

100 barges that produce \$4,000,000 revenue per year, each barge produces \$40,000 in revenue per year, \$110.00 per day, \$4.58 per hour or 7½ cents per minute.

If this 15 barge tow is delayed 2 hours taking care of the injured man, using this formula, we multiply $15 \times \$4.58 \times 2$ hours equalling \$137.40.

If our towboat costs us \$1,400 per day to operate we would have \$116.66 ton-mile-production lost time for the 2 hours. Adding \$116.66 to the \$137.40 "lost-barge-revenue", we have a hidden loss of \$254.06 to our equipment in indirect cost.

If we do not add these indirect costs to each injury or equipment damage that caused delay time, these costs will not be pinpointed but will be buried somewhere in over-all operating costs.

It can be seen from this example, that these "hidden" lost times are just as important as keeping track of lost time attributed to lock and fog or other delays. The later delays are not directly controllable, but the majority of accidents *can be* controlled by focusing attention on their causes. There are in addition to the costs I have exampled, other costs which must be considered, and I think we have to be careful in trying to apply some magical formula to obtain an easy answer.

The formula you use should apply to your size of operation, wage factors, cost of materials and supplies, since these will not be the same for all companies. Remember, we are trying to sell or educate management on the true purpose and importance of safety. They must respect our figures, and we must be able to substantiate their reliability.

To obtain a basis for your figures, you will have to run time studies on deck crew members for the various duties they perform. For instance, do you know how much time is required to face up or unface a particular boat? How long it takes to pick up and place in tow a barge? How long to make a coupling? This time must be considered, for if a three man crew is normally assigned to these duties, and are forced to do without the services of their injured deckmate, any increase in normal time for the crew to perform these functions will be reflected in towboat lost-ton-mile production time, and lost-barge-revenue.

As all of you know, the safety department cannot do the job alone and it is obvious that if loss prevention programs are to be effective they must have sustained support from all phases of management. How do you get this support from management?

Many companies have obtained this support by means of committees. They have established *executive* or *policy* committees which review and evaluate the over-all safety program and the company's operation. Such a committee should include those people from top management who can establish policy, and those who will be responsible for administering these policies.

The controller, insurance manager, safety director, and directors of operation and maintenance should be on this committee. It is important that this committee be as small as possible and meetings held regularly.

A *general safety committee* should be set-up which includes the executive committee and all department heads. This is the group which will assume responsibility for implementing policies of the executive safety committee.

A *towboat safety committee* should be set-up and administered by the captain or relief captain under the supervision of the safety director, and the frequency of safety meetings should be determined by the company's accident rate; in no case, should these meetings be less than one time each month.

When management has recognized the full potential of loss-control by giving their unqualified support for their safety program, lower accident frequency rates will be coming, since the individual responsible for company safety will have the direct support from officials of the company, department heads and supervisors. Without this support, all safety programs are doomed to mediocre results.

When the safety program has this support the director of that program will be challenged to use all of his ingenuity to dig out these hidden costs and to educate all company personnel on the value of an accident free operation. By pinpointing costs, everyone in the company can be motivated to an intensified accident prevention effort.

SHIP OPERATION (Dry Cargo Vessels)

ENVIRONMENTAL SERVICES FOR MARINE SAFETY

By PAUL H. KUTSCHENREUTER

Director, User Affairs, Environmental Science Services Administration
(Delivered by John A. Mirabito, Marine Services Coordinator)

There is no doubt that man's basic instinct for self-preservation is as strong today as it was in prehistoric times. As in the dim past, and even in the same physical form, natural dangers and hazards continue to pose a threat to his well being. On terra firma this threat is ever present and substantial, but when man transposes himself into an alien medium, such as the marine environment, survival becomes infinitely more complex and evasive.

The pages of history and the daily press continue to unfold the grim statistics of casualties which the relentless sea has foisted as an intolerable burden on mankind. The pressing need to meet the virtually insatiable demands of an exploding twentieth century world is forcing man to explore and exploit the surrounding sea for new resources. Is this increased activity in the marine environment to be accompanied by a disproportionate increase in the casualty lists or will science once again provide the knowledge necessary to cope with its inherent dangers and hazards? In keeping with its mission, the Environmental Science Services Administration (ESSA) has dedicated itself to the latter alternative.

No matter what the enterprise—whether commercial or recreational—there are certain basic environmental problems involving the state of the sea which must be answered if this enriching potential is to be realized without undue loss of life and property. An analysis of the statistics indicates that the sea exacts its devastating toll primarily from the unwary. Therefore it becomes patently clear that all endeavors which are directly or indirectly associated with the sea must be conducted within the knowledge of its present and future state.

This is no easy task as the oceans, the inland waters and lakes, constitute forces

in direct and subtle ways with both the on a global scale which interact dynamically adjacent solid earth and atmosphere. Acquiring a comprehensive understanding of these interactions constitutes one of the greatest scientific challenges of the twentieth century for it is only from this understanding that the descriptive and predictive capability can be achieved. The annual statistics on casualties clearly indicate the enormity and immediacy of this problem.

During the period 1 July 1964 through 30 June 1965, the U. S. Coast Guard reports that damages to high seas shipping in U. S. waters for which weather and seas were contributory factors amounted to approximately 20 million dollars and claimed 25 lives. On a world-wide basis the Loss Book of the Liverpool Underwriters Association shows that weather damages caused the loss of 8 ships and partial losses to 1087 additional ships during 1965. The Coast Guard report also notes that for the years 1963 through 1965 the greatest single toll of deaths occurred as a result of casualties to fishing vessels. The fact that a number of these casualties were associated with adverse weather conditions emphasizes the extreme sensitivity of small craft to physical changes in the marine environment.

The recent destruction of a British petroleum platform in the North Sea with the resulting loss of 11 lives has created new concern among underseas oil exploration companies. This anxiety is quite real since investments in this form of activity now total more than 1 billion dollars and involve many hundreds of personnel.

Nearly one-half of the U. S. population, complete with its vast supporting industrial complex, resides near the margins of the ocean or the Great Lakes. The threat of damage from seas generated by off-shore

storms or seismic disturbances will undoubtedly increase due to the ever-expanding industrial, residential and recreational development taking place in coastal areas. The magnitude of the threat is illustrated by the 200 million dollars' damage which a slow-moving off-shore storm inflicted on the East Coast in March 1962.

In addition, the near-shore environment is being modified rapidly by human activities in ways that are unknown in detail but broadly are undesirable. Pollution, if unchecked, can render beaches unsafe for recreation, destroy fisheries and generally degrade the coastline. The Great Lakes offer a concrete example of how large bodies of water can be drastically altered and reduced in value as natural assets.

The use of the seashore and adjacent waters for sport fishing, swimming, skin diving, boating and surfing is becoming more popular not only for people living near the sea but, with the growth of rapid transportation facilities also for many people living inland. There are approximately 8 million small boat owners, and nearly 40 million people participate annually in recreational boating. Unfortunately, this form of marine recreation is also represented in the statistics. In calendar year 1965 the U. S. Coast Guard reports that boating accidents resulted in 1360 fatalities of which 131 were attributed directly to either weather or seas conditions. The increase in boating is reflected in the comparable figures for 1960 when 739 deaths were recorded of which 55 were related to adverse environmental conditions.

It is apparent that as a first step in accident prevention there is an urgent requirement to describe and predict the behavior of this fluid medium and to disseminate this information in a timely manner to users. Since wind affects the sea surface and the sea in turn exerts an influence on the behavior of the atmosphere an understanding of the resultant interplay requires treating the ocean and atmosphere as a thoroughly interacting system.

It was the growing awareness of the unity of the physical environment which prompted the recent formation of the Environmental Science Services Administration (ESSA). The rationale was that improved environmental services would result from studies which treated the ocean, the atmosphere and

the solid earth as a scientifically interrelated entity. In July 1965 the Coast and Geodetic Survey and the U. S. Weather Bureau were combined to form ESSA within the Department of Commerce. The Central Radio Propagation Laboratory, formerly of the National Bureau of Standards, joined the ESSA family in October 1965.

To fulfill the ESSA objective of providing a single national focus to describe, understand and predict the state of the oceans and the atmosphere, and to determine precisely the size and shape of the earth—the ESSA functions were redistributed among its five major components—the Coast and Geodetic Survey, the Weather Bureau, the Environmental Data Service, the National Environmental Satellite Center and the Institute for Environmental Research.

Uniquely, we find embodied in the products of each of the five components, services which can meet the urgent requirements of diverse marine interests for environmental information which will contribute significantly to safety and efficiency.

The Coast and Geodetic Survey provides cartographic and hydrographic services which are essential to safe navigation. Included are nautical charts, U. S. Coast Pilot and supplements, maps of the bottom topography of the ocean, information concerning the time and range of the tides and the direction and velocity of tidal currents. In addition, the Coast and Geodetic Survey is responsible for the operation of a seismic sea wave warning system in the Pacific to protect life and property on the islands and around the rim of the Pacific Ocean.

The Weather Bureau provides on a routine basis weather forecasts, warnings and reports for marine activities taking place on the high seas and on coastal and inland waterways. For small boating, emphasis is placed on the winds and sea conditions. Whenever certain meteorological and oceanographic conditions are observed and predicted, appropriate warnings are disseminated by mass media. Included are forecasts and warnings of storm surges. Two specialized services are provided in the Great Lakes area—(1) a forecast of the opening date for navigation into selected Great Lakes Ports, based on ice distribution, and (2) the issuance of warnings of lake oscillations known as "seiches."

The Environmental Data Service collects, archives, publishes and issues environmental data relating to the marine environment. These data are useful in the detailed planning required for the construction of residential, commercial and recreational facilities in coastal areas so that they may be capable of withstanding the rigors of the marine environment.

In addition, these data can be utilized in the engineering design of equipments which will be utilized within the extremely abrasive marine environment.

The National Environmental Satellite Center provides regular and reliable cloud picture coverage of the entire sunlit portion of the earth once every 24 hours by means of artificial earth satellites. This is a most useful tool in detecting developing hurricanes, typhoons and other oceanic storms over data-sparse areas. The Automatic Picture Transmission (APT) system automatically takes and immediately transmits pictures to all suitably equipped ground stations located within line of sight telemetry range. The availability of an APT receiver on shipboard can provide the mariner an instantaneous panoramic view of weather conditions along the ship's path of advance permitting him the opportunity to make timely evasive maneuvers.

The Institute for Environmental Research conducts and sponsors the fundamental investigations needed to develop the new knowledge which is required to understand environmental processes so that improved predictive techniques can be derived. In this connection, the Institute for Oceanography is conducting a comprehensive program of research on the physical characteristics of the ocean, and on the interaction between land, sea and atmosphere. Understanding the complex processes taking place in the marine environment will allow a more detailed description of its state and accordingly a more accurate prediction of its future behavior.

In the ultimate sense the achievement of the research objective will be ESSA's greatest contribution to marine safety.

Another element of the Institute of Environmental Research is the Institute for Telecommunications and Aeronomy (ITSA). This institute is actively engaged in research to strengthen and expand the Nation's capa-

bilities in telecommunications. In the course of this research the ITSA prepares and issues prediction of electromagnetic wave propagation conditions and warnings of disturbances in those conditions. The selection of proper radio frequencies is vital in maintaining reliable long-range communications with ships at sea.

Inherent in the ESSA mission is the responsibility to provide timely warnings of all destructive phenomena. In this connection plans are underway to implement a nationwide Natural Disaster Warning System (NADWARN). NADWARN provides for the rapid dissemination of warnings for such natural hazards as tornadoes, hurricanes, blizzards, floods, seismic sea waves, storm surges, and other natural disasters. Weather-related losses are now estimated to cost the Nation between 500 and 600 lives annually and produce economic losses averaging between \$11 billion and \$15 billion a year.

When fully operational the NADWARN is expected ultimately to cut the death toll in half and reduce the economic loss by more than \$100 million. Unquestionably marine users will also share in the benefits to be derived from the operation of the NADWARN system.

What has been described is the current status of the ESSA Services which comprise in effect a portion of the national safety program. When viewed against the additional user requirements arising from increasing participation in the marine environment, the need for a rapid expansion in the scope of the services becomes quite evident.

A most important event which will accelerate ESSA's capacity to meet growing user needs was the recent establishment of the National Council on Marine Resources and Engineering Development. The Council will establish a national policy for the development of a long-range national program in marine science for the benefit of mankind, including the enhancement of commerce, transportation, national security and the rehabilitation of commercial fisheries. Implementation of the National program will produce new sources of data which will permit the ESSA to more fully discharge its service responsibility to marine interests.

Man's activity in the ocean environment is encumbered and at times denied as a result of the reactions which take place at the air-sea interface. The inherent capacity of the sea to transform itself swiftly from a benevolent to a hostile medium epitomizes the urgent need for comprehensive environmental services which will permit man to utilize with maximum safety and efficiency

the sea as a place in which to work, to play, and possibly to live.

The Environmental Science Services Administration is proceeding at flank speed to conduct the scientific investigations required to achieve this goal. Then, and only then, can man lay full claim to the legacy of the ocean.

SAFETY DIRECTLY AFFECTS INSURANCE COSTS

By WALTER B. POTTS
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The title "Safety Directly Affects Insurance Costs," while direct, is a gross understatement. Would that I had dared: "\$20,000 Reward Per Ship Per Year" or "How To Avoid Wasting A Few Hundred Thousand Dollars."

I hope today to spotlight both the future heavy financial penalties of poor insurance claims experience and the broad field of opportunity which exists to control that experience. Since each vessel owner's insurances are annually re-negotiated largely on the basis of his own claims experience, the control of claims is vital to the control of future insurance costs. In my opinion the ratio of controllable to non-controllable insured accidents and claims is far higher than generally accepted and the possible rewards are frequently grossly under-estimated. I hope to emphasize these points by referring to a little insurance history and by illustrations in dollars and cents.

Marine ventures always have been expensive. Insurance in respect of them has, of necessity, been expensive also. In ancient times and in the middle ages, when insurance existed in reverse, special laws existed which excluded marine loans from the accusation of being usurious and in conflict to Jesus' teachings respecting usury. In those days, while the idea of insurance, as we know it, had not emerged, a merchant shipowner borrowed money to start a venture and repaid it when the voyage or venture was over, but he was free of liability to repay if the venture came to grief as a result of marine perils. Interest on such

loans clearly was much higher than on more normal loans.

Today, to most U.S. Flag owners, insurance premiums are the third largest operating item, ranking after wages, and fuel. To some foreign flag operators, wages slide to third, and it becomes fuel, insurance, and wages. What's more, insurance is the only one of those three costs susceptible to direct control. That control is the detection and correction of unsafe conditions and practices, known as a safety or loss prevention program.

Though perhaps we acknowledge marine insurance costs to be large, somehow, when we think of safety and loss prevention we tend to think small. Few blatantly make the point of how truly *big* are the possible insurance cost rewards or penalties which depend on the success or failure of a safety program. That reward or penalty can be large.

To illustrate, in 1939, there were two very similar fleets whose premium for one particular type of insurance also was very similar. During the intervening years, in which one fleet maintained a most active safety program and the other maintained *no* such program, the rate for Fleet One increased by 60 per cent whereas that for Fleet Two increased by 330 per cent. That may sound theoretical, gentlemen, and may not sound large but from an even start, these fleets, in just one type of insurance, now differ in premium by more than \$20,000 *per ship per year*. I suggest that no matter how you slice it, that is *not* a small amount and

would be ample to defray the cost of *some* control by loss prevention work.

In this case each fleet owner, by his own action—or inaction—has set the level of his own insurance cost—or allowed his employees to do so—for the entire difference in premium cost can be explained by the difference in accident and/or claim cost.

Not only are the financial rewards considerable but also the area within which to control insurance claims is very broad. It has been growing broader for years and continues to grow. At how many points and in how many ways, vessel owners through the years have desired their insurance underwriters to be concerned in their accidents, many of us are not really aware. We tend to see a series of isolated unconnected claims where instead we should see a whole pattern of insured exposures—(or as you safety people would say—"accidents in the making"—"accidents going somewhere to happen")—and by far the majority of these many insured exposures, since they involve human judgment, present an opportunity for control of claim cost through Safety Programs and thus control of insurance cost.

Having myself become acutely aware of the broad pattern of insurance exposures through some rather fascinating compilations of insurance history, I'm going to use a little bit of history to help to bring into focus the breadth of insurance protection in a ship-owner's normal insurance program today. Its breadth incidentally is far more than his shoreside counterpart. It has broadened rather considerably over the past two or three centuries because of desire and demand of vessel owners, as they, in turn, adapted their services to meet changes in commercial practice.

Marine insurance in its present form was apparently conceived in about the Fourteenth Century and existed for many years to protect adventurers against these fortuitous occurrences for which there was little or no defense such as the perils of heavy weather, lightning, and striking uncharted reefs. Underwriters held themselves out to indemnify the vessel owner or the cargo owner (in those days usually one and the same person) against accidental loss or damage to the thing insured from perils described in their policy as "of the seas," fire, lightning, and all other *like* perils, losses

and misfortunes that have or shall come to the hurt, detriment, or damage of the vessel or any part thereof. It was easy to recognize stranding and heavy weather as perils of the sea, but as we shall see there could be great differences of opinion about some other occurrences, as to whether they were perils "of" the seas as opposed to perils "on" the sea. These differences had a curious result.

In 1884, the good ship, *Inchmree* was lying at anchor. Prior to getting underway, a donkey engine and donkey pump were started to pump water from the sea into her boilers. Nobody checked to see if the valve leading to the boilers was open. It probably wasn't. At any rate the pump burst. Vessel owners claimed this was a "like" peril to one "of the sea."

Underwriters contended not, it's simply "on the sea."

The result was twofold—*First*, the English House of Lords, as the highest court, upheld underwriters' position that the policy as then written did *not* cover the damage as a peril "of" the sea—*Second*, and more important, marine underwriters, at the urging of vessel owners, agreed to write into the policy a new clause which extended the normal policy protection to include the consequences of negligence of masters and mariners, of explosion and of latent defects. Up to this point, "goofs" had primarily been the concern of the shipowner alone. Now by this clause (named then after the vessel and still known today as the *Inchmree Clause*) "goofs" by ships' personnel became underwriters' interest as well as the shipowners'—so did the consequences of explosion and latent defects.

Forty years before the *Inchmree* case, another argument had arisen about perils of the sea where in 1840, the ship *La Valeur* came into collision with a steamer in the Hugle River. Arbitrators so divided the fault that the *La Valeur* owed the steamer for damages done to the steamer. Underwriters of *La Valeur* were perfectly willing to pay the physical damages *sustained* by herself, but were amazed when her owners tried to stick them with the liabilities for damage *done to* the steamer, on the theory that these liabilities also were perils "of" the sea.

The litigation again ended by supporting

the underwriters, but the immediate result was that underwriters agreed to extend their policies to include liabilities for damage done.

You may be interested that underwriters were so fearful of this departure toward covering liabilities of negligent navigation, that they refused to give full insurance for such liabilities and would not cover more than 75 per cent on the theory that leaving 25 per cent as self-insurance to the owner would encourage safe navigation. Today, as you know, the normal program includes 100 per cent collision liability protection rather than just 75 per cent.

Thinking of the changing times in the Twentieth Century, we are inclined to forget what changes the Nineteenth Century saw. That, was the age of steam, increased speeds, a great rise of transportation of passengers and freight as the great wave of immigration swept from the Old World to the New. The Gold Rush, in turn, swept West to California, and Australia began to be settled. Vessels increased greatly in value, naval architects made great strides in the design of ships and harbor installations, which all became more elaborate and susceptible to damage. Cargoes were larger and more subject to concentration. On the human side, a man's rights to sue for injury and damages were legally held *not* to die with him, but to live on. Human life, rights, and the impairment thereof thus took on immensely greater value.

No such changes could go on then (nor can changes go on today) without being reflected in changes of commercial practice. The sum total of the increases in human and property values and risks caused shipowners to call upon their insurance markets to provide the means to spread the load of accident and misfortune, to broaden the definition of perils covered by the policies of insurance, and thus to provide a backlog of capital on which they, as venturers, could depend. As a result, the scope of insurance was extended to include more and more coverage for the acts of human error and negligence. Consequently, human errors and negligence came to be far more important sources of claims than the age-old accidental peril of the sea and the Act of God.

This, in turn, brought another great change. Whereas in the Sixteenth, Seven-

teenth, and Eighteenth Centuries, rates for a voyage to the Baltic or the Mediterranean or even the New World could be uniform from owner to owner, by the Nineteenth Century the altered scope of insurance protection began to disclose differences—vast differences—in the incidence of claim as between owners, since differences in caliber and training of crews inevitably showed.

This, in turn, brought an increased demand by owners for discrimination in rate making to reflect those differences. No longer was the controlling factor those fortuitous perils common to all—rather the control began to shift toward the broader definition of accident, toward the more human elements of negligence, and judgment which either hinder or encourage accidents and insurance claims.

Thus came a shift toward today's practice whereby each owner's insurance claim record is reviewed annually and his fleet's premium individually re-negotiated on the basis of its own past claims.

While I have talked of hull claims, we should not forget that at about the same time, historically, the extension of man's rights to sue for loss of life and personal injury, and the growing recognition of liability for damage to cargo, and to docks and other shore property, brought about the actual creation of facilities to insure what we know today as Protection & Indemnity Risks—which prior to 1825 were actually unknown. Curiously, the normal hull and cargo underwriters wanted no part of this new field of protection—resting solidly as it did on the errors of the shipowner and his employees both shoreside and afloat. Entirely separate facilities came into being to protect these new exposures. In most cases, they remain separate today.

Since so much is usually said about claims control of what we today know as Protection & Indemnity Risks (particularly damage to cargo and injury and illness), I am going to continue to stress the more materialistic hull exposures after simply admitting that from the standpoint of frequency, protection & indemnity claims far exceed hull claims. However, industry wide hull claims remain by far the most severe individually (as well as in the aggregate) and to my mind are somewhat overlooked as an opportunity for claim control.

Today there is hardly a phase of vessel operation which does not constitute a source of insurance claims. The old "peril of the sea," as originally conceived is much in the minority. Today's usual "Inchmaree Clause" includes loss or damage to the insured vessel directly caused by the following:

This insurance also specially to cover (subject to the Average Warranty) loss or damage to the subject matter insured directly caused by the following:

Accidents in loading, discharging or handling cargo, or in bunkering;

Accidents in going on or off, or while on drydocks, graving docks, ways, gridirons or pontoons;

Explosions on shipboard or elsewhere;

Breakdown of motor generators or other electrical machinery and electrical connections thereto, bursting of boilers, breakage of shafts, or any latent defect in the machinery or hull, (excluding the cost and expense of replacing or repairing the defective part);

Breakdown of or accidents to nuclear installations or reactors not on board the insured Vessel;

Contact with aircraft, rockets or similar missiles, or with any land conveyance; Negligence of Charterers and/or Repairers, provided such Charterers and/or Repairers are not Assured(s) hereunder;

Negligence of Master, Mariners, Engineers or Pilots;

provided such loss or damage has not resulted from want of due diligence by the Assured, the Owners or Managers of the Vessel, or any of them. Masters, Mates, Engineers, Pilots or Crew not to be considered as part owners within the meaning of this clause should they hold shares in the Vessel.

and there is a growing practice of broadening even those causes.

The all embracing nature of today's insurance programs leaves no room for the old idea of restricting loss prevention efforts to one or two particular fields i.e. persons or property on deck or below deck. When it comes time to negotiate insurance costs, it is the aggregate claim cost which counts (rather than the individual accident). When you think safety, please think total safety.

Now how about the cost?

The value of a safety program is not its own cost but rather the degree to which,

by claims avoided, it realizes the large potential annual dollar savings in future insurance costs. How large can these be? Well those same two shipowners who by reason of different accident costs now differ in premium cost by \$20,000 per ship per year for just one type of coverage, actually differ by just over \$50,000 per ship per year when their full insurance programs are considered! You see, the savings can be very large. The effectiveness of your safety program will largely determine the cost of your future insurance. To curtail that effectiveness will be costly.

One more thought:

To what extent do your supervisory personnel appreciate, or do you wish them to appreciate, that *they*, not you or your brokers or your underwriters, actually set the level of your annual insurance costs—that the aggregate accident cost results of *their* five year actions and their own performances are actually reviewed in negotiating your insurance premium?

A handful of fleets have asked us to present or help them present this idea to their captains, chiefs, mates and engineers. The interested response by vessel personnel was tremendous. In the final analysis they—not you ashore—nor we here gathered in Chicago—set the level of your insurance costs—they take the action which directly affects these costs and yet to some of you (and most of them) it comes as a shock that for vessel insurances *first*, there are no rates except that which vessel personnel set; *second*, that some owners pay two or even three times the insurance costs of others. Whether *they* should be made more aware of this dollar importance of safety and loss control is a question I leave with you.

If you don't correct misapprehensions and misunderstandings, who will? More positively, if you don't detect and correct unsafe conditions and practices and insist on training, you will pay dearly for it.

RELATION OF CARGO GEAR TO SAFETY ABOARD SHIP

By CAPT. E. B. HENDRIX

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Whenever I am called upon to speak before a group that know as much about my subject as I do, I try to follow a statement I heard once, that goes like this: "I always like to keep, My words both palatable and sweet, Because I never know as years roll by, Which ones I'll have to eat."

With this in mind, I shall immediately go into the matter at hand. I think the most outstanding comparisons regarding the fundamental nature of my topic today can be found in a simple application of known facts.

The cargo gear aboard modern ships is as safe as our naval architects can make it—limited as they are by the fact that the gear must be usable; cargo must go on and off vessels in order that maritime trade can exist. While the gear is not fool-proof, it certainly can be described as reasonably safe, with continuing efforts directed toward making it safer. But accidents are still caused with and by cargo gear.

Throughout the years, and particularly during the past quarter century, we professionals have improved our cargo handling gear to a degree where, in our estimation, we should safely operate with maximum dispatch and minimum casualties.

Important advances have been made in the construction of ships and in the character of their cargo gear facilities in promoting safer and speedier loading and discharging in order to reduce the ships' time in port.

We have imposed upon ourselves a multitude of rules, regulations and standards to control and enforce participation in methods to prevent gear failure and to avoid bodily injury.

We have joined forces with each other in an alliance of safety standards to promote a full gamut of proved scientific principles.

We have been aided by our municipal, state and federal government with assist-

ance in coordinating these factors within our industry.

It would seem, when we attained maximum mechanical proficiency in our cargo gear, that, because of these developments, we would enjoy a marked reduction in accidents involving loading and discharging operations. But, contrary to our every effort, we still continue to suffer cargo gear accidents which cause personal injury and property damage.

Perhaps in our modern push-button generation, which demands efficiency and progress to survive, we should remind ourselves of George Bernard Shaw's sarcastic observation that "progress is merely the exchange of one inconvenience for another."

Although I cannot subscribe to this thesis, nor will I attempt to argue the soundness or fallacy of this gentleman's wisdom, I am often tempted to place some credence in the remark when I review the never ending flow of damage and injury reports attributed to cargo handling operations.

It is true that we have benefited by the many built-in safety features which have been introduced into our cargo gear arrangements. But thus far we have not accomplished the end of suffering and monetary losses in connection with the use of these devices.

The complete answer then lies in a combination of mechanical proficiency and human behaviour; it is evident that we must pause occasionally to survey our trends lest we pay unquestioned homage to the technical developments in our ships, and forsake the individual motivation which must be present to capture the full potential of our progressive developments.

To clarify the mechanical and human behaviour facets we must explore and compare the advantages derived by all concerned.

On general cargo ships, the term "cargo gear" is used to describe the ship's deck winches, its booms attached either to masts or kingposts, and the ropes or falls used in

connection with booms and winches, in addition to loose gear used by stevedores for hoisting or lowering drafts of cargo.

General cargo is handled in United States ports chiefly by means of ship's gear, or by ship's gear in conjunction with floating derricks or lifting equipment on the dock.

In the economic objective of loading and discharging cargo, the operators, stevedores and longshoremen have similar interest in the physical performance of this gear. The operators wish the greatest possible amount of cargo to be handled in the least possible time, because the transportation is paid by established rates, and any delay will cost them a considerable amount each hour. The stevedores' interest in performance is the same, because his worth to the operators is predicted on tons of cargo handled in a given period of time. The stevedore normally pays his longshoremen by the hour, and, therefore he is dependent upon the uninterrupted functioning of the ship's equipment to do a good job.

The individual longshoreman's interest in the performance of the gear is not as easily defined. He is interested in rigs that provide the greatest ease and speed in handling his loads. He is concerned also with the reliability of the gear in that any extended breakdown would cause an unscheduled knock-off with loss of wages.

From the foregoing it can be seen that all parties involved in the utilization of the ship's cargo gear have a related interest in the "mechanical" factors of performance.

Now we come to the matter of the relation of cargo gear to "safety" aboard ship.

On the subject the operators and stevedores are not merely joined by similar interests, but their motives are united and identical in their determination to protect their workers by requiring the absolute maximum safety of the gear. The operator has a legal and moral responsibility to maintain his vessel as "a safe place to work" and to provide "safe tools" with which to work. In the normal application of his safety duties and responsibilities the stevedore's actions are mutually beneficial, because he is compelled to confirm the adequacy of the ship's gear to insure the protection of his longshoremen, thereby fulfilling the obligations of all parties concerned.

Individual longshoremen, with their limited technical knowledge, cannot be entirely relied upon to discipline themselves in matters of safety. They must have guidance. For example, experienced longshoremen know that if the married falls are tightened with little or no load on the hook, the pulling power of the winches will part a guy or tear down a boom. They also know that if a lift is close to the safe working load, the gear seems to be under excessive stress and in danger of failure. These conclusions are the result of their experienced judgment but they seldom understand the reasons for these conditions.

When safety was being designed into ship's gear and equipment, special consideration was given to human factors. Almost every piece of equipment requires a worker to operate it, and the mechanisms of some have become too complex to be understood by the average worker. Therefore, human limitations and capabilities, both mental and physical are salient problems in the safety of the gear.

A good illustration of the principle of designing safety into mechanism is provided by the automatic coupler used on railroad cars.

The automatic coupler is a great improvement over the old link and pin coupler, which required a man to go between the cars to drop a pin and thus expose himself to a crushing hazard when the cars came together. But this device is not the final answer to railroading injuries. The brakeman must be compelled to practice safe methods and not to rely entirely upon built-in safety.

In the maritime industry during the past six years, on new vessels constructed, I am of the opinion that we have been able to eliminate two major hazards that caused many serious injuries and several deaths, that is, the elimination of the old-fashioned wooden hatch board and beams with the new modern self-closing hatch covers.

Ever since I can remember, in this industry we have had a problem with longshoremen and crew stepping on broken or loose hatch boards and falling into the deck below. These hatch boards were placed on beams, which when not secured could be pulled out by cargo whip, the beam falling and allowing hatch boards to collapse.

The securing of these beams is a very simple matter and can be handled with a small bolt or clip, however, it was impossible to keep these properly secured, as the stevedores when switching from one deck to another would not replace these bolts or clamps.

Along with this we have been able to develop our cargo gear in the form of booms where these are handled with small electric winches and the raising and lowering of these booms, has become a safe operation where years before the topping lift had to be removed and put on the gypsy head of the winch. Here again invariably the longshoremen did not secure this wire and the next thing we knew the boom was dropped. It is indeed good to feel that these problems are now solved on our modern day vessels and these are no longer problems with us.

Failure of conventional ship's cargo gear occurs infrequently when it is utilized within the capacities for which it was designed. Usually a gear failure can be traced to improper rigging or lack of knowledge regarding the practices and conditions which are likely to result in failures.

From this we can see that cargo gear accident control is largely dependent upon the skill of the ships' officers and the stevedores. Casualties can be avoided if super-

visory personnel, who are thoroughly familiar with the various mechanical features, enforce upon labor safe methods for handling the equipment. It is of paramount importance that effective restraint is directed toward the longshoremen, particularly winch operators and riggers, to insure that these members of the working force will devote their attentions to the proper use of the gear.

Take, for example, an enjoyable task such as learning to play golf. A "duffer" on a golf course, with the finest, most expensive bag of clubs, will practice poor habits unless he is shown the correct methods by someone who knows. It is the same way with a worker on a job. A "pro" must insist not only on good equipment but also on correct methods.

In summation, the pertinent question to be asked is, "have we been successful in our endeavors to promote mechanical perfection and simultaneously affect accident control?" The answer obviously cannot be a 100 per cent "yes." However, definite and considerable progress has been made and it is clear that more fruitful accomplishments will be attained in future years, to a degree that maximum efficiency in preventing accidental injuries attributed to cargo gear will become a reality.

COAST GUARD

SHIPPING TRAFFIC SAFETY, TRENDS AND PROPOSALS

By CAPT. W. C. FOSTER, USCG

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It has been traditional to discuss the past year's significant marine casualties with the marine industry and to review activities developing from them. The Coast Guard has made and will continue to make case studies and critical analyses of these, with a view towards determination of causes and prevention of their recurrence. In addition to this concept of corrective safety engineering, we have also adhered to a policy of anticipatory safety engineering by an analysis of trends and proposals dealing with *Shipping Traffic Safety*. In the past, there has been some success in helping to reduce the number of serious casualties. An example of this is the number of major casualties on United States inspected passenger vessels since the MORRO CASTLE disaster of 1934, and the subsequent establishment of the Merchant Marine Technical Division; those resulting in death have been few and far between, and the death toll has been low.

United States standards for construction of passenger vessels, which entail Method I, or non-combustible material, are gaining world-wide acceptance. This can be attributed to two casualties involving foreign flag vessels carrying a majority of United States citizen passengers. First, the Panamanian flag *SS Yarmouth Castle* burned and capsized in November, 1965, with a loss of 90 lives. The Coast Guard, in the public interest and at the request of the Republic of Panama for assistance and cooperation, convened a Marine Board of Investigation to inquire into this disaster. It was learned that the wooden construction of much of the vessel and the open staircases contributed strongly to the rapid spread of the fire, which probably caused most of the deaths through lack of oxygen.

The United States delegation to a meeting of the Maritime Safety Committee of the Intergovernmental Maritime Consultative

Organization during January and February of 1966 gave a report of the *Yarmouth Castle* disaster, and requested a special meeting of the Committee for the purpose of reviewing fire protection on passenger vessels. At this time many governments agreed, but were of the opinion that the Method I construction urged by the United States was unnecessary; they felt that a ship constructed partially of wood and having an alert crew and adequate fire-fighting equipment would not be subject to great danger from fire.

Between February, 1966, and the special meeting of the Safety of Navigation Committee on fire protection, which was held during May, 1966, the Norwegian flag *M/V Viking Princess* caught fire and burned in the Caribbean area. The well-disciplined and alert crew managed to save all passengers from the fire, but the general excitement resulted in two passengers dying from heart attacks. However, this same crew was unable to save the vessel.

Some of the Governments which had expressed unwillingness to rule out wooden construction changed their attitudes toward fire protection. As a result, many of the original United States proposals to upgrade and amend the 1960 International Convention of Safety of Life at Sea standards for fire protection have met with favorable reaction.

Here in the United States recent casualties involving uninspected towing vessels indicate that some control over them, perhaps in the form of licensing of the master and mates, would be beneficial. The foundering of the *Gwendoline Steers* in Long Island Sound with a loss of 9 crew members, and the collision of the *Rebel Junior* with the Lake Pontchartrain Causeway, resulting in the death of 6 persons on a passing bus, are prime examples.

For the three year period prior to fiscal 1966 there was a steady downward trend in the number of lives lost in casualties involving United States vessels. Due to several tragic collisions, this trend was reversed during the past year. The most widely publicized disaster occurred last June in Arthur Kill. There the inbound naphthaladen British M/V *Alva Cape*, and assisting tugs, collided with *Texaco Massachusetts*, which was outbound and in ballast. The tankers and two tugs received extensive fire damage. As a result 33 died. Two weeks later the *Alva Cape* suffered another fire and explosion and a loss of four lives. The vessel was subsequently towed to sea and sunk by the CGC *Spencer*, at the request of the owners.

Relatively high loss of life also resulted in two collisions involving American freighters and small Japanese tankers near Japan. The first of these occurred in fog on August 2, 1966, at a time when the *SS Arizona* was proceeding at 17 knots; the M/V *Meiko Maru* was cut in two, and only one of the nineteen aboard survived. On March 11, 1966, the *SS Pelican State* encountered a Japanese coastal tanker in a crossing situation during clear visibility. As the *Pelican State* was burdened, she came right to pass astern. The tanker then came left and collided with the freighter. The resulting conflagration took the lives of the 5 crewmen on the tanker and the bow lookout on the *Pelican State*.

Collisions were also the cause of heavy vessel damage during fiscal 1966. Some of the circumstances surrounding them are worthy of review. During a period of thick fog an outbound tanker and an inbound freighter collided in the channel leading to one of our major ports. Both vessels were steaming at greater than moderate speed and were too close to the center of the channel. Neither made full use of her radar. One of them was equipped with a VHF radio-telephone capable of operating on the navigational information frequency. Since the collision was the result of a misunderstanding as to intent, it appeared that it might have been avoided if both vessels had been so equipped and had established direct contact.

In another collision in fog off one of our ports, two vessels approached in the vicinity

of the sea buoy. Each had radar, but did not plot the other's approach. The outbound vessel assumed the other would pass the sea buoy on her own port side, while the inbound vessel planned a starboard-to-starboard situation. The value of radar was clouded by slight course changes, which gave the navigators a false impression. The failure to navigate with caution, and the failure to use radar information properly, contributed heavily to the cause of this collision; however, it might have been avoided by the establishment of sea lanes in the area. Here again, direct radio contact between the bridges of the vessels might also have been helpful.

As it has been indicated in the past, many of us are prone to look to the individual master, to the pilot or to the person in charge of the navigation of the vessel, and claim that it is his personal error, his error in judgment, his inattention to duty, his negligence, or in some extreme cases, his criminal negligence that caused the collision. It is true that in many instances the primary cause is human error, but, how many other underlying facts are really involved? Rapid turn-around requirements, high speed express cargo service, longshoremen and shipyard commitments, and competitive considerations have all had something to do with placing the vessel in the jaws of collision.

In the *Fernview-Dynafuel* collision could it not be said that the vessel's speed in excess of 17 knots in heavy fog and restricted waters, was the result of an underlying arrival commitment at Boston? In the *Bohene-Bonnie D* collision in the Mississippi River could it not be said that the pilot's failure to recognize a dangerous situation was partly the result of his zeal in trying to get the vessel to sea as quickly as possible?

We need not say anymore because we believe the points are well taken by those who are directly and properly concerned with the problem. This is management's ultimate operational responsibility, and the Coast Guard will not intervene.

However, we are planning programs to advance *shipping traffic safety*. These include: unification of the three sets of United States *Rules of the Road* for interior waters; enforced availability of navigational-safety radiotelephone; the development of sea lanes;

and vessel traffic control through shore-based harbor advisory radar.

Shipping traffic generally follows certain navigation rules, designed to prevent collisions, which have over the past century been referred to as the *Rules of the Road*. These rules, if conscientiously followed, work admirably when the traffic density is not too high. However, in restricted waters or at any point of high traffic density, they tend to have inherent deficiencies; they cannot handle a high rate of crossing traffic at optimum speeds, they automatically create what is known as a "special circumstance" when more than two vessels are approaching one point at the same time from widely converging directions, their required whistle signals are often not heard, and their efficiency is reduced during periods of poor visibility.

The present International Rules of the Road were revised recently and became effective on September 1, 1965. Since early 1963, the Coast Guard has had under study the revision and unification of the three sets of rules that apply to our own waters. A proposal to effect this has been under close scrutiny by various maritime interests in our country for over two years. It is presently felt that there has been sufficient review and that the shipping community has had ample opportunity to comment on these rules. The proposal is awaiting the concurrence of Canada with respect to its portions affecting the Great Lakes. When this is completed, it will be placed in legislative form for submission to Congress.

Two years ago a joint committee, established by the Coast Guard and the Federal Communications Commission, embarked on a study to determine the need for legislation requiring any vessel in United States waters to carry a VHF-FM radiotelephone immediately available for use by the master or pilot for the exchange of navigational information. After study, this committee became convinced that such a need does exist and thereafter developed a preliminary proposal for legislation and regulations. This was released to the public on July 22, 1965, and has since received wide dissemination and discussion among interested parties. Certain groups have expressed strong opposition to the concept.

The committee has recently rewritten the

proposal so that it includes all waters of the United States except the Great Lakes and their tributaries, and the Mississippi River north of the Baton Rouge Bridge, along with its tributaries. The exclusion of the Great Lakes was recommended by the committee because that area already has a compulsory navigational information radio system under the "Great Lakes Agreement" of November 1954 between our country and Canada. The Mississippi River was excluded because vessels in that area voluntarily utilize radio-telephones for navigational information.

The committee's proposal is being drafted in legislative form for submission to Congress. Its compulsory coverage has been limited to all power-driven vessels of 300 gross tons or over, all passenger vessels of 100 gross tons or over, and all dredges or other floating plants engaged in operations which actually restrict or affect vessel traffic.

It would require these vessels to listen on a common navigational information frequency and would assure that they were provided with a useful tool to help them pass one another safely. This additional aid is especially needed in the situations in which the Rules of the Road have built-in deficiencies—high traffic density, special circumstances, whistle inadequacies, and poor visibility.

The Coast Guard has recently entered another field that is intended to help vessel traffic pass safely: sea lanes, or separate traffic lanes. During the late spring of 1965, a committee was formed in New York City to study the problem of the separation of vessel traffic approaching New York Harbor. The Commander, Third Coast Guard District, invited the shipping industry, pilots, various other groups concerned with the maritime community, and interested governmental agencies to send representatives to this committee.

The group held several meetings and arrived at an agreement recommending parallel sea lanes for each of the major routes to New York Harbor. These lanes would ultimately converge into a circle with a seven mile radius, centered on the new Ambrose Light Station. Certain aids to navigation would have to be relocated to tie in with existing routes, such as the ter-

mination points of the internationally recognized North Atlantic Track Lines.

A similar study has been carried out for the approaches to the Delaware River. If the recommendations of the New York Harbor and Delaware River groups gain wide acceptance, studies will be made in all other approaches to major sea ports. The recommendations of any of these sea lane committees would be printed on all appropriate charts.

A similar concept of vessel traffic operation was instituted on the Great Lakes by commercial interest in 1911, and, while not directly enforceable by any government, this concept has been judicially recognized by various admiralty courts. It is possible that the separate lanes recommended for New York, or those that might arise in other areas, will attain similar status.

Vessel traffic "fairways" are now being printed on charts of the Gulf Coast. Considerable study and discussion between shipping and oil interests took place prior to the decision that these "fairways" would be published. The fairways are merely structure-free two-mile wide lanes in which vessels will not encounter oil rigs. It would have been desirable from a safety standpoint to have established separate lanes for vessel traffic in each direction, but at least this is a start. A parallel to this situation has existed in the North Sea since 1945, wherein vessels are routed over mine-free lanes marked by fairway buoys.

Strict ship traffic control and regulation is almost non-existent today in United States waters. The Corps of Engineers controls a certain amount of vessel movement for safety purposes within some of the waterways and facilities it operates. The Coast Guard exercises control over movement of vessels in the St. Marys River between Lakes Superior and Huron.

Control of shipping traffic has necessarily lagged behind control of air, rail, and road-borne traffic. These media of transportation move considerably faster than vessels, and this has necessitated a positive control for their safety. Nevertheless, it has been suggested that some positive vessel traffic control is needed in certain converging traffic areas.

Already in existence is a limited number of "traffic lights" for vessels which operate

as the traffic lights do at any street intersection. Such lights are presently found at either end of the Cape Cod Canal, operated by the Corps of Engineers, and at Algiers Points in the Mississippi River, operated during certain stages of the River by local authorities. Further expansion of this type of control system is not currently envisioned. Navigational information radiotelephones could convey the same information if used properly at blind bends in narrow rivers.

In lieu of "traffic lights" for vessel movement, shore-based harbor advisory radar has been under consideration in a preliminary sense only. For several years, the two pilots associations in the Los Angeles-Long Beach area have been using radar advice from their respective pilot stations. It is noted that to the best of the Coast Guard's information, the use of shore-based radar for this purpose in the Los Angeles-Long Beach area was the first such occasion in the United States.

The highly sophisticated systems presently in use in the approaches to Rotterdam, Netherlands, and Southampton in Great Britain go far beyond the Los Angeles procedure. It is also noted that overseas each harbor radar advisory system was developed primarily at the expense of the seaport, in many cases as a competitive measure to furnish better service than neighboring seaports.

This has not occurred to date in the United States. The Coast Guard has been interested in harbor surveillance radar systems as a possible method to increase the safe movement of shipping in highly congested areas and particularly during times of poor visibility. Preliminary studies which were made of several United States seaports last year are still under review by the Coast Guard. It is considered possible that the concentration of shipping and the greater speed of vessels in the future at the approaches to large seaports such as New York would necessitate the establishment of harbor radar advisory systems. Any such advance for the greater safety of shipping must necessarily be obtained through review by and the firm backing of the marine industry and the local authorities in a particular area.

The Coast Guard considers that shore-based harbor advisory radar may be nec-

essary in the near future and we will continue our studies in order to be prepared to cooperate with, assist, and lend direction to marine interests desiring to establish such assistance.

From the foregoing, it is apparent that collisions are now the big casualty news,

and collision prevention is of utmost importance. However, studies of casualties, new developments, and trends affecting all aspects of marine safety are continuing within the Coast Guard, so that sound safety standards will be maintained in the United States Merchant Marine.

PORTABLE TANKS FOR COMBUSTIBLE LIQUIDS

By CAPT. WILLIAM F. REA III, USCG
Officer in Charge, Marine Inspection, New York

As far back as ten years ago, or probably even earlier, there started a bulk movement of combustible liquids on cargo vessels in a fashion that was eventually to result in a new set of Coast Guard regulations. I refer to the regulations that are found in Title 46 of the *Code of Federal Regulations, Chapter I, Section 98.35*, entitled "Portable Tanks for Combustible Liquids."

Now, many regulation changes, and most laws upon which regulations are based, have a history of a major marine casualty as the motivating or triggering force. In my limited research on this particular subject I am unable to determine that there have been any major casualties resulting from the carriage of portable tanks on cargo vessels. I must assume, therefore, that the motivation for these regulations was the potential hazards that were apparent and the fact that all who saw the operation were aware that serious casualties could occur unless the operations were carried out in a safe manner.

The first movement of combustible liquids with portable tanks in the United States was probably out of the ports of Savannah and New Orleans. For quite a long time these were the only two ports that were concerned with the handling of these tanks and the products they contained. Eventually, however, the movement of bulk combustible products in portable tanks was to increase and there appeared to be a need for guidelines or regulations in which to provide a safe manner of transportation.

In 1962 on the Public Hearing Agenda of the Merchant Marine Council there was included proposed regulations for portable

tanks for combustible liquids. These regulations were based on standards developed by a Portable Tank Committee formed under the sponsorship of the American Merchant Marine Institute.

After the public hearing minor changes were made and the regulations were adopted some four years ago. I now find myself being faced with the administration of these regulations for portable tanks in my capacity as Officer in Charge, Marine Inspection, New York.

One thing I find, now that I have renewed my acquaintance with these regulations, is a definite need to revise and update them. I feel sure, in the light of the four-year experience since the regulations were first adopted, that they can be much improved upon both from Coast Guard and industry viewpoints.

Some of you may say this is heresy to comment that the regulations in their present form are not so hot; however, I have an advantage in that, in the development of these regulations, I became one of the writers engaged in putting them into the regulation format during their development. I now find phrases and requirements, which, if I had to do it over again, I would find a better means of expressing.

There are well established means for amending these regulations and it will be my intention to make recommendations to the Commandant as a result of this review. I find at least three separate areas or items that need clarification, and I will discuss these briefly at this point.

First, there is a definite requirement for a "permit" when U. S. flag vessels are to

carry combustible liquids in bulk. I fear that at the time of writing these regulations we were too close to the subject, because this requirement for a "permit" is not easily found in the regulations. In fact, you must turn to the Tank Vessel Regulations, not the Cargo Vessel Regulations, in order to find the authority and the requirement for this "permit."

The Tank Vessel Regulations state in part that "vessels certificated as passenger, cargo or miscellaneous vessels, where the principal purpose or use of the vessel is not for carriage of flammable or combustible liquid cargo in bulk, may be granted a permit to carry limited quantities of flammable or combustible liquid cargo in bulk" in the grades indicated in those sections of the regulations [46 CFR 30.01-5(a)].

Now, what is this "permit"? The "permit" is simply an endorsement on the Certificate of Inspection such as used on cargo vessels when Grade D and E combustible liquids are authorized to be carried in bulk in the deep tanks. In the case of portable tanks on deck we simply endorse the Certificate of Inspection, authorizing the carriage of portable tanks on deck and indicating the grade of product or the product that can be carried. The endorsement to the Certificate of Inspection also indicates the additional fire fighting equipment that is required when the combustible liquid is on board.

A second item that needs clarification, is the regulation that general authorization is given for "paraffinic hydrocarbons" to be transported in portable tanks. This regulation goes on to say that authorization shall be obtained for each separate commodity other than "paraffinic hydrocarbons" prior to its transportation in portable tanks. I, for one, have had difficulty in determining what products are "paraffinic hydrocarbons."

At first I thought a simple definition in our regulations was indicated. In this regard, I asked an officer on my staff, who had a considerable chemical engineering background, to provide me with a simple layman's definition of paraffinic hydrocarbons, and at the same time, give me a list so I could identify the product when the subject came up. The next day I was presented with a five page handwritten discussion of this subject, including a partial listing of prod-

ucts that were considered paraffinic hydrocarbons.

One thing became apparent; that is, there is no simple layman's definition of paraffinic hydrocarbons, at least not in terms of listing specific products by their various chemical names, isomers, and synonyms that could be so identified. I was advised that an all inclusive table listing paraffinic hydrocarbons could quite possibly be expanded to include well over a million names.

The basic formula for paraffinic hydrocarbons is C_nH_{2n+2} . Probably the easiest way to recognize a paraffinic hydrocarbon is to remember the following: (a) the compound will be composed only of carbon and hydrogen atoms, no oxygen, chlorine, nitrogen, or other elements are involved; (b) the ratio of hydrogen to carbon is fixed as illustrated by the chemical formula stated; in other words, for "n" carbon atoms there must be " $2n+2$ " hydrogen atoms, no more, no less.

A third area that needs clarification is the definition of portable tanks. In the section under discussion, namely 46 CFR 98.35, portable tanks are defined as cargo tanks having a capacity greater than 110 gallons, and which are independent of the vessels' structure. However, in another section of the same regulations there is an interpretive ruling on "portable containers." This section (46 CFR 98.05-30), refers to "portable containers" as having a maximum capacity of 110 U. S. gallons. Then in the same paragraph it states that the phrase "inflammable or combustible liquid cargo in bulk" as found in the statute is interpreted to include such cargo in "portable containers" of a capacity of more than 110 U. S. gallons.

Thus, we have a conflict with the previous definition which refers to a portable container in this capacity as "a portable tank." My main purpose of listing these three items is to illustrate there is a need for clarification, updating, and revising and I will not dwell on this any further at this time, except to say there are undoubtedly other areas that require clarification and improvement.

Possibly a guide is indicated for both Coast Guard inspectors and vessel operators as to the steps that are necessary to carry combustible liquids in portable tanks on U. S. flag cargo vessels in accordance with regulations as they are now written. I found

that in New York the vessel operators have been fairly good in obtaining and using tanks that are Coast Guard approved, or ICC tanks acceptable to the Coast Guard; however, at this point some operators, at least, have felt they have done all that is necessary to comply with the regulations, overlooking the fact that an inspection is required of the tanks and of the vessel on which they will be carried, in order that a "permit" may be obtained.

The regulations provide some latitude as to size and type of portable tanks that can be used. Either Coast Guard approved portable tanks, or Interstate Commerce Commission's approved tank cars or tank trucks (for flammable liquids), or specification ICC-51 portable tanks are acceptable. In the case of Coast Guard approved tanks, the usual procedures for plan approval and inspection are required. The regulations contain the detailed requirements for construction, testing, and inspection.

Having obtained a Coast Guard approved portable tank or an ICC tank that is acceptable, the next step is to provide a vessel that is authorized to carry the tank with the combustible liquid. In the case of a vessel not certificated for portable tanks and the product to be carried, application should be made to the Officer in Charge, Marine Inspection, having jurisdiction for an inspection of the vessel. The inspector will want to sight the tanks to be assured they are acceptable and also to inspect the additional fire fighting equipment that is required.

If the product to be carried is a "paraffinic hydrocarbon" the local office can issue the necessary amendment to the Certificate of Inspection when satisfied that the requirements have been met. When the product is other than a paraffinic hydrocarbon special authorization must be obtained from the Commandant before the vessel can be certified to carry the cargo.

A common tank that is being used at this time has a capacity of approximately 2,500 gallons, and there are some having a capacity of as much as 5,000 gallons.

Some tanks are loaded and discharged with the cargo in them. In other cases the tanks are loaded with the cargo in them, but that the tanks are left on board the vessel and discharged by gravity into a shore tank. In other cases the tanks have

actually been secured on deck and are loaded and discharged in place. All of these arrangements are within the scope of the regulations authorizing this movement.

Now, in most cases, the portable tanks are not assigned to a particular vessel. For example, they will be loaded outbound on one ship and placed ashore, then picked up empty and brought back on another ship. In each case where the tanks are employed it is necessary, as indicated earlier, that the particular vessel that carries the tank with cargo have an endorsement on the Certificate of Inspection authorizing the carriage of these tanks and the product that is being transported.

There have been movements of combustible liquids which have other characteristics of concern in addition to the fire and explosion hazard, and these have not been without incident. In a recent case that came to the attention of my office, a vessel transported four portable tanks (5,000 gallons each) on deck with a product having a trade name of Hylene. During the course of a transatlantic voyage two of these tanks were found to be leaking. As a result of the inhalation of the vapors from the product being carried, several crew members became ill and it was necessary to remove two from the vessel for additional medical care.

One of the significant facts developed in this case is that neither the Master nor the crew had any knowledge as to the characteristics of Hylene. We have been able to determine that Hylene is a trade name for tolylene diisocyanate.

This product under its chemical name is listed in the U. S. Coast Guard *Chemical Data Guide for Bulk Shipment by Water* (CG-388). In that publication it is described as a Grade E combustible liquid that produces highly toxic nitrogen dioxide gas when it burns. Inhalation of its vapors causes intense irritation to nose and throat and can also cause asthma-like symptoms which may not appear for several hours after exposure. These were the symptoms that appeared in the case of the crew members that became ill in this instance.

It seems to me that the ship operators and, if necessary, the regulatory bodies should see to it that personnel on board vessels are provided with far more complete information as to characteristics of

the cargoes they are transporting and how to deal with them in the event of fire or leakage or other emergency. One step in this direction would be to provide the Master with this *Chemical Data Guide for Bulk Shipment by Water*. In order to use this guide, it is essential to know the chemical name, not just the trade name.

It is anticipated there will be a continuing increase in the products that are being transported in portable tanks. It is likely that this forecast will especially be true in the transportation of products that have various health hazards as well as the fire and explosion hazards. As indicated already, there is a need for information to be made available to the Master when he is carrying products such as Hylene, for example. As an alternate to the *Chemical Data Guide* it may be well to consider providing the vessel with a chemical information card which would set forth in a readily available form important information as to the characteristics of the product and how to deal with emergencies that might develop.

Such a chemical information card already has a basis in our regulations. Under the *Special Operating Requirements* for barges carrying certain dangerous cargoes in bulk there is a requirement for a cargo information card. This card identifies the cargo listed in the *Dangerous Cargo Regulations*, its chemical name, its appearance and its odor. The card contains a statement of the hazards involved and instructions for safe handling of the cargo and, as applicable, the need for special cargo environment.

The card also includes emergency procedures such as precautions to be observed in the event of spills, leaks equipment or machinery breakdowns, and/or uncontrolled release of the cargo into the waterway or atmosphere. Precautions to be observed in the event of exposure of personnel to toxic cargo are also included. The card contains precautions to be observed in the event of fire occurring on or in the vicinity of the barge and a listing of the fire fighting media suitable for use in case of a cargo fire.

If there is a need for such an information card for towboat captains handling barges with dangerous cargo, is there not an equal need for ship Masters whose vessels are carrying dangerous cargo in bulk in portable tanks? I think so.

Most of my comments, and particularly the guide as to the procedure for complying with the Coast Guard requirements, have been directed to U.S. flag vessels. There are movements out of the United States also of similar cargoes in portable tanks on foreign flag vessels. In this area we in the Marine Inspection Offices exercise far less control; however, the Coast Guard, through its Captains of the Port and their responsibility for port security, do not permit the foreign cargo vessels to transport portable tanks in or out of the port without first being satisfied that this cargo does not constitute a potential risk to the port.

In order to accomplish this they basically carry out the same requirements of 46 CFR 98.35 in that they satisfy themselves that the portable tank is a suitable one and has the approval of its home administration, or if not, insist on Coast Guard or ICC approval. The port security forces also check the fire fighting equipment, and have sufficient authority to prevent the movement of the products by foreign vessels if they feel there is a hazard to the port. The special operating requirements in 46 CFR 98.35-30 apply to all vessels carrying portable tanks with combustible liquids, both U.S. and foreign flag. These operating requirements are in many cases quite similar to those operating requirements found in the *Tank Vessel Regulations* which deal with the handling of liquid cargoes in bulk that are combustible and inflammable.

The basic thought I would like to leave with you is that if you are planning to transport combustible liquids in portable tanks on cargo vessels, or, in the case of Grade E cargo, on passenger vessels, you should consult our regulations. In addition, consult the Officer in Charge, Marine Inspection, having jurisdiction at the port where the tanks will be placed on the vessel.

REPORT ON THE 1966 LOAD LINES CONFERENCE

By CDR. LLOYD W. GODDU, JR., USCG
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Load Lines—Safety for Seamen

An International Conference on Load Lines, convened by the Intergovernmental Maritime Consultative Organization (IMCO) and attended by 60 countries, ended with the signing of an agreement—the International Convention on Load Lines, 1966. To quote from the preamble to the convention, the conference was motivated by a recognition that the "establishment by international agreement of minimum freeboards for ships engaged on international voyages constitutes a most important contribution to the safety of life and property at sea."

A load line mark is placed on the side of a ship to permit loading of a vessel to that mark and yet remain within a limit of safety for the voyage intended. Samuel Plimsoll is generally regarded as the father of the load line mark, having been the author of the United Kingdom's Merchant Shipping Act of 1876. This act culminated a long and hard drive to offset the unseaworthy conditions permitted on vessels of the era. Owners, in their drive to increase revenues, were overloading their vessels to a point of being in an unsafe condition. Sailors were generally not aware of this unsafe condition, and in any event had no recourse to change this situation nor were their survivors able to receive benefits or pensions. On the other hand sailors could be jailed for breaking contract and refusing to sail these vessels.

Even though Plimsoll gained world fame and recognition for his work in the establishment of the load line mark, it was not entirely his own idea. Plimsoll, after several early reverses, won his fortune as a coal merchant and was subsequently elected to a seat in the British House of Commons. It was as a member of the House, with information gathered by a Mr. James Hall, that Plimsoll in 1870 was inspired to begin his drive for better safety for British seamen. Hall, who with his brother operated a successful steamship company, had begun

writing on the unsafe practice of overloading vessels, several years before, in 1867. However, he was completely overshadowed by Plimsoll with the latter's convenient public exposure in the House of Commons.

In the late 1800's, Hall said in a letter to a friend, "I have in my lifetime, at a cost of much labor, taken the initiative in certain movements, such as that of the load line, of which Plimsoll, with the information I gave him, subsequently reaped the credit."

History records the fact that load line marks were used as far back as the Middle Ages. The records of the Italian Republics show that agitation against overloading was not unknown at that time, and to secure safety for the crew and cargo it was found necessary to place some restrictions on the more careless owners. The Venetians were so impressed by the advantages of a load line that the Doge passed a law for such mark to be placed on vessels to avoid the danger of overloading. They marked their hulls with the sign of the cross, which to them symbolized the salvation of their bodies from the sea as well as their souls from perdition. The Sardinians were the next known to have placed a mark on their vessels. It is not known whether they simply followed the lead of the Venetians or not. Venetian ships must often have to put into the ports of Sardinia, and the seamen of the island could not have failed to notice the sign of the cross. They may have noticed that while a Venetian ship had outritten a gale and come safely to port, one or two of their vessels had failed to return. However, there is a strong presumption that the Sardinians came upon the idea on their own, since they adopted a different load line symbol. It was a painted disc with a line through its center. One thing at least is certain; the disc which the Sardinians painted on the hulls of their vessels with the line through it was undoubtedly the forerunner of the Plimsoll mark. Created centuries ago, it was for centuries forgotten.