of making an efficient sound signal. Vessels 12 meters (39.4 ft) or more in length are required to carry a power horn or power whistle capable of producing a four second blast, and a bell measuring at least 7.875" at the mouth.		CME requirements are the same as the Federal requirements.

MINIMUM FEDERAL REQUIREMENT	Registration/Documentation Papers	CME REQUIREMENT
The owner/operator of a vessel must carry a valid certificate of number whenever the vessel is in use. The person in command of a documented vessel must have the Certificate of Documentation issued to that vessel on board unless the Certificate is being submitted to a documentation officer.		CME requirements are the same as the Federal requirements.

Miscellaneous CME Requirements

Fuel Systems: Portable fuel tanks (7 gal. capacity or less) must be constructed of sturdy, non-breakable material an in safe condition. Tanks must be free of excessive corrosion and must not leak. Any vents must be capable of being closed and the tank must have a vapor-tight, leak-proof cap.

All tanks must be properly secured in the boat to prevent excessive movement. Permanent fuel tanks (over 7 gallons capacity) and fuel lines must be free of excessive corrosion and not leak. Permanent fuel tanks must be grounded. The fuel fill pipe must be securely fitted to the fuel fill plate and located outside of a closed compartment where any spilled fuel will be directed overboard. A vent terminating outboard of the hull and compartments must lead to each permanent fuel tank.

Note: <u>According to CME requirements, there is no such thing as a portable fuel tank larger than 7 gallons. Therefore, any fuel tank larger than 7 gallons would have to meet all of the requirements for *permanent tanks.*</u>

Seaworthiness: The boat must be free from fire hazards, in good overall condition with the bilges reasonably clean and the visible hull and structures generally sound. The maximum persons capacity and maximum horsepower capacity must not be exceeded.

Note: <u>Some States consider carrying more people or more horsepower than is displayed on the capacity label prima facie evidence of negligent operation and some insurance companies will deny insurance to owners of outboard powered boats which are overpowered.</u>

Galley appliances and their fuel tanks must be properly secured and the system must not leak (no odor of fuel when the system is turned on). There must be no flammable material in the vicinity of stoves or heaters. Adequate ventilation must be provided for appliances and their fuel supplies. Appliance shut-off valves must be readily accessible. Only common appliance fuels must be used. Due to their volatile nature, gasoline, naptha or benzene are prohibited for use as appliance fuels if a boat is to pass a CME.

Wiring must be in good condition and properly installed. No exposed areas or deteriorated insulation is permitted. The electrical system must be protected by fuses or manually reset circuit breakers. Switches and fuse panels must be protected from rain or spray. Batteries must be secured to prevent movement and the terminals covered to prevent accidental arcing.

State requirements: The owner/operator may be required to comply with additional regulations specific to the State in which the vessel is registered or operated. Therefore, the boat will be checked against the requirements of the *State in which the CME is being conducted.*

COMMONWEALTH of VIRGINIA

Department of Game and Inland Fisheries

4010 WEST BROAD STREET
BOX 11104
RICHMOND, VA 23230
1-800-252-7717 (V/TDD)
(804) 367-1000 (V/TDD)

October 10, 1990

Mr. Donald J. Kerlin, Chief
Recreational Boating Product
Assurance Branch (G-NAB-6)
Auxiliary, Boating, and Consumer
Affairs Division
United States Coast Guard
Washington, D. C. 20593

Dear Mr. Kerlin:

As a result of our correspondence in June regarding a Manufacturer's Certificate of Origin for a Vessel, NASBLA's Numbering and Titling Committee researched the information required in this document by those states which issue certificates of title to vessels.

Enclosed is a copy of the newly designed Manufacturer's Certificate of origin recommended by the Numbering and Titling Committee to NASBLA at its annual Conference in Panama City, Florida on October 2, 1990.

The Numbering and Titling Committee request your assistance in providing a sample of this MCO to all recreational boat builders and urge that all involved in boat building use it as a model for designing their own company's MCO.

Your assistance in this matter is greatly appreciated.

Sincerely,

Nancy H. Jamerson

Nancy H. Jamerson
Boating Law Administrator

j
cc: John Simmons, Chairman, Numbering & Titling Committee

Enclosure

Equal Opportunity Employment, Programs and Facilities

MANUFACTURER'S CERTIFICATE OF ORIGIN
FOR A VESSEL
SOLD IN THE STATE OF_____

The undersigned manufacturer hereby certifies that the new vessel described below, the property of said manufacturer, has been transferred this _____ day of _____, 19 _____ on Invoice No._____ to:

Dealer's Name_____
Address_____
City, State and Zip_____

Model Name: _____ Model Year: _____ Manufacturer's Hull Identification Number: (HIND)_____

Type: Open____ Cabin Cruiser_____ Houseboat____ Sail_____ Canoe_____
Personal Watercraft_____ Pontoon ____ Runabout____ Other_____ (Specify)

Propulsion: Inboard_____ Sail_____ Air Propelled_____
Outboard____ Inboard/Outboard____ Manual_____
Horsepower (If Applicable)_____

Fuel: Gasoline_____ Diesel_____ Other_____ (Specify)

Hull Material: Fiberglass____ Wood_____ Metal____ Inflatable_____
Other_____ (Specify)

Length Overall: _____Ft. _____In. Beam: _____Ft. _ _____In.
(Exact Measurement Required)

Built For: Pleasure Use_____ Commercial Use_____

U.S. Coast Guard Capacity Plate Information: (Where Applicable)
Maximum Horsepower Rating_____
Maximum Persons Capacity in Whole Persons_____
Maximum Weight Capacity (persons, motor, gear, etc.)_____

The Manufacturer further certifies that this was the first transfer of such new vessel and that all information given herein is true and accurate to the best of his knowledge:

Firm Name_____
Street Address_____
City, State and Zip_____

By (Authorized Signature)_____
Title or Position_____

MSO

FIRST ASSIGNMENT

FOR VALUE RECEIVED, in the amount of $_____, the undersigned hereby transfers the Certificate of Origin and the boat described therein to: _____

Address_____and certifies that the boat is new and has not been registered in this or any other state; he also warrants the title of said boat at time of delivery, subject only to the liens and encumbrances as set out below:

Amt. of Lien	Date	To Whom Due	Address

Dates_____19___, at_____

_____ By: _____

Transferor (Firm Name) Sign Here Position

Before me personally appeared_____who by me being duly sworn under oath says that the statements set forth above are true and correct. Subscribed and sworn to before me this____day of_____19____.

_____Notary Public Date Commission Expires_____

(SEAL)

SECOND ASSIGNMENT

FOR VALUE RECEIVED, in the amount of $_____, the undersigned hereby transfers the Certificate of Origin and the boat described therein to: _____

Address_____ and certifies that the boat is new and has not been registered in this or any other state; he also warrants the title of said boat at time of delivery, subject only to the liens and encumbrances as set out below:

Amt. of Lien	Date	To Whom Due	Address

Dated_____19___, at_____

_____ By: _____

Transferor (Firm Name) Sign Here Position

Before me personally appeared_____who by me being duly sworn under oath says that he statements set forth above are true and correct. Subscribed and sworn to before me this___day of_____19____.

_____Notary Public Date Commission Expires_____

(SEAL)

DEFECT NOTIFICATION AND RECALL CAMPAIGNS

Problem Descriptions:

Basic Flotation: Most inboard, inboard/outdrive and jetdrive powered motorboats less than 20 feet in length are required to contain sufficient flotation so that some portion of the boat remains above the surface of the water if the boat is swamped. Boats with "Basic Flotation" problems will sink if they capsize or swamp.

Level Flotation: Most outboard powered motorboats less than 20 feet in length are required to float level when they are swamped and to support a certain percentage of the weight which they are rated to carry. Boats with "Level Flotation" problems do not float level when swamped.

Capacity Label Missing, Maximum Persons Capacity Overrated, Maximum Weight Capacity Overrated or HP Capacity Overrated: Almost all motorboats less than 20 feet in length are required to bear a "U.S. Coast Guard Maximum Capacities" label. If the label is missing or the values are overrated, an operator who is unfamiliar with a particular boat may try to carry too much weight or, in the case of outboard powered boats, too much horsepower. Some insurance companies will not insure a boat that lacks the label or bears a label with incorrect information.

The recall list includes new campaigns as well as old ones that are still going on. The new campaigns begun since August 1990, the date of the previous release on the subject, follow:

AMERICAN SUZUKI MOTOR CORPORATION
(Brea, CA)
Year: 1988 & 1989
Models: 4- and 6-gallon fuel tanks sold alone or with the following Suzuki outboard motors with engine numbers:

Model	Last Affected Engine No.
DT6	923002 — 4 gallon
DT8C	905721 — 4 gallon
DT9.9C	908860 — 6 gallon
DT15 (88)	ALL — 6 gallon
DT15C	902868 — 6 gallon
DT20 (88)	ALL — 6 gallon
DT25 (88)	ALL — 6 gallon
DT25C	902479 — 6 gallon
DT30C	907049 — 6 gallon
DT35C	901631 — 6 gallon

and all Cabrea outboard motors except for the following which were not shipped with fuel tanks:

EL50 803308 - 803535
EL75 811581 - 812030
EL85 820782 - 821231
Units: 32,118
Problem: Expansion and contraction of tank may create hairline crack in base causing fuel leakage

BAYLINER MARINE
(Seattle, WA)
Year & Models:
1987 - 1988 3417 Tri-Cabin Motoryacht (gas)
1987 - 1989 3416 Trophy Convertible (gas)
1989 - 1990 4558 Motoryacht (gas)
Units: 125
Problem: Aqualift style mufflers may rupture during backfire; boat may take on water

BOMBARDIER, U.S.A.
(Wausau, WI)
Year: 1990
Models: Sea Doo 5810 Personal Watercraft
Units: 206
Problem: Steering column support may fail causing loss of steering control

BOMBARDIER, U.S.A.
(Wausau, WI)
Year: 1991
Models: Sea Doo GT Personal Watercraft with HINs: ZZN00001K091 to ZZN01668L091 with fuel tanks bearing "16" molded on exterior
Units: 1002
Problem: Wave riding or jumping may cause fuel tank breakage

CHAPARRAL BOATS
(Nashville, GA)
Year: 1990 & 1991
Models: 1800 SL, 1900 SL & 2000 SL
Units: 2014
Problem: Non ignition-protected stereo receiver not isolated from fuel fill hose and vent hose fittings

CORRECT CRAFT
(Orlando, FL)
Year: 1989 & 1990
Models: Sport Nautique & Ski Nautique
Units: 1263
Problem: Defective welds in fuel tanks may cause fuel leaks; danger of fire or explosion

DIXIE FIBERGLASS PRODUCTS
(Winter Garden, FL)
Year: 1988 - 1991
Models: 1670 Malibu
Problem: Maximum horsepower, maximum weight and maximum persons capacities overrated

FOXCRAFT BOATS, INC.
(Carbon Hill, AL)
Year: 1990
Models: 1500
Units: 17
Problem: Level Flotation

FOXCRAFT BOATS, INC.
(Carbon Hill, AL)
Year: 1990
Models: 1690V
Units: 15
Problem: Level Flotation

GLASTRON, INC.
(New Braunfels, TX)
Year: 1987 - 1990
Models: CVX-16 Outboard Runabout
Units: 592
Problem: Level Flotation

JOHANNSEN BOAT WORKS
(Miami, FL)
Year: 1985 - 1989
Models: Trinka 10' Dinghy
Units: 228
Problem: Weight and persons capacities overrated

MERCURY POWER BOAT
(Monticello, AR)
Year: 1990
Models: Monark Legend 155
Units: 61
Problem: Level Flotation

REGAL MARINE INDUSTRIES, INC.
(Orlando, FL)
Year: 1989 & 1990
Models: Regal Valanti 225 Sport Cruiser
Units: 317
Problem: Fuel tank hatch cover screw may pierce fuel hose causing fuel leak; danger of fire or explosion

SPORTCO OF MINDEN, INC.
(Minden, LA)
Year: 1991
Models: Tidecraft TC15B Spitfire
Units: 34
Problem: Level Flotation; maximum persons capacity overrated

THUNDERCRAFT BOATS, INC.
(Knoxville, TN)
Year: 1987
Models: Malibu 190 I/O
Units: 586
Problem: Basic flotation

THUNDERCRAFT BOATS, INC.
(Knoxville, TN)
Year: 1989
Models: Malibu 162 O/B
Units: 88
Problem: Level Flotation

VOLVO PENTA OF AMERICA
(Rockleigh, NJ)
Year: 1989 & 1990
Models: 290A Outdrives
Units: 2759
Problem: Defective upper gear head assembly may prevent engagement of forward or reverse

WAITSBORO MANUFACTURING CO, INC.
(Corbin, KY)
Year: 1990
Models: 154 F/B Tri-Hull
Units: 23
Problem: Level Flotation

<u>The following are campaigns still in progress that began before August 1990, the date of the last release</u>:

ALINDALE MANUFACTURING, INC.
(Wilmington, NC)
Year: 1989
Models: 17-foot Sea Mark
Units: 32
Problem: Level Flotation; maximum weight and maximum persons capacities overrated

AMERICAN SUZUKI MOTOR CORPORATION
(Brea, CA)
Year/Models: All 1989 V-4 and V-6; some 1990 V-6 outboard motors
<u>SIZES, MODELS and ENGINE NUMBER RANGE</u>
DT90TCLK/DT90TCXK
901001 - 901699
DT100SFK/DT100TCLK/DT100TCXK
901001 - 901927
DT150SSK/DT150SSL/DT150TCLK/DT150TCLL/
DT150TCXK/DT150TCXL
905904 - 011393
DT175TCLK/DT175TCLL/DT175TCXK
901868 - 011043
DT200TCLK/DT200TCLL/DT200TCXKDT200TCXL/
DT200VLK/DT200VLL/DT200VXK/DT200VXL
907123 - 011409
Units: 3511
Problem: Clutch rod connector may fracture; operator may not be able to select intended gear

BOMBARDIER, U.S.A.
(Wausau, WI)
Year: 1988 & 1989
Models: Sea Doo Personal Watercraft
5801 with Hull serial nos. 12 to 1290
5802 with Hull serial nos. 1 to 15,494
Units: 14,613
Problem: Loose battery cables at starter or chafing of cables may cause spark; danger of fire/explosion

CRUSADER ENGINES
(Sterling Heights, MI)
Year: 1989
Models: Marine gasoline engines with serial #s:
C305L&C305R S/N 81913-82423
C350L&C350R S/N 81834-82424
C454L&C454R S/N 81860-82430
C502L&C502R S/N 81856-82444
Units: 533
Problem: Engine mounted fuel filter header assembly may cause fuel leakage; danger of fire if sparks present

KAWASAKI MOTORS CORPORATION
(Santa Ana, CA)
Year: 1989
Models: JB650-A1 Jet Mate with HINs:
JKA00030H889 to JKA00501B989
Units: 438
Problem: Damaged O-ring in carburetor could cause fuel leakage; danger of fire/explosion

KAWASAKI MOTORS CORPORATION
(Santa Ana, CA)
Year: 1989
Models: JB650-B1 Personal Water Craft
Units: 7532
Problem: Engine stop switch may fail; danger of collision

ONAN CORPORATION
(Minneapolis, MN)
Year: 1989
Model: 6.5 kw rated MME-A1C and MME-1R/1A
8 kw rated MME-B/1C
9 kw rated MME-B/1C and MME-B/2650C
9 kw rated MME-3R/1A and MME-3R/26501A
9 kw rated MME-A/1C and MME-1R/1A
Units: 921
Problem: Defective circuit breakers can generate an electrical arc providing ignition source; danger of fire if explosive fumes are present

OUTBOARD MARINE CORPORATION
(Waukegan, IL)
Year: 1989
Models: 5.0, 5.0 HO and 5.8 Litre OMC Cobra Stern Drive models: 502AMLM, 502APRM, 502BPRM, 584AMLM and 584APRM
Units: 6,027
Problem: Starter solenoid cable may contact exhaust manifold damaging cable insulation; electrical spark could cause fire/explosion

OUTBOARD MARINE CORP./SEA NYMPH BOATS DIV.
(Waukegan, IL)
Year: 1989
Models: SC-175, SS-175 and GLS-175 with HINs ending in A989 thru E989 equipped with fuel tanks manufactured by Buechler & Sons, Inc.
Units: 508
Problem: Buildup of pressure in fuel tank vent may force fuel out of vent hose and into boat; possibility of fire/explosion

OUTBOARD MARINE CORP/SUNBIRD BOAT COMPANY DIV.
(Waukegan, IL)
Year: 1990
Models: SPL 160 FS outboard models w/ HINs:
SB2F0006E990 to SB2F0199B90
Units: 147
Problem: Level Flotation

YAMAHA MOTOR CORPORATION, U.S.A.
(Cypress, CA)
Year: 1990
Models: WJ500D WaveJammer with engine serial #s:
EW3-109286-110307
WR500D WaveRunner with engine serial #s:
EU0-803101-807587
EU0-808501-808510
WR650D WaveRunner LX w/ engine serial #s:
FK7-200351-202719
FK7-800101-806256
WRA650D WaveRunner III w/ engine serial #s:
FJ0-200101-200938
SJ650D SuperJet with engine serial #s:
EW2-800032-800131
Units: 7,762
Problem: Corrosion of start/stop switch could prevent engine shutoff when lanyard pulled; danger of collision

CONSUMER AFFAIRS

COAST GUARD SEEKS BOATER FEEDBACK ON BOARDING EXPERIENCES

Recreational boaters who have been boarded by the Coast Guard are asked to call the Coast Guard Boating Safety Hotline toll free (800-368-5647) and discuss the experience. The Coast Guard wants this input — favorable or otherwise — as a means of evaluating its procedures, policy, and its training of boarding teams. The Coast Guard will use the information on boater's reactions to educate Coast Guard boarding team personnel and thereby fulfill its maritime law enforcement role with minimum inconvenience to boaters.

Hotline operators have a standard questionnaire they can lead a boater through in a few minutes. Questions focus on the boater's perception of how and why the boarding was conducted, the extent of the boarding, and the professionalism of the boarding team. Operators can answer questions the caller may have about a citation or a damage claim resulting from a boarding.

The Coast Guard has an updated and improved Consumer Fact Sheet on the Coast Guard Boarding Policy that addresses many areas of boarding procedure often misunderstood by boaters. This Fact Sheet should be available by the time this issue of the Boating Safety Circular is published. For a copy of the Consumer Fact Sheet, call the Boating Safety Hotline.

Boaters are welcome to call with comments on our boarding policies even if they have not personally experienced a boarding. The Boating Safety Hotline is open Monday through Friday, 8:00 AM to 4:00 PM, eastern time, except on Federal holidays.

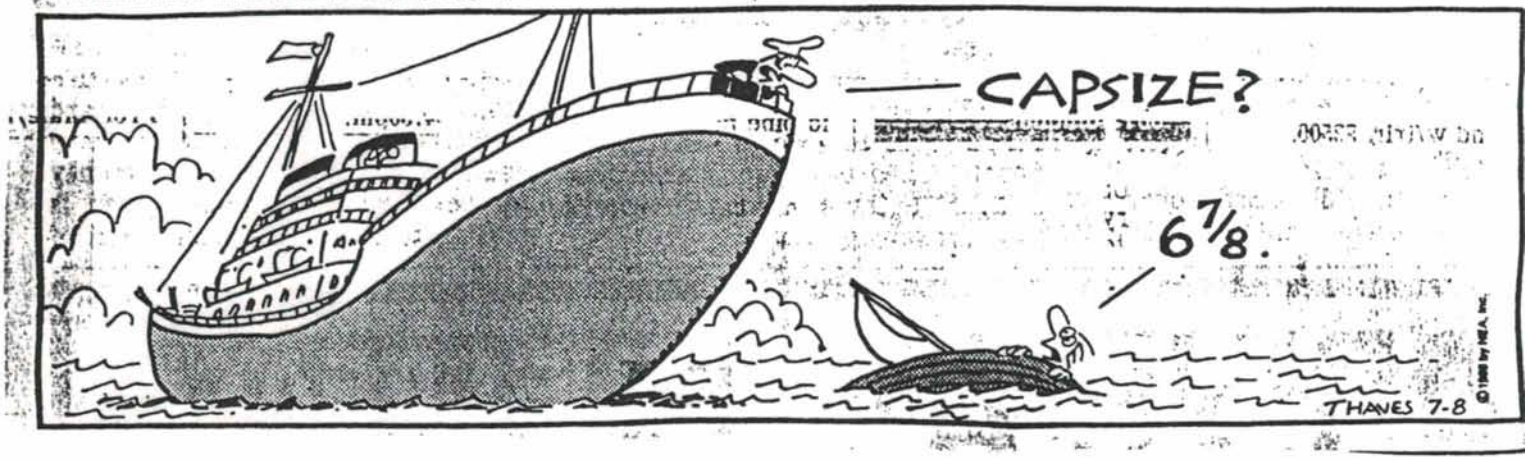
U.S. Coast Guard

Boating Safety Hotline

Call, Toll Free! 800-368-5647

- *For Boating Safety Recall Information*
- *To Report Possible Safety Defects in Boats*
- *For Answers To Boating Safety Questions*
- *For Information On USCG Boarding Procedures*

FRANK AND ERNEST



UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

DATE: July 11, 1991

TO: Jim Williams

FROM: Jack Bash

SUBJECT: COMSAT Phone Rates

Attached is a new rate schedule for COMSAT reflecting off peak rates for the Pacific. The volume rate plan is available to UNOLS ships also if we are able to work out a procedure. It may not be worth the effort.

I have received a fair response from my telemail requesting information from the operator. It appears that this should be an agenda item for the RVOC meeting. If you want to assign somebody to lead the discussion that will be fine, otherwise I will volunteer to do it. I suggest 15 minutes should be enough.

RECEIVED
JUN 14 1991
UNOLS OFFICE

COMSAT

COMSAT ANNOUNCES REDUCED RATES IN THE PA

June 7, 1991

Dear Customer:

COMSAT is pleased to announce major price reductions for our off-peak telephone service in the Pacific Ocean Region (POR) effective immediately. In addition to a reduction in our standard off-peak rate in the POR, other changes include the elimination of additional landline charges to non-U.S./Canada destinations, and the addition of a special deep-discount period for calls terminating in the U.S. or Canada. Some highlights of these changes follow.

First, calls originating from the Pacific Ocean Region between the hours of 1301 - 1600 GMT (to the U.S. or Canada), or 1001 - 1600 GMT (to all other countries) will now be tariffed at US$8.00 per minute fully terminated. This means that calls are billed at one all-inclusive rate without additional landline charges. Furthermore, this all-inclusive rate applies to all calls placed during the specified periods, regardless of destination (except, of course, ship-ship calls which are billed at twice this rate).

Even more significant is the addition of COMSAT's special deep-discount period for calls to the U.S. or Canada. From 1001 - 1300 GMT, calls placed via COMSAT's Santa Paula Land Earth Station and destined for the U.S. or Canada will be billed at US$6.94 per minute fully terminated, providing customers with an extremely cost-effective option for their communications needs.

For your reference, we have enclosed COMSAT's revised rate card and a recent press release which reflect these changes. Keep them handy as a quick guide to COMSAT's communications charges. Please contact your COMSAT Sales Representative to answer any questions you may have about these or any of COMSAT's quality services.

Sincerely,

Edward G. Ryznar,
Vice President,
Maritime Sales

COMSAT

COMSAT
Mobile Communications

Communications
Satellite Corporation
950 L'Enfant Plaza, SW
Washington, DC 20024
Telephone 202-863-6000
Telex 197800
Fax 202-488-3814/3819

For Immediate Release:

June 7, 1991

COMSAT INTRODUCES LOWER OFF-PEAK RATES IN THE PACIFIC OCEAN REGIONS

Washington, D.C. - COMSAT Mobile Communications announces new off-peak discounted rates for ship-to-shore Inmarsat telephone calls in the Pacific Ocean Region (POR) that are transmitted through COMSAT's Santa Paula, Calif., land earth station (LES).

The new rates are effective immediately and are available for all Maritime and International Land Mobile applications in the ship-to-shore direction during the off-peak hours of 1001 to 1600 Greenwich Mean Time. Users wishing to take advantage of the rates simply turn their Inmarsat-A ship earth stations to code 01 in the POR.

According to Ronald Mario, President of COMSAT Mobile Communications, this new off-peak rate represents a significant savings for COMSAT's customers. He said that the new rates will bring COMSAT's charges to as low as $6.94 per minute for a standard Inmarsat-A terminal and as low as $6.50 per minute for large antenna multi-channel terminals. The new rates also remove

-more-

any restrictions on the destination of the call and eliminate the landline charges for all calls made during the special off-peak hours. He said that under the new POR off-peak tariff, the highest possible rate to anywhere in the world would be $8.00 per minute. He warned that some satellite service providers will add the landline charge or other hidden costs, such as time and charges for directory assistance, to their publicized rates making them more expensive than they may appear in a simple rate comparison.

"We're lowering our rates to meet head-on the growing competition within the mobile communications arena," said Mario. "COMSAT's land earth stations offer the most sophisticated, high-quality services in the Inmarsat system and we intend to remain the largest provider of Inmarsat services in the world," he said.

"In addition, our new off-peak rates will encourage users in the Pacific Ocean Region to move much of their traffic to the less congested off-peak periods, which will lessen the potential of congestion in this region," he said.

Mario said that COMSAT also offers a long-term volume discount for customers who use as little as 3,000 minutes per year and provides customized communications services such as Sea Phone^{sm} and smart card telephone service for crew members, CruiseCalling^{sm} services for cruise ship passengers, and facsimile and telex services for both passengers and ship's management.

COMSAT Mobile Communications began the concept of providing satellite voice, data, and facsimile services to vessels at sea in 1976. Today, there are nearly 15,000 ships and land mobile terminals equipped for Inmarsat satellite communications. COMSAT Mobile Communications, based in Washington, D.C., provides maritime, aeronautical, and international land mobile satellite

communications to customers around the world through its Inmarsat coast earth stations, located in Southbury, Conn., and Santa Paula, Calif. COMSAT represents the United States in the 64-member Inmarsat and the 120-member International Telecommunications Satellite Organization (INTELSAT).

# # #

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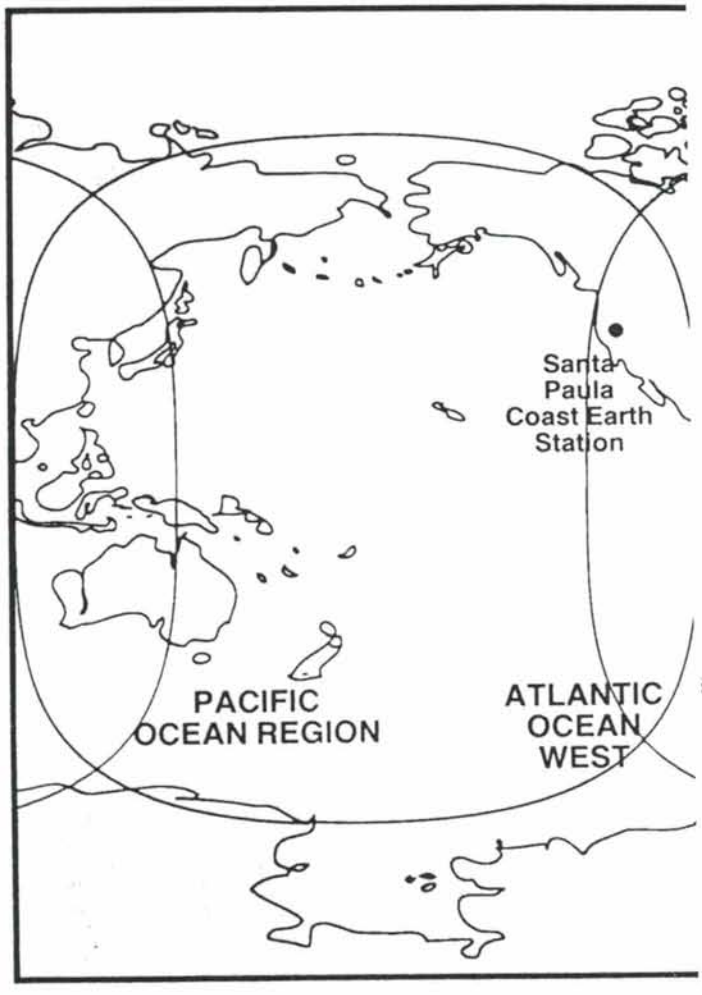

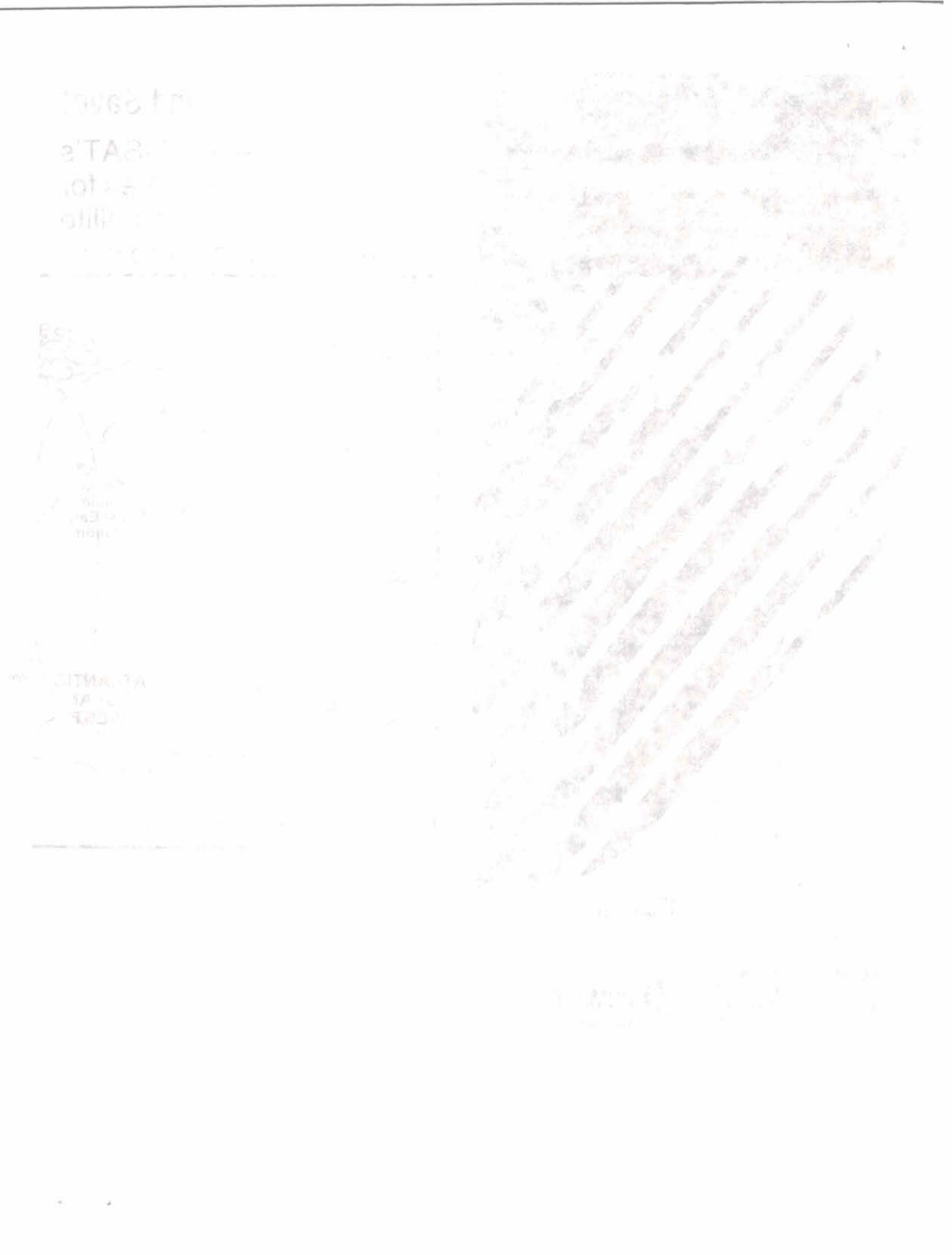

	0001-0400	0401-1000	
Ship-to-Shore Voice Calls From Ships Located in the Atlantic Ocean Region Using Southbury Coast Earth Station			**Atlanti**
Direct Dial to *Europe	$10.00/Minute (−$1.00/.1 Minute) Plus Landline Charge**	$8.00/Minute (+$.80/.1 Minute) No Landline Charge	$ (+ No
Direct Dial to U.S. and Canada	$8.00/Minute (+$.80/.1 Minute) No Landline Charge	$10.00/Minute (+$1.00/.1 Minute) No Landline Charge	$ (+ No
Direct Dial to Japan, Australia, New Zealand, Taiwan	$8.00/Minute (+$.80/.1 Minute) Plus Landline Charge**	$10.00/Minute (+$1.00/.1 Minute) Plus Landline Charge**	$ (+ Plus
Large Antenna Multi-Channel Rates			
Direct Dial to *Europe	$8.50/Minute — Plus Landline Charge**	$7.75/Minute — No Landline Charge	— No
To U.S. and Canada	$7.75/Minute — No Landline Charge	$8.50/Minute — No Landline Charge	— No
To Japan, Australia, New Zealand, Taiwan	$7.75/Minute — Plus Landline Charge**	$8.50/Minute — Plus Landline Charge**	— Plus
Ship-to-Shore Voice Calls From Ships Located in the Pacific Ocean Region Using Santa Paula Coast Earth Station			**Pacifi**
Direct Dial to U.S. and Canada	$10.00/Minute (+$1.00/.1 Minute) No Landline Charge	$10.00/Minute (+$1.00/.1 Minute) No Landline Charge	($ No
Direct Dial to all other countries	$10.00/Minute (+$1.00/.1 Minute) Plus Landline Charge**	$10.00/Minute (+$1.00/.1 Minute) Plus Landline Charge**	(No
Large Antenna Multi-Channel Rates			
Direct Dial to U.S. and Canada	$8.50/Minute No Landline Charge	$8.50/Minute No Landline Charge	No
To all other countries	$8.50/Minute Plus Landline Charge**	$8.50/Minute Plus Landline Charge**	No
To Europe	$8.50/Minute Plus Landline Charge**	$8.50/Minute Plus Landline Charge**	No

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†Rates for AOR East and West are the same

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1001-1100	1101-1600	1601-2200	2201-2400
c Ocean Region†			
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c Ocean Region				
$6.94/Minute .694/.1 Minute) Landline Charge	$6.94/Minute ($.694/.1 Min.)	$8.00/Minute ($.80/.1 Minute)	$10.00/Minute (+$1.00/.1 Minute) No Landline Charge	$10.00/Minute (+$1.00/.1 Minute) No Landline Charge
$8.00/Minute +$.80/Minute) Landline Charge	$8.00/Minute (+$.80/Minute)	$8.00/Minute (+$.80/Minute)	$10.00/Minute (+$1.00/.1 Minute) Plus Landline Charge**	$10.00/Minute (+$1.00/.1 Minute) Plus Landline Charge**
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$7.75/Minute Landline Charge	$7.75/Minute	$7.75/Minute	$8.50/Minute Plus Landline Charge**	$8.50/Minute Plus Landline Charge**

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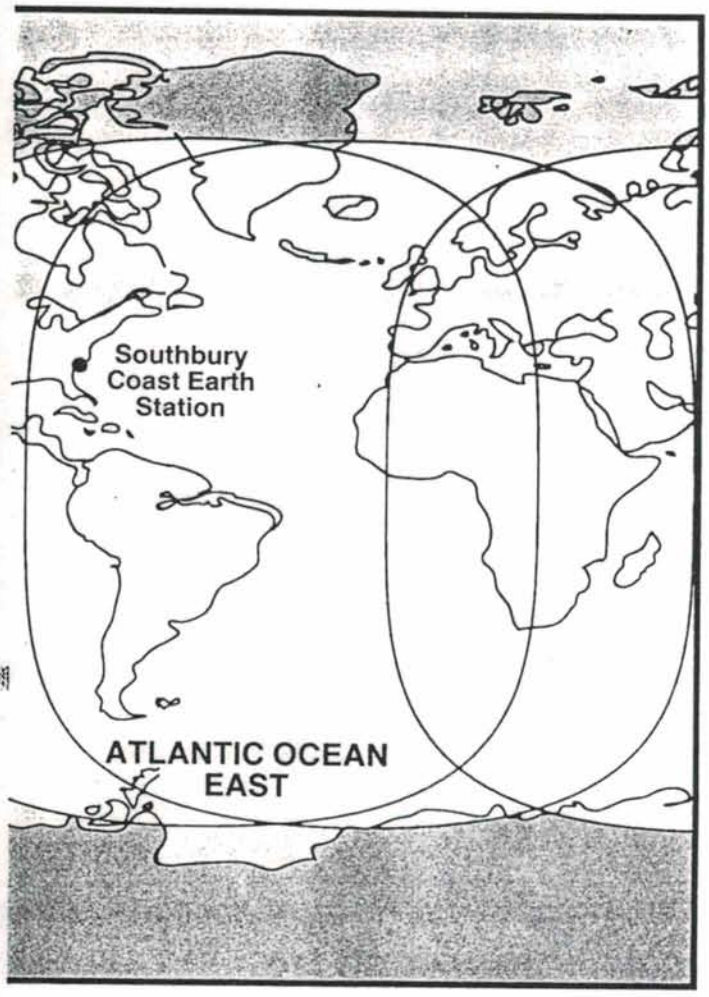

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TO: BRUCE CORNWALL
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FROM: JIM WILLIAMS

SUBJECT: NEWSLETTER

BRUCE,

THIS MIGHT BE APPROPRIATE FOR NEWSLETTER.

THE PACIFIC MARITIME MAGAZINE PUBLISHED A HARBOR FACILITIES GUIDE IN THEIR JUNE 1991 ISSUE FOR THE PORTS LISTED BELOW.

IT APPEARS TO BE CURRENT. THE PRICE IS $5.00. THEIR PHONE NUMBER IS (206) 284-0391 FOR ANYONE INTERESTED.

cc:

NUMBER OF PAGES (1) PLUS COVERSHEET BEING TRANSMITTED.

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The Pacific Maritime Magazine

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BPA

1991 HARBOR FACILITIES GUIDE

DEPARTMENTS

COVER PHOTO

Michael Menkin, Seattle marine photographer, took this photo of the East Waterway of Seattle's Duwamish River to illustrate our 1991 Harbor Facilities Guide. The photo, looking north, shows Terminal 18, operated by Stevedoring Services of America.

COMING NEXT MONTH

The first new barges built since the early 1980s were delivered, early this year, and more are under construction. In July, Feature Editor Jim Shaw will describe what's new in barges and the barge business.

Electronic Charting And the Personal Computer

The Ubiquitous PC Brings Alternative Electronic Charting Capability to Smaller Vessels

By David F. Crane
President
DF Crane Associates Inc.

Just as the personal computer has become a powerful, versatile, and easy-to-use productivity tool for businesses and educational institutions, so are PCs becoming an increasingly familiar sight in the marine environment.

In fact, some sources estimate that over half of all ocean-going cargo vessels carry at least one PC onboard. On today's scientific vessel, it is hard to imagine a research team going to sea without PC technology to assist them with data gathering and other clerical tasks.

Mariners have also been using computers to help with basic navigation problem solving, plotting and surveying, maintenance scheduling, inventory control, and, of course, budgeting and other general accounting tasks not unlike those of their land-locked cousins.

Sophisticated applications, such as precise navigation and surveying using accurate chart graphics, however, have until recently been available only to vessels with enough space and money to install the dedicated, proprietary hardware required.

Currently, PC hardware and software innovations have brought new technology within reach of even the most budget-constrained. It is now practical for modestly priced PCs—including many laptops—to support electronic charting and surveying applications using exact reproductions of paper charts distributed on floppy diskettes.

In addition to cost savings, advantages to this approach include the ability to:

- Use existing PC hardware
- Purchase one or many electronic charts based on actual NOAA or user-proprietary paper charts
- Modify software to address unique requirements
- Use a variety of electronic protocols to interface to other devices.

Before describing the characteristics and capabilities of this approach, however, let us explore two of the problems these systems are attempting to solve.

Electronic Chart Navigation

At sea, the question that comes most often to everyone's mind is: "Where are we?" Through the years, this question has been answered by the traditional method of first ascertaining the vessel's position by whatever means are available, then marking the position on a paper chart so that the vessel's position can be put into perspective with everything else drawn on the chart.

We all know that, at times, determining one's position can be laborious and even uncertain depending on the methods available. What can be frustrating to both navigator and non-navigator is that all the effort that goes into placing the vessel's position on the chart must be repeated whenever an updated position fix is required.

Even with the promise of 24-hour global positioning system (GPS) fixes, the location of the vessel relative to everything else on the chart still becomes a manual operation.

(Continued on page 39)

PC display shows example of electronic chart.

Electronic charting solves these concerns by automatically placing the vessel directly on an electronically created visual image of a paper chart. With input from a navigation receiver—such as Loran or GPS—connected into the PC, your position is constantly updated directly on the chart. Since the computer knows the geographic coordinates at every spot on the electronic chart, range and bearing from the vessel to navaids and any other features on the chart can be shown.

Speed can be automatically determined from successive position fixes supplied from the navigation receiver, and elapsed time to destination and ETA can also be calculated and displayed by the computer.

Plotting and Surveying

Using traditional dead-reckoning and even with more modern electronic methods of determining position, adding any appreciable amount of survey data to the vessel's location makes for a busy clerical task indeed, even disregarding chart updating tasks. Not only must the sampling information be written down (or accumulated by logging devices) and coordinated with the vessel's location at the time the samples were taken, but the coordinated data must later be entered into a computer program for analysis.

Another issue is coordinating the sampling efforts with the activities of the vessel operator if the survey is dependent on the vessel following a pre-described course and speed.

The use of PC-based electronic charting software addresses these problems by serving as a single source for accumulating data. Vessel position—as well as survey data from a variety of sensors—can be recorded to a log on the PC disk drive. The computer can then "time stamp" each entry on the log with the date and precise time.

Since vessel position, course, speed, and other navigation information (such as the distance to the next waypoint) can be visually displayed on an electronic chart, the vessel operator has the advantage of using the same data as the surveyors to guide the path of the vessel.

Electronic navigation, plotting, and surveying applications have been developed on PCs because of the availability and accessibility of appropriate hardware and software. There are some different approaches as to how this technology is applied, however, that significantly affect the usability of the end result.

Chart Standardization Near?

Much has been written about the present and future availability of electronic chart data, and much more probably remains to be written as the International Hydrographic Organization (IHO) attempts to establish guidelines governing availability and use of electronic charts.

In the U.S., the Radio Technical Commission for Maritime Services (RTCM) has spent the last three years studying the situation. Their recommendations have been submitted to the IHO, which—if adopted—may result in some form of coordinated international agreement.

Estimates vary as to when electronic chart data may begin to become available directly from hydrographic agencies, with most sources guessing anywhere from five to ten years.

As a result, sources for electronic

(Continued on page 40)

ARGOS

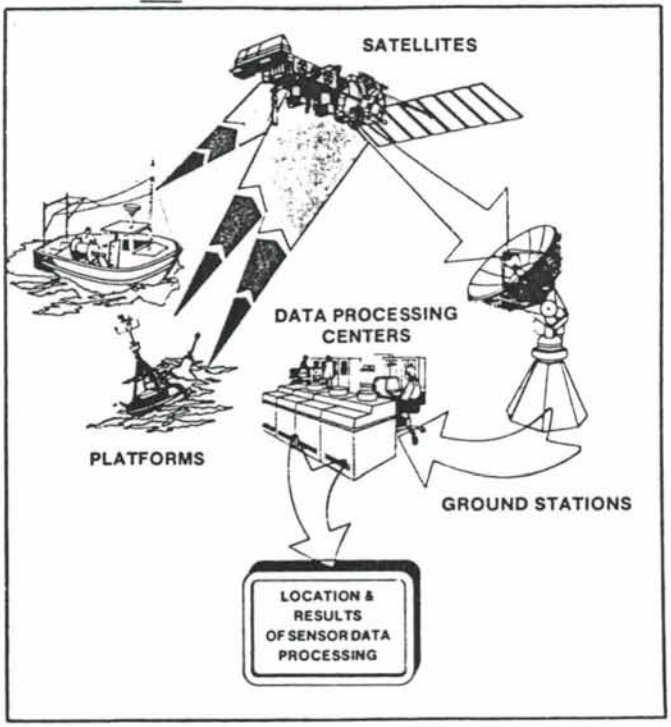

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chart data for PCs are currently available only from the software developers themselves. These electronic charts are based, for the most part, on data obtained from NOAA paper charts. Some developers digitize chart detail by hand, a lengthy process involving tracing the desired outlines of a paper chart laid over a digitizing pad. The digitizing pad captures the data, and a software program then recreates the traced image on the computer display.

This approach, which creates an "etch-a-sketch" image, can be quite suitable for some applications, although the drawbacks include having to rely on skilled personnel with steady hands, the possibility of missing important details, and not being able to capture all data on the chart.

Another approach involves the use of an optical scanner to digitize the data on a paper chart. This process captures every detail—even imperfections made by the original cartographer—and makes the resultant electronic image an exact reproduction of the original.

There are a few "marinized" PCs on the market for those applications where the equipment must be directly exposed to the sea environment. For most pilot-house or below-decks installations, however, office or laptop PCs hold up well if kept out of direct contact with sea water.

Some software is equipment-independent while other software developers dictate, to some extent, the use of proprietary or specialized hardware that must be used with their particular software. A few electronic charting software systems have been developed for Macintosh computers, but more has been developed for IBM-compatible PCs largely due to the popularity, price/performance, and relative ease of interfacing these computers to other devices.

Electronic charts for PCs are currently distributed either on floppy diskettes or compact disks (CDs). This means that it is not necessary to delete currently unused charts to load new ones if your hard disk becomes full, an advantage if your application requires many charts. On the other hand, the advantages to the floppy disk/hard drive approach include low cost, freedom to select almost any standard computer, ability to order charts one at a time because of the low cost of creating diskettes vs. CDs, and very rapid chart retrieval and re-display (approximately 1 second) compared to CDs.

Based on the rapid evolution of the personal computer into the versatile, low-cost technological tool it has become today, it is exciting to contemplate how the ubiquitous PC might help shape marine navigation and research tomorrow. We will certainly see smaller, even more "personal" PCs, perhaps strapped to our wrists with a digitized chart to guide us on our way! st

David F. Crane has been involved in various aspects of data processing for almost 25 years, including a 15-year "apprenticeship" in field engineering and marketing with IBM. His firm is a consulting and software development and marketing company specializing in the commercial and recreational marine industries. Crane also holds a U.S. Coast Guard master's license—with sail endorsement—for mechanically propelled vessels.

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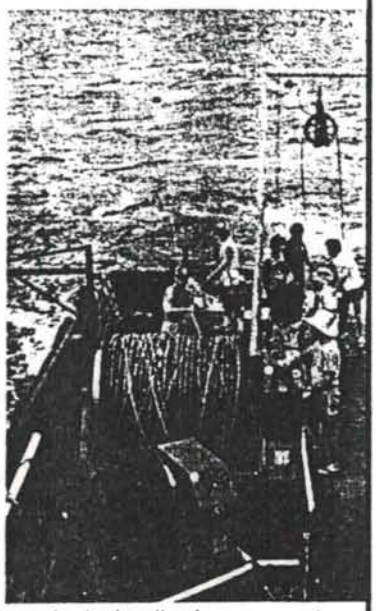

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CIRCLE NO. 27 ON INQUIRY CARD

Navigation in the 1990s...and Beyond

Marriage of Paper Nautical Charts with Electronics Technology Promises to Bridge Gap Until Advent of 'The Electronic Chart'

By John L. Hammer III
Vice President, Marketing
Qubit North America

and

Hugh J. Agnew
Managing Director
Qubit (U.K.) Ltd.

Relentless is the march of technology that has significantly affected every aspect of life as we know it today. The world of navigation is no different, though many mariners would like to think that they're more immune than most.

What follows is a look at the practice of navigation and the effect that technology is having at present and in the future. Our comments about the future, of course, are pure surmise; we provide them as a stepping-off point for future thinking.

Reasons for the conservatism held by mariners results from the surroundings in which they operate. The seas constitute a harsh environment and those who sail them take more than ordinary risks. While the mariner's movement is generally constrained to two dimensions, his risk comes often in the third dimension where he cannot see hazards hidden beneath the surface.

Significant challenges arise because there are few landmarks at sea. Furthermore, the dynamic medium on which he moves prevents easy positioning without some sort of technical equipment or methodology.

Seamen have developed interesting and ingenious ways to find their way.

We've come a long way since the days of the lodestone and quadrant. Celestial navigation has been brought into the computer age with calculators that perform the laborious calculations.. Nevertheless, the mariner continues to practice the older techniques for he never knows when he will be caught without electrical power or some critical electronic system will fail.

Navigation has advanced significantly with the advent of radar and radionavigation equipment. Modern navigators are beginning to trust electronic systems but relegate them for the most part to support status.

The reliability and capabilities of newer systems demand much higher credibility among users. While these systems are often called aids to navigation, they, in effect, result in increasing the workload of the navigator, rather than decreasing it. (Pike, *The Journal of Navigation*, May 1990)

Most mariners continue heavy reliance on bearing-taking and radar piloting.

Reliance on Paper Charts

One tool that has remained essentially constant in the practice of navigation is the nautical chart.

Since the 16th century, the nautical chart has been the foundation on which almost all navigation has taken place. The information presented on nautical charts has improved with collection technology and the standardization of presentation.

The conventional practice of navigation has remained centered on the nautical chart regardless of the source of position information. Observed data mean very little to the navigator

The Yeoman "puck" consists of a circular plotting window, one "leg" containing the keypad for function and data entry, and another leg for digital display and control keys.

until he places them on a chart where the information can be analyzed.

Electronic Positioning Technology

Electronic positioning systems have been with us since the 1940s. We have seen the increase in their accuracy, availability, and reliability with every passing year. One of the newest, the global positioning system (GPS), is promising round-the-clock, three-dimensional positioning worldwide within the next few years. The positions thus determined can be fine-tuned to the tens of meters or better (using precision mode or differential signals).

One point must be remembered about radionavigation systems: In their purest form, they provide numeric, electronic position readouts. Such readouts, to be completely usable, must be referred to an accurate chart medium for analysis and decision-making. Raw latitudes and longitudes are as a rule meaningless unless they've been referred to a chart.

Such systems unquestionably improve safety and speed in the positioning aspects of navigation. But what happens in the navigation process?

Many radionavigation systems carry out decision-making computations, such as route following and tactical maneuvering. They will hold libraries of waypoints. Sometimes a chart is not consulted and waypoint coordinates are extracted from a book of tables. Without reference to a chart, there is a serious risk that a leg of the route might lead over a danger.

Electronic Charting

Enter the electronic chart display system (ECDIS). The key driver in the growth of electronic systems has been the almost logarithmic rise in microprocessor capability (power, speed, and memory capacity) with a concurrent steep drop in cost.

The next step in the technological growth of the navigation is the marriage of radionavigation positions with digital databases containing chart information—the electronic chart database (ECDB). Such a marriage gives the user a better indication of what exactly is happening.

Simply put, "It shoehorns nautical charts into an electronic box."

The benefits that can accrue from such a combination are numerous:

- Electronic charting reduces potential plotting and scaling-off human errors because data are automatically and accurately applied directly into the navigation database.
- The display can be made more dynamic, thus portraying more in-

(Continued on page 12)

Electronic Charts: Standardization Soon?

Within the unregulated commercial world, electronic chart systems are proliferating. Many are not considered fully equivalent of the paper chart and are generally available for both professional and avocational uses—usually with the *caveat* that they should not be used for navigation without also using a paper chart.

Electronic chart technology continues to evolve along a number of avenues, providing the impetus for developing a standardized product that can ultimately become a legal tool for use in marine navigation.

Standards under consideration now range the full spectrum of ECDIS characteristics: database content, format, symbols, number of screens available, colors, etc.

Development of those standards, a key issue, is being coordinated by two international organizations: the International Maritime Organization and the International Hydrographic Organization.

The IMO is developing the standardization of ECDIS equipment for installation aboard ships under the Safety of Life at Sea (SOLAS) convention. These are ships engaged in international and oceanic trade.

The organization has adopted a Provisional Performance Standard that gives general guidance to evolving systems. Its goal is to bring a more complete, authoritative standard into full effect by 1993. Implicit in these specifications is the need for an electronic navigation chart (ENC) and supporting database (ECDB) to provide the equivalent to the paper chart.

Development of this equivalent chart is being considered by IHO and its Committee on ECDIS. Considerable work has been done already toward this end by several subcommittees (Overall Standards, Updating, Colors/Symbols, Quality, Databases, and Glossary subcommittees).

The principal result so far has been the issuance of *Special Publication 52* and its supplements describing overall specifications of the ENC, updating criteria, and colors/symbols. The Updating Subcommittee has recommended the Inmarsat Standard C group call system as the medium over which updates to ECDBs should be transmitted.

Under the Databases Subcommittee, much work has been done towards deciding the digital data exchange format between hydrographic offices and to ECDIS users. IHO's Committee on ECDIS selected its own DX90 format as the basic data exchange format.

Comite International Radio Maritime (CIRM) has undertaken a study of ECDIS and its effects on radio frequency usage. Both IHO and IMO are joined by a unique group entitled the Harmonization Group on ECDIS. Its function is to bring together the work of IHO, IMO, and CIRM and report to the IMO Subcommittee on Navigation.

On national levels there are a number of initiatives ongoing. Following the successful North Sea Project in 1989, the Norwegians have developed a chart database that is in active use aboard a ship sailing between Norway, Germany, and the Netherlands as part of Project Seatrans. Goals are to test the ECDIS concept and the draft standards and updating done by Inmarsat. Norway is also pursuing the concept of a foundation to develop and distribute an internationally recognized, worldwide electronic chart database.

Similarly, a test bed project is underway in the U.S. investigating standards and updating under the leadership of the Radio Technical Commission for Maritime Services (RTCM). Startup funding already granted means the project will be well underway by this summer.

Meanwhile, work continues in Canada where transmission and test bed activities are underway. The Germans and Dutch are studying ergonomic aspects of video presentation of nautical charts.

—John L. Hammer.

formation. For example, a lighted buoy on-screen with text can be replaced by a symbol flashing at the prescribed interval. The operator is able easily and quickly to distinguish information about that particular aid. Similarly, the system could flash danger information in a noticeable way and sound an alarm based on the vessel's position.

- The chart can be kept current electronically if data are transmitted directly from hydrographic data sources to the computer. Not only would corrections be made quickly, but also the potential for human plotting error would be greatly reduced.
- Knowledge-based (artificial intelligence) systems can be brought to bear on navigation problems, giving the operator a quick list of choices in tactical situations.
- Tactical decision-making sources (navigation, radar, chart, sailing directions, etc.) are combined at one tactical control station. This fits into the reduced-manning concept.
- Electronics allow incorporation of navigation data into a digital ship management program for more economical ship-keeping.

With the benefits come some disadvantages, as noted below:

- Electronic charts require ECDB data that is not yet available in cartographically pure form; i.e., not the full equivalent of the paper chart (with corrections).
- The above technologies present an unusual psychological problem. Their effect on a user is much like television in its passive nature. Once a navigation program has been set running, the user can be lulled into inaction by ignoring what is going on. Such systems do not encourage active participation in the solution of the navigation problem.
- The display may miss data through inattentive decluttering, scale, or screen size selection.
- Loss of power deprives the user of critical information. This is always a concern and is made more dramatic by the potential need to carry one's chart into a lifeboat.

The union of technologies is now accomplished in a number of ways —from underlaying chart-like information on radar and ARPA screens, to integrated bridge systems handling many navigation variables, down to small yachtsmen's systems.

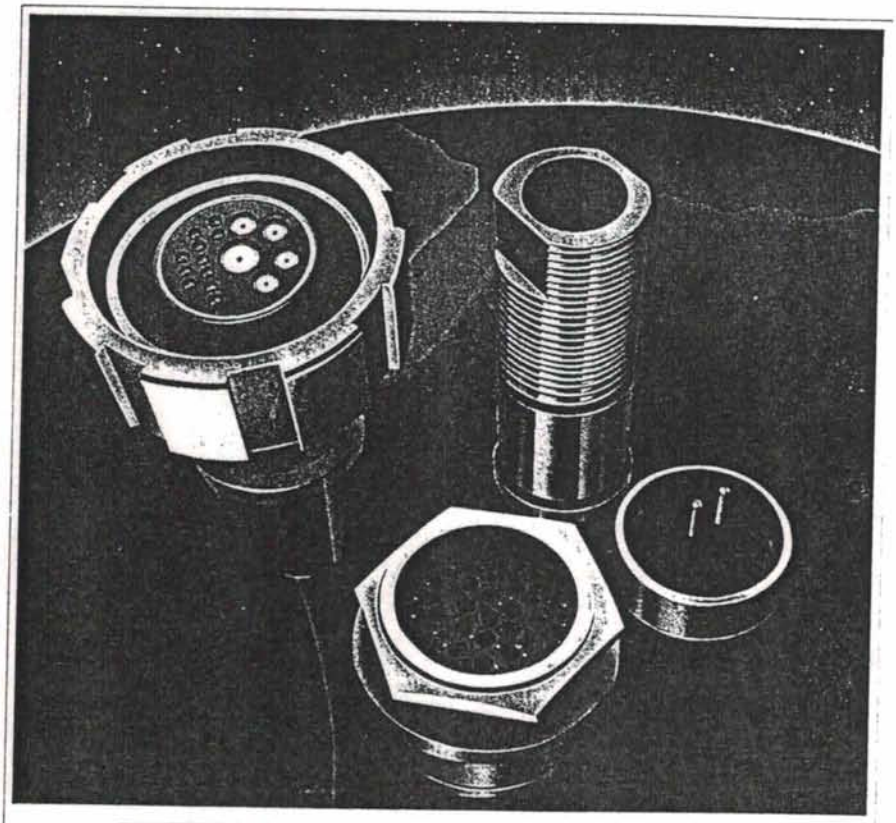
Many systems have become integral parts of the "one-man-bridge" concept. Strictly speaking, the term ECDIS belongs to that family of systems defined by the International Maritime Organization (IMO) in its Provisional Specifications. These systems to be compliant must present for the user the "equivalent of a paper chart" and would probably be found on reduced-manning bridges.

Standardization Question

The question that hangs over the ECDIS community is how the regulatory authorities will react to their development. Standardization of the international paper chart symbols has taken many decades. It may take that long for official acceptance of an equivalence of the paper chart. We feel it unlikely that an approved ECDIS will be readily available in the near term. Some of the reasons for this are:

- IMO approval needs to be obtained (see the sidebar article) for the use of ECDIS equipment. Provisional

(Continued on page 14)



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standards will be addressed for acceptance in 1993. This step requires development of equipment and, in parallel, the requisite ECDB. Even if approved in 1993, there is a question as to how long it might take for the commercial sector to produce widespread versions for general use.

- Meanwhile, as the IMO standard ECDIS is in the approval cycle, the difficult work of standardizing an "equivalent paper chart" (electronic navigation chart or ENC) is being carried out by the International Hydrographic Organization (IHO). Widespread acceptance of ECDIS is dependent on availability of necessary coverage. This implies that a number of charting agencies will need to have converted most of their inventories to digital production—a massive undertaking. Without widespread ECDB coverage, the use of ECDIS is quite limited.
- Conservatism makes mariners uncomfortable with rapid change. Until they have grown computer-literate and trusting, acceptance of ECDIS may well be limited. Ship owners will move slowly as they evaluate costs versus benefits.

So where does that leave us?

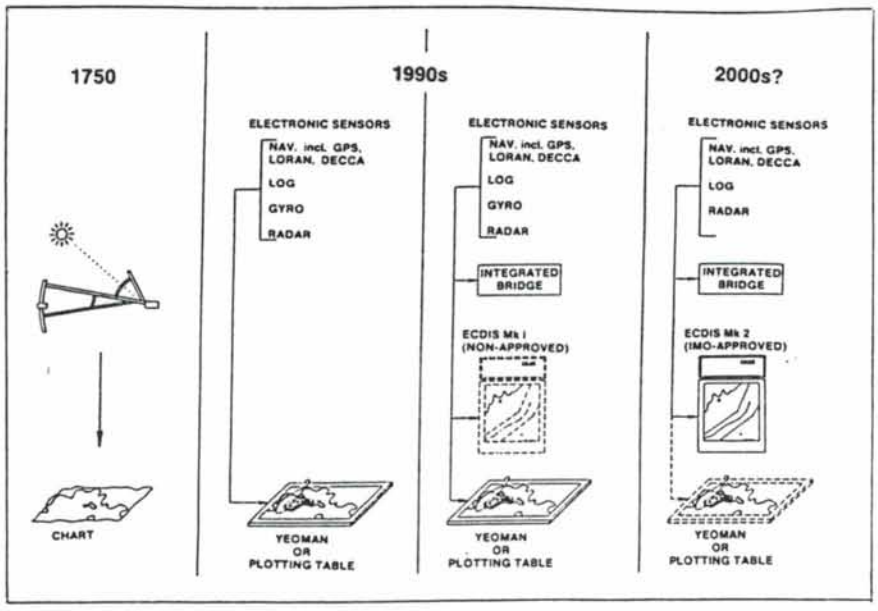
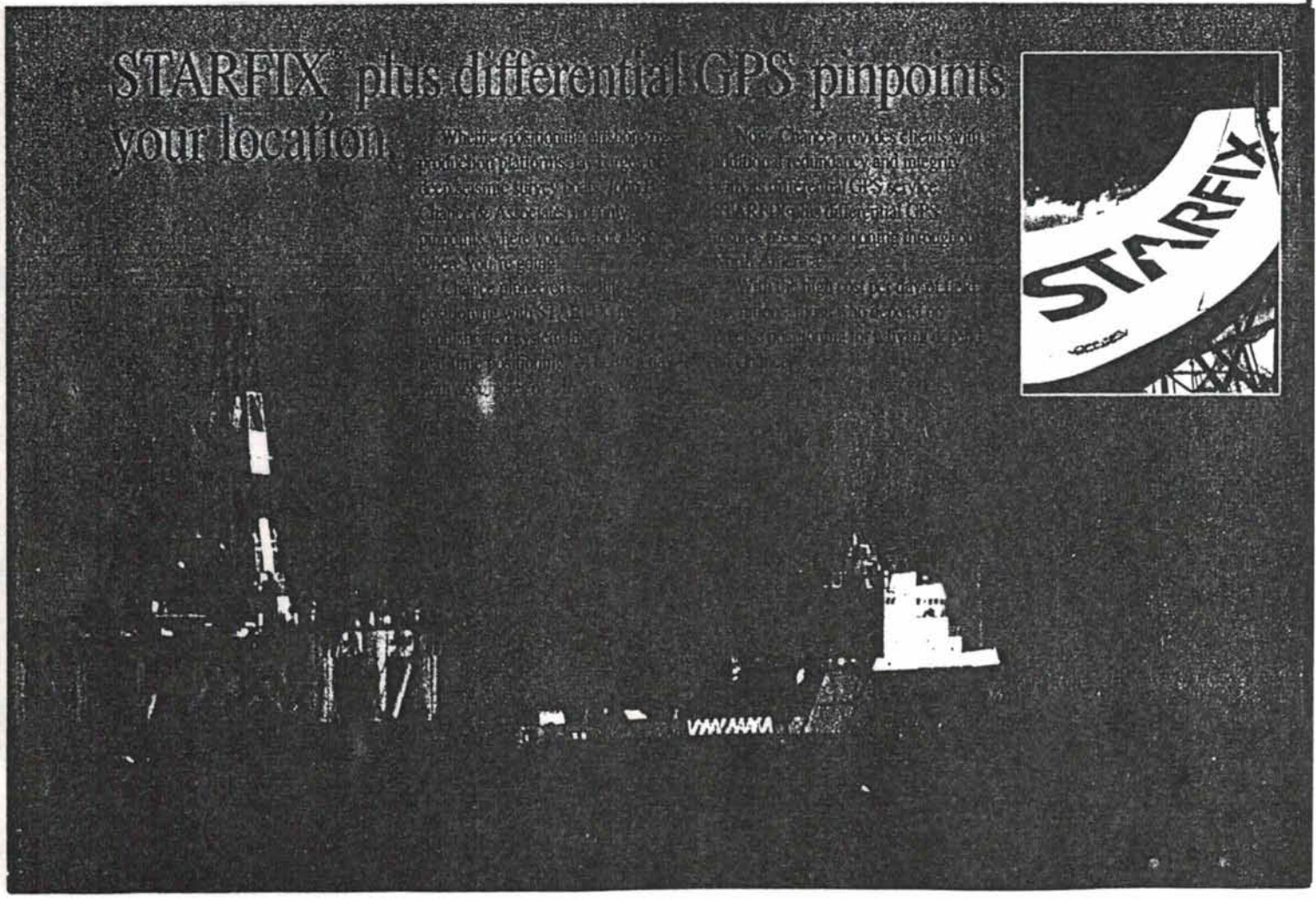


Illustration above traces stages in the introduction of electronics to bridge navigation practices.

The deep sea mariner today must still accomplish his work on a paper nautical chart because of regulatory, cultural, intellectual, and aesthetic imperatives. There can be no argument that paper charts are the best databases of their kind, developed over centuries to provide the best display of information.

Having said that, let's look into the future for a way to make the transition from paper to electronic charts. What is needed is a marriage of the two technologies encompassing a gradual decrease in the use of paper charts while the ECDIS concept grows.

The day will surely come when



ECDIS will be predominant, although when is uncertain. (We look at this toward the end of this article.) A bridging technology should therefore be made available to lead the art/science of navigation forward into this new age. This bridging technology must:

- Rely on the paper nautical chart as its primary database.
- Link this hard-copy database (chart) to electronic systems.
- Retain as many conventional navigational procedures as possible to allow easy transition from paper to screen.
- Concentrate on minimizing additional workload for operators. Paper charting will be continued in conformity with standard practice and regulations during the transition period.
- Be usable in event of power or database failure.

There are a number of systems that begin to meet these criteria. They all have a common characteristic—that of plotting on paper charts and they fall into three categories: (1) Plotting tables using projected lights such as those built by Martin Marietta, Smiths Industries, Racal, and Lawrence Scott; (2) automatic pen plotters, such as the one seen in the Sperry integrated bridge system and Qubit's TracPlot; and (3) a new form of plotting system—the "Yeoman."

Yeoman: New Way of Plotting

Yeoman provides a simple and effective way for the operator to take part in the interaction between electronic positioning systems and the all-important chart. The philosophy behind such a system is that it provides a single operations station where the watchkeeper/navigator can plot his position and evaluate its relationship within the area of operations on the chart, without increasing his workload.

It is based on the paper chart and is immune to the power failure scenario, will allow legal plots to be kept, and its use is based on conventional navigation practices. Yeoman does the electronic work for the operator and significantly reduces the amount of plotting effort.

It doesn't replace the navigator; it includes him in the process while speeding up that process and increasing accuracy.

The system consists of three basic parts:

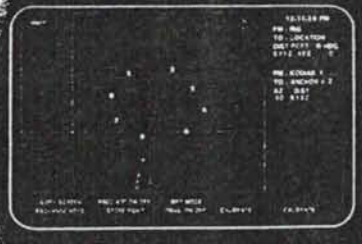
- An electronic tablet mounted on a standard chart table. It is large enough to accommodate the largest charts issued.
- An interface unit with processor, power supply, and interface for connection to external navigation or computer systems.
- The "puck," a passive unit that interacts with the tablet and is moved over the paper chart by the operator.

By a simple keystroke, the position of a radionavigation system can be quickly taken up. This is achieved by the cardinal point lights that burn, indicating the direction in which the puck must be moved to take position. The lights go out when in position. The operator may then mark the position on the chart through the hole in the plotting center. Thus the position is quickly and accurately plotted on the chart and with little mental effort.

A wide range of plotting functions is available, such as direct readout of distance and bearings, calculation and display of time to go, estimated time of arrival, and transfer of waypoints and routes between charts of

(Continued on page 16)

Our GIS database pinpoints any problems.

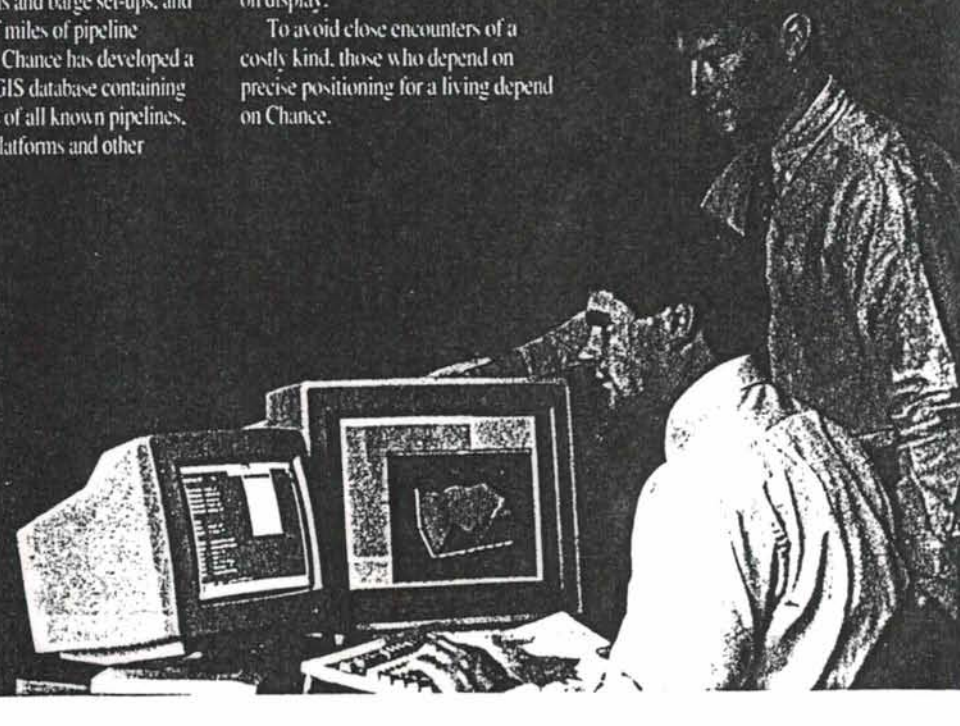


For more than 30 years, John E. Chance & Associates has been positioning clients in the Gulf of Mexico.

Through more than 8,000 rig moves; hundreds of platform settings, core locations and barge set-ups; and thousands of miles of pipeline construction Chance has developed a proprietary GIS database containing the locations of all known pipelines, wellheads, platforms and other facilities in the Gulf.

With an integrated dynamic graphic positioning system, Chance clients can view the whole operation graphically with shipping fairways, lease boundaries and subsea hazards on display.

To avoid close encounters of a costly kind, those who depend on precise positioning for a living depend on Chance.



JOHN E. CHANCE
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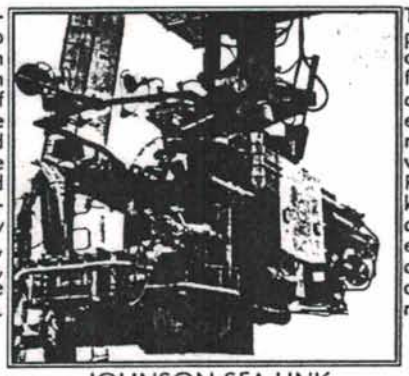
HARBOR BRANCH HAS A SPECIALIZED FLEET TO MEET YOUR NEEDS

With the ease of underwater helicopters, two HBOI submersibles can either fly to work sites on the sea floor, to a depth of 3,000 feet, or hover in the water column. Manned with a pilot and three passengers, equipped with the latest technology, they allow occupants to collect, photograph, measure, and observe in situ.



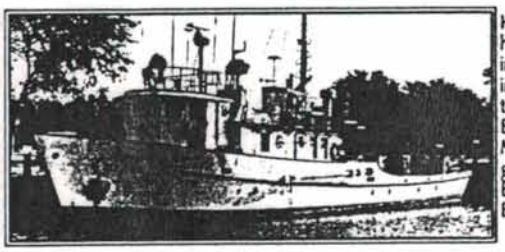
The JOHNSON-SEA-LINK pilots and submersible crew members are known for their professional handling, maintenance, and efficient operation of these remarkably capable vehicles. Harbor Branch R&D engineers constantly keep the submersibles updated with new tools and equipment for all types of underwater oceanographic research.

JOHNSON-SEA-LINK

R/V SEWARD JOHNSON, 176'

R/V EDWIN LINK, 168'

These professionally operated vessels, with wet and dry labs, environmental rooms and accommodations for up to 30, support surface and submerged research with manned and unmanned operations.



Harbor Branch also has Ocean Engineering R&D expertise in Life Support Systems, Chemical Engineering, Mechanical Engineering, and Electro/Optical Engineering.

R/V SEA DIVER, 100'

Hysub 40 SCOOP (Sample Collecting and Oceanographic Observation Platform) is equipped with a color video and still TVP camera, a spatially correspondent manipulator and five-function arm, and a

rotary bucket sampler. The vehicle operates to a depth of 3,300 ft., and is lowered from the vessel in a cage from which it can fly via its 450' neutral tether, thus isolating itself from surface vessel motion.

ROV SCOOP

For information, contact Tim Askew, Marine Operations Director
(407) 465-2400, extension 262 or 271; Fax: (407) 465-2446; Telex: 52-2886
HARBOR BRANCH OCEANOGRAPHIC INSTITUTION, INC.
5600 Old Dixie Hwy., Ft. Pierce, FL 34946

different areas, scales, datums, and projections.

The conventional process for planning a voyage is to plot a track on a chart and transfer it to an electronic system. With Yeoman, one enters the route points by placing the puck on the desired position and depressing the "enter" key. The route can be easily transferred to a radionavigation system or to a number of charts regardless of scales, projections, etc. Great Circle and rhumb line routes can be plotted with ease.

The system has a number of different interface options for radars, plotters, autopilots, alarm, and storage systems. This allows operators to integrate the paper chart with electronic systems, including tactical computers, quickly, easily, and unambiguously.

One option includes the ability to connect Yeoman to a computer on which data from the Defense Mapping Agency's Automated Notice to Mariners System (ANMS) has been loaded. The ANMS provides digital files containing, among other things, chart correction data. Yeoman takes positions directly from the ANMS and allows them to be plotted and marked up in a very few seconds with accuracy.

Looking Ahead

The future promises evolution leading away from the paper chart. Early navigators applied computations directly onto the chart. With the growth in electronics, the navigator still manually plots data derived from electronic systems.

Each new electronic navigation system has thus resulted in addition of steps for the navigator. It also results in additional log entries. With a system such as Yeoman, positions can be streamed directly down to the chart with little effort and no loss in accuracy.

As the ECDIS concept continues developing, systems such as Yeoman can be employed to increase the interaction and availability of navigational data. In a number of cases, Yeoman already provides digitizing capabilities to video plotters.

One of the benefits of such a bridging system is that it brings navigators and watchkeepers gradually into the new and rapidly changing technological world represented by ECDIS. They can continue to monitor their navigation process on the paper chart

CIRCLE NO. 8 ON INQUIRY CARD

while availing themselves of the newer and faster technologies.

The all-important linkages are maintained.

In a manner of speaking, the Yeoman concept provides an ideal man-machine interface for advanced electronic systems. The tedious and potentially error-prone method of position entry is virtually eliminated.

Once ECDIS technology has been fully approved, accepted, and available, it will remain to be seen whether the plotting systems will remain. But for the near- and mid-term, they stand to play a major role as user interfaces or information backup.

We've gone out on a limb in an attempt to forecast a time scale for the change from all-paper to the ECDIS (in the majority) age. The curves represent the proportion of the merchant fleet fitted with each class of equipment.

Currently, all ships are assumed to be using conventional charts since no IMO-approved ECDIS yet exists. Some time, well into the next century, we think that we might see the decline of paper charts, though IMO is unlikely to call for their abolition.

We think that the chart-to-ECDIS changeover will not start for at least ten years, though we would expect a significant number of vessels to carry some sort of automatic plotting device/aid in the near future. Their increase will start to tail off as ships are fitted with a full-chart-equivalent ECDIS, which is likely to occur between the years 2020 and 2040.

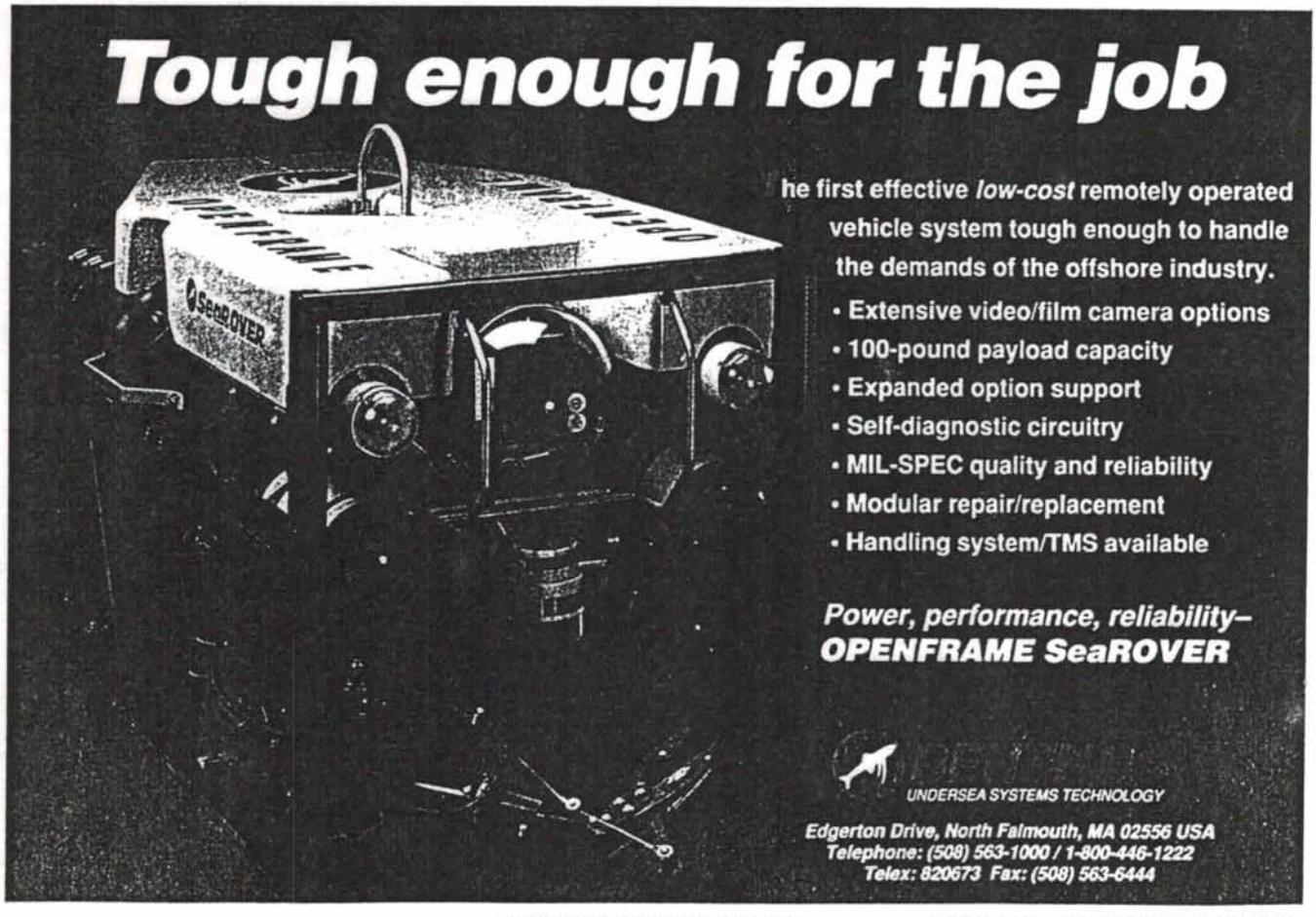
A corollary to this forecast is that the immediate future of non-IMO-approved ECDISs appears as a "bubble," since they will be fitted in significant numbers of ships over the next few years. They will be supplanted by approved systems as they become recognized and accepted.

The growth and visibility of ECDIS technology is a fact. The speed with which it is embraced in the fleets of the world is a matter of some conjecture. There are other technologies—as yet undreamed of—that might speed or hinder the march toward full usage of the ECDIS.

The fact remains that we are in an interim period and as long as there are not sufficient ECDBs, the paper chart must be consulted. When electronic equipment is being used with paper charts, the bridging technologies will have a major role to play. /st/

John L. Hammer III spent 25 years in the U.S. Navy, beginning in destroyers and ending as deputy director of the Defense Mapping Agency's Hydrographic/Topographic Center. He is a 1962 graduate of the U.S. Naval Academy, and later of the Naval War College, with postgraduate work in geodetic sciences and ocean engineering. Hammer introduced electronic chart technologies and trends to Sea Technology *readers in March 1984 and has since been an occasional contributor on these pages of articles in the electronic charting field.*

Hugh J. Agnew earned degrees in mathematics and oceanography at the universities of Cambridge and Wales. After five years as an academic at the University of Western Australia, he put together a number of large-scale integrated positioning and navigation systems during the 1970s period of growth in the offshore industries. Agnew was one of the founding directors of Qubit and continues to play a strong role in technological developments—including conception of the Yeoman. An active ocean racing navigator, he plays an active role in the Royal Institute of Navigation.



TRAC* 1205

RUST DEOXIDIZER AND PROTECTOR

This product is directed toward improvements in currently available rust deoxidizers and protectants. More particularly, the product's parameters are concerned with :

* Liquid Composition
* Ease of Application;
  Dipping, Spraying, and Brushing
* Effectively Removing Rust
* Protecting Steel Against Corrosion
* Leaving A Hard, Crystalline Neutral Binder/Primer
* Non-Toxic
* Non-Flammable
* Bio-Degradable

Steel commonly rusts by an electro-chemical process called oxygen absorption. All that is required is an electrolyte, which simply may be moisture in the air, and oxygen. Rusting frequently begins at a scratch or nick in a protective coating which exposes bare steel to the electrolyte.

Iron readily gives up electrons to the crystalline metal and frees itself to the electrolyte. These electrons migrate throughout the base metal seeking a location for a cathodic reaction for equilibrium. At one or more points the electrons eventually find their way back to the electrolyte. In some instances however, the electrons migrate directly through solid layers of coating as a result of an electrical potential difference between two or more surfaces. At this point, electrons combine with the water and oxygen to form hydroxcylions which unite with the ferrous ions in the electrolyte and through a series of chemical reactions, rust is formed. Once established these reactions are self-generating.

Known rust-removers generally contain a strong mineral acid which attack both the metal and the rust. Careful surveyance must be made and the acid removed as soon as the rust disappears. This is generally accomplished by washing the acid from the metallic surface. However, since there is no rust-preventative coating left on the metal, it is necessary to protect the bare, cleaned metal by applying a resinous or silicone protective coating. Any opening in this coating, whether caused by physical damage or incomplete application, becomes instantaneous sites for anodic or cathodic reactions. This is especially common in harsh environments where the electrolyte is strong enough to encourage ions to migrate through the coating. Design and metallurgical variations can also encourage rusting by creating strong electrical fields within the metal.

It is therefore an objective of our product to provide a composition which does not attack the metal itself and yet completely removes rust while leaving a protective coating which strongly adheres to the metal surface acting as a barrier against air and water and even resists migrations of ions and electrons from the metal to the surface.

Our product forms an electrically neutral binder/primer that insulates electrical fields within the metal from the surface which is fourteen times stronger than paint, thereby inhibiting electrochemical rusting reactions. Not only does this layer insulate the metal from the atmosphere but it's rough crystalline surface provide "teeth" that help paint adhere to the surface without the requirement of a primer coat.

DIRECTIONS FOR APPLYING TRAC*1205

TRAC*1205 is not a rust converter

TRAC*1205 is a unique product that will de-oxidize rust/corrosion from all metal surfaces, and when dry leaves behind a primer/binder coating which is heat resistant to 2400F, weather resistant, and resistant to most acids.

TRAC*1205 may be applied with a brush or roller, low or high-pressure sprayer, or used in vatting systems. TRAC* is water-based and may be diluted 1:1 with water when used for dipping or when sprayed with a pressure washer in place
of sandblasting.

TRAC*1205 may be applied to previously painted surfaces to remove all corrosion; although it will not adhere to the old paint, there is a rinse process required. After corrosion is completely de-oxidized and primer/binder coating is dry, sealing area(s) where bare metal is exposed, simply rinse the film from existing painted surfaces and apply finish coat. TRAC* may discolor some paints; apply to small area first to check for discoloration or reaction. On new metal surfaces, TRAC* may be painted over when all corrosion is removed, although the primed surface may appear tacky.

For severest cases of rust, more than 2 applications of TRAC* may be needed when applied with brush or roller - - sandblasting, wire brushing, chipping, etc. may be required prior to application of TRAC*1205 - - TRAC*1205 will then remove all remaining rust and prime the surface.

TRAC*1205 may be used in dipping applications. If this method is used it may be practical to dilute 1:1 with water. To remove the oxidation, soak the metal until corrosion is removed and allow to dry.

TRAC* dries to a water-white coating; if diluted 1:1 with water dries clear. Heating the product decreases immersion times (see brochure). If a finish coat is required, allow primer/binder coating to dry or become non-transferable. Do not dip Zinc.

MATERIAL SAFETY DATA SHEET

TR*1205 Revision of 01-01-91

MANUFACTURE LOCATION .....3715 Northcrest Rd., Suite 31.
Atlanta, GA 30340

PRODUCT DISTRIBUTION BY: CHEMICAL RESEARCH CORPORATION
Telephone: (404) 936-9215 FAX: (404) 455-3075

PRODUCT IDENTIFICATION

Product name: TR*1205
Common names/synonyms: Rust deoxidizer/binder/primer
Formula: H3 P O4 + (additives)
Hazard ratings: Health: 2-1
Flammability: 2-0
Reactivity: 0-0

HAZARDOUS INGREDIENTS

Component	CAS #	%	tlv	pel
Phos acid	7664-38-2	<20	none	none
Water	7732-18-5	balance	none	none
Additives	Trade secret	balance	none	none

PHYSICAL PROPERTIES

Boiling point: 300 degrees Fanrenheit Freezing point: -58 F
Vapor pressure: 14mm HG/20 Degrees Celsius
Vapor density: (air = 1.1) N/D
Solubility in water: complete
Specific gravity: (Water = 1) : 1.38
Melting point: none
Evaporation rate (Butyl Acetate = 1) same as water.
Appearance and odor: colorless, light amine odor.
PH = 1

FIRST AID MEASURES

If inhaled: Remove person to fresh air.
In case of eye contact: Irrigate eye with water for 15 minutes.
In case of skin contact: Wash immediately with soap and water.
If swallowed: May cause slight stomachache. Do not induce vomiting. Drink milk and/or water. Consult physician immediately.
Notes to physician: none

HEALTH HAZARD INFORMATION

Inhalation: Vapors - none (particle mist).

Eye contact: May cause irritation.
Skin contact: May cause slight irritation.
Ingestion: Gastrointestinal irritation.

PERSONAL PROTECTION

Ventilation: Local exhaust.
Respiratory protection: Recommended in closed areas.
Eye protection: Goggles/faceshield.
Skin: Impervious gloves and protective garments are recommended for prolonged use.
Other protective equipment: None

FIRE AND EXPLOSION INFORMATION

DOT category: Flash point/ method used= None/ Closed cup auto ignition

Flammability Units
lel:1.5 uel:11

Extinguishing media: Water, Co2, dry chemical, foam.
Special fire fighting procedures: Wear self contained breathing apparatus in confined areas.
Unusual fire and explosion hazard: None

HAZARDOUS REACTIVITY

Stability: Stable Hazardous polymerization: Will not occur.
Conditions to avoid: Avoid contact with incompatible materials.
Materials to avoid: Alkalies, strong oxidants, zinc, leather, nylon fabric, colored laminates.
Hazardous decomposition product: None

SPILL, LEAK AND DISPOSAL PROCEDURES

Steps to be taken in case material is released or spilled: Flush thoroughly with water or neutralize with Sodium Carbonate.
Disposal method: Flush spills with water to sanitary sewer.

SPECIAL PRECAUTIONS

Storage and handling precautions: Keep from freezing. Keep container tightly closed when not in use.
Other precautions: Recommended for Industrial Use Only.

OTHER REGULATORY INFORMATION

This product contains the following hazardous chemicals subject to the reporting requirements of Title 3 of the Superfund Amendments and Reauthorization Act of 1986 and 40 cfr Part 372

Chemical	cas no.	%
Phosphoric Acid	7664-38-2	<20

SHIPPING DATA

DOT shipping name: TR*1205
DOT hazard class: Non corrosive, non toxic, non flammable.
DOT required labels: None
Technical shipping name: Cleaning Compound, Liquid.
Freight class bulk: 55
I.D. or U.N. number: N.A.
T.S.L.A. Status: Listed

NOTICE

This data is furnished in good faith and as of the issued date is believed to be true and correct based upon our sincere efforts. This data is offered solely for the user's information and consideration. Since conditions of use are beyond our control, the user assumes all responsibility to determine the conditions of safe use, and the risk for use of this product. This information and any recommendations or suggestions are made without liability or legal responsibility as implied.

MAERSK PLACENTIA

ST. JOHN'S, NFLD

JULY 1st, '88

TRAC* of Nfld & Lab.,

Mount Pearl, Nfld.

To whom it may concern:

As regards the performance of the Trac* coating applied to the vessel's main working deck in June of '87, I can verify that my crew removed deck planks at random and found in all cases that the coating remained intact and apparently in perfect condition. This was viewed with some surprise as the main deck is generally awash in the winter months and comes in for considerable rough treatment. This inspection took place one year after the initial application. In terms of performance, I can find no fault with this product after one year's service.

Sincerely,

Lawrence G. Lacey

Capt. Lawrence G. Lacey

MASTER
MAERSK PLACENTIA

DEPARTMENT OF THE NAVY
COMMANDER MILITARY SEALIFT COMMAND
WASHINGTON, D.C. 20398-5100

REFER TO:
4700
Ser N741b/ 04617

AUG 28 1990

Mr. Roger D. Cates
Chemical Research Corporation
3715 Northcrest Road - Suite 31
Atlanta, GA 30340

Dear Mr. Cates:

Your letter of August 2, 1990 requested approval for shipyards to use your product 'TRAC*1205' cleaner/descaler on Military Sealift Command (MSC) ships.

MSC has completed a review of the submitted material and determined that your product can be used (at their discretion) by any shipyard or similar repair contractor for cleaning and descaling shipboard pipeline systems, including firemain, boilers, pumps, valves, waste water, potable water, heat exchangers and chilled water systems.

Please note that the nature of most repair/overhaul specifications prepared by MSC allows contractors to choose their own methods to meet the requirements. This letter is allowing such contractors the option of using your product if they so desire. As with any method, it is ultimately their responsibility to ensure that it is used appropriately and, if the product does not achieve the necessary level of cleaning or descaling as required by the specification, then they are still responsible to utilize an alternative method until the requirements are met.

The uses for which this approval is granted are not normally performed by MSC ship crews, therefore the product is not being approved for crew use. As further marine experience is gained, however, it may be determined that there are additional uses for your product which are appropriate for ship's force to perform. At such time, you may apply for additional approvals.

MSC reserves the right to revoke this approval if it is determined that your product is not performing satisfactorily.

The MSC point of contact for this matter is Thomas Jordan at (202) 433-0262.

Sincerely,

T.J. ALLEN
Engineering Director

Copy to:
COMSCPAC (N7)
COMSCLANT (N7)

23 AUG 90

MEMORANDUM

From: Bob Mygatt
To: Roger D. Cates

Subj: USE OF CRC "TRAC #1205/RUST-FREE" TO CLEAN NUMBER 4 AIR CONDITIONING UNIT CHILLER AND RECEIVER

1. Chemical Research Corporation (CRC) product "TRAC #1205/RUST-FREE" was used on USS NIMITZ No. 4 A/C unit in August 1990. Product was used to remove internal rust/scale buildup inside the chiller and receiver. The process used to remove scale and foreign material was by the recirculation or loop method, using temporary flushing pump, jumper hoses, strainer, and heated flushing barrel supplied by North Coast Refrigeration Co. Before using "RUST-FREE" the ship's equipment was visually inspected at view ports and by removing hand hole covers on the chiller unit. About 1/4" - 1/2" thick deposit of rust/scale was found on internal surfaces of chiller shell and on external surfaces of tubes. After completion of inspection and assembly of temporary equipment, both chiller and receiver were flushed, which required about six days' continuous flushing. After completion of flush and rinse, the system was opened and visually inspected. Internal surfaces of chiller shell and external surfaces of tubes were found free of scale and foreign material with no residual deposits or injurious effects to the system.

2. "RUST-FREE" was found to be non-toxic and non-odorous and by itself required no special safety equipment or clothing to protect the workers. Disposal of flushing media was carried out in the normal manner.

3. In summary, "TRAC #1205/RUST-FREE" was found to be satisfactory.

Mygatt
R MYGATT

AUG. 24. 90 10:53 AM *SUPSHIP SEATTLE P02

Cleaning and Removal of

Mineral Deposits
(Trace Elements of Calcium Carbonate, Limestone, Sodium Sulfate, and Magnesium)

and Ferric Oxide (Rust)

from the

Forward and Aft Saltwater Feed Lines and Sewage Drain Lines of the SS *Del Monte* MARAD Hull #200

Report Submitted by

Chemical Research Corporation
3715 Northcrest Road
Atlanta, Georgia 30340

Cleaning and Removal of Mineral Deposits and Ferric Oxide from the Feed and Drain Lines of the SS *Del Monte*

1.0 Rationale for Cleaning

When piping systems have been extensively repaired or are blocked, the replaced or repaired piping components must be cleaned to ensure that no foreign material restricts flow throughout the system. The cleaning is necessary to clear sewage drain lines and saltwater feed lines of mineral scale (trace elements of calcium carbonate, limestone, sodium sulfate, and magnesium) and ferric oxide (rust).

2.0 Inspection

2.1 Safety Inspection

Southern Marine Chemists, Inc., completed an initial inspection for trace elements of methane gas and other hazardous elements in the forward and aft CHT holding tanks. A chemist's report presenting the results is enclosed.

2.1. Inspection of the CHT Tank

After inspection of the forward and aft CHT tanks determined the working environment to be safe, inspection for mineral scale and ferric oxide began. The inspection was begun and completed by representatives of Chemical Research Corporation, Roger D. Cates and Michael J. Wynn, Chief Engineer Carl Stayton, First Engineer Robert Burke, and Third Engineer Kevin Russell from the crew of the SS *Del Monte*. Also participating was Port Engineer Matt Schulic of Lykes Brothers Steam Ship Company. The inspection revealed a moderate amount (1/4") of ferric oxide in the CHT tank.

2.2. Inspection of the Forward and Aft Saltwater Feed Lines

Inspection of the forward and aft saltwater feed lines was also completed by the Chief Engineer, First Engineer, and Third Engineer of the SS *Del Monte*, representatives of Chemical Research Corporation, and Port Engineer Frederickson of Lykes Brothers Steam Ship Company. Inspection points were the forward pump room (bottom deck) at the saltwater feed pump, and the aft section (bottom deck) at the saltwater feed pump. Inspection point was 15 feet from the saltwater feed pump in both a vertical and horizontal section of piping. A significant

amount (2") of mineral scale and rust deposit was attached to the inner walls of the 4" piping. Inspection also revealed large particles of mineral scale and ferric oxide that were not attached to the inner walls but were present in the piping, severely restricting flow. A combination of the inner wall buildup and dormant particles in the piping produced a 90% blockage.

Fiberoptic Borescope Equipment was used to receive the inspection information, which was recorded for your records. Narrated copies are enclosed for your records.

2.3. Inspection of the Forward and Aft Sewage Drain Lines

Inspection of the forward and aft sewage drain lines was completed by the Chief Engineer, First Engineer, and Third Engineer of the SS *Del Monte*, Port Engineer Frederickson of Lykes Brothers Steamship Company, and representatives of Chemical Research Corporation. Fiberoptic Borescope Equipment was used to videorecord the mineral scale and ferric oxide present in the sewage drain lines.

The forward sewage drain line was inspected at the toilets on the first deck and in the forward pump room. The inspection showed that the forward sewage drain had 2" to 3" of mineral scale and ferric oxide attached to the inner wall of the 6" piping. The forward sewage drain line also contained large particles of mineral scale and ferric oxide that were not attached to the inner walls but that contributed significantly to the 100% restriction of flow.

The aft sewage drain was inspected on the second deck 18 feet from the CHT tank. The inspection revealed that the 6" aft sewage drain lines contained 1 3/4" to 2" of mineral scale and ferric oxide. The inspection also revealed the presence of large particles of mineral scale and ferric oxide that were not attached to the walls but that contributed to the severe flow rate restriction. The particles ranged in size from 6" to 10" in length and from 2" to 3" in diameter. The inspection determined the flow to be restricted by 85%.

The combination of attached and unattached particles inside the sewage drain lines was determined to be the cause of the inoperative condition of the forward system. This combination was also determined to be the major factor in the greatly restricted flow rate of the aft sewage drain lines.

3.0 Calculating Required Quantity of Cleaning Compound TR1205

After examining the forward and aft CHT tank, blueprints of the forward and aft saltwater feed line, and blueprints of the forward and aft sewage drain line, Port Engineer Matt Schulic of Lykes Brothers Steamship Company and representatives of Chemical Research Corporation calculated the total number of gallons of compound necessary to clean and remove internal blockage and corrosion. The total amount was estimated to be 2000 gallons. Once the gallon usage requirements were determined, induction began.

4.0 Induction of Cleaning Compound TR1205 Supplied by Chemical Research Corporation (Forward Pump Room and Bottom Deck)

The forward and aft saltwater feed lines and sewage drain line system was reviewed to determine the best point of induction. The Chief Engineer, First Engineer, and Third Engineer of the SS *Del Monte* and representatives of Chemical Research Corporation determined that this point was located 15 feet from the CHT tank into the onboard saltwater feed pump at the onboard strainer.

The proper fittings were adapted and put into place by employees of North Florida Shipyard, Inc., of Jacksonville, Florida. The fittings were able to adapt to 2" glass-filled polypropylene ball valves (4-bolt) with Teflon seals, then connecting with Evertite 31685T cam and groove investment cast (long shank) fittings attached to 2" ID CORONADO X-link polyethylene 200 upsi EPDM chemical hose.

Once the fittings were in place, the 2" ID CORONADO X-link polyethylene chemical hose was connected at the onboard saltwater feed pump into the onboard in-line strainer. The opposite end of the 2" CORONADO X-link hose was submerged into the forward CHT tank for suction of the cleaning compound. The CHT tank was filled to capacity and its lids were removed to allow overflow. The CHT tank was used as the reservoir, thus producing a closed-loop system.

To ensure that the sewage drain line was completely full, the valve from the sewage drain line to the CHT tank was closed. The shut-off valve was 3 feet from the CHT tank. The flushometers were wired open to allow filling to all five decks to be completed. As the sewage drain line of one deck filled, the flushometers were closed to allow the next level to fill. This step was repeated until the sewage drain lines of all decks were full.

There was some overflow on the bottom deck of the living quarters because of blockage in the sewage drain lines and gravity from the upper deck. Once the overflow began, the saltwater feed pump was stopped.

After the saltwater feed lines and sewage drain lines were filled, the cleaning compound TR1205 was allowed to penetrate and dissolve the minerals and ferric oxide for a period of 24 hours.

After the 24-hour period of penetrating and dissolving was complete, the sewage drain line valve at the CHT tank was partially opened to ensure back pressure, which was necessary to ensure that the sewage drain line would remain full. At this time, the saltwater feed pump was engaged to allow closed-loop circulation throughout the entire saltwater feed and sewage drain lines. The circulation was allowed for 12 hours.

5.0 Removal of Cleaning Compound from CHT Tank and Sewage Drain Line

After cleaning and circulation were completed, a suction line was adapted into the CHT tank by means of a double-diaphragm air-operated pump to pump the compound from the CHT tank to the port side 275 gallon containers for proper disposal by Chemical Research Corporation. When the CHT tank was completely drained, the saltwater feed line was opened, the flushometers were wired open, and saltwater flush proceeded for 4 hours.

6.0 Results of the Cleaning

After cleaning compound TR1205 was circulated and the saltwater flush was completed, the saltwater feed lines, flushometers, toilets, and sewage drain lines operated at 100% efficiency.

7.0 Inspection of Forward and Aft Saltwater Feed Lines, and Sewage Drain Lines After Cleaning

The forward and aft saltwater feed lines and sewage drain lines were inspected and video recorded with Fiberoptic Borescope Equipment. The points of inspection were the same points inspected before the cleaning. The Chief Engineer, First Engineer, and Third Engineer of the SS *Del Monte*, Port Engineer Frederickson of Lykes Brothers Steamship Company, and representatives of Chemical Research Corporation confirmed that the saltwater feed lines, and sewage drain lines were 99% free of mineral scale and ferric oxide.

8.0 Cost Analysis of the Method Used in Cleaning Saltwater Feed and Sewage Drain Systems

Representatives of Chemical Research Corporation were requested to examine the sewage drain system on the SS *Del Monte*. After inspecting the system, it was determined that by using the CHT tank as a reservoir and the onboard saltwater feed pump as the circulation source, both systems could be cleaned simultaneously. Using this method of circulation, no additional chemicals were required to clean the saltwater feed system. By eliminating the need for additional chemicals, the cost of cleaning the saltwater feed system was reduced by 85 to 100%.

Utilizing this circulation method proves to be highly cost efficient. Cleaning the saltwater feed system alone would require less chemical cost when compared to the sewage drain system, however, there would be increased labor cost due to the necessity for proper fitting placement, shut off valves, and control valves located throughout the system's five decks. The estimated cost of cleaning the saltwater feed system was $95,000 to $100,000. The estimated cost for cleaning the sewage drain system totaled $100,000. By employing the above method, the cost for cleaning both systems totaled only $89,740. This total cost for cleaning the SS *Del Monte* could be used as a guideline in estimating the cost of cleaning a similar size saltwater feed system and sewage drain system for other steam ships.

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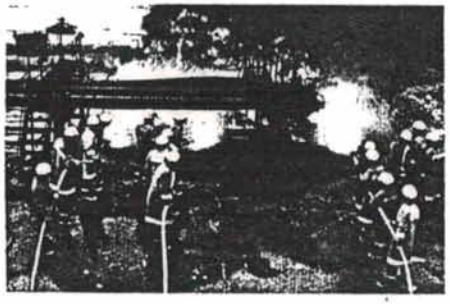

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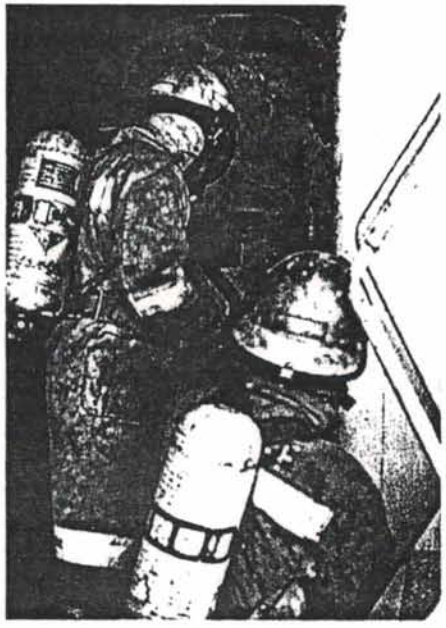

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