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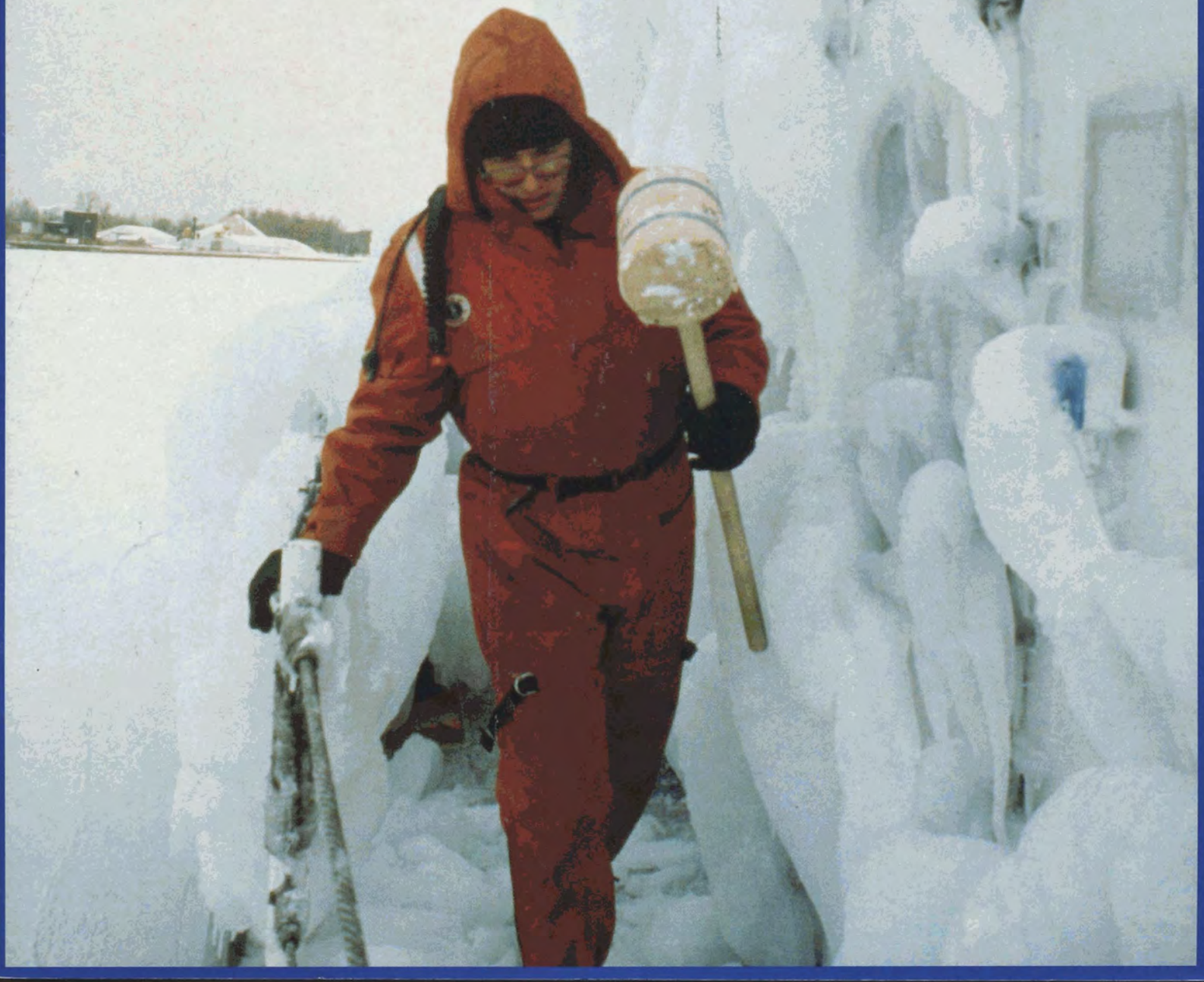

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Assistant Commandant's Perspective

By RADM Robert C. North
Assistant Commandant For Marine Safety & Environmental Protection

The Coast Guard Marine Safety and Environmental Protection Program serves a diverse customer base, from onshore platforms to coastal ports, supply vessels to cargo ships, pollution cleanup to construction, manufacturers to the merchant marine, to general shipping and towing. Each of these customers is important and each has particular needs, from the offshore industry that fuel our nation's power and transportation needs, to the barge, ship and towing fleet which carry nearly 90 percent of our nation's total imports.

This issue of Proceedings includes a virtual "potpourri" of topics on marine safety and environmental protection to provide you, our reader, with a glimpse and insight to the many challenges (and opportunities) our Headquarters and field commanders face in crafting strategies to safeguard the traveling public, our valued merchant marine, and the environment. Oftentimes, you might learn of a particular Coast Guard program or initiative, but not all of the details. Perhaps you hear of a certain regulation or policy, but are unsure of why it was developed. Or maybe your local Coast Guard Captain of the Port (COTP) / Officer-in-Charge of Marine Inspection (OCMI), under the precept of risk-based management, focuses on a particular segment of his/her local environment which best contributes to the goals of our Business Plan.

Like you, we too are striving to meet the needs of our diverse customer base, all the while promoting cleaner, safer and more-efficient use of our nation's waterways. Regulatory reform, Prevention-through-People and a focus on the human element, improved testing and mariner licensing, analysis of trends in pollution spills and marine casualties, and promotion of safety and environmental protection standards at the International Maritime Organization are but a few of the many issues we are addressing.

While formidable, these challenges are greatly simplified by the good work from COTP Area Committees nationwide, and the productive input of our industry-lead Safety Advisory Committees. These include: the National Offshore Advisory Committee (NOSAC), the Towing Safety Advisory Committee (TSAC), the Chemical Transportation Advisory Committee (CTAC), the Commercial Fishing Industry Advisory Committee (CFIVAC), the Navigation Safety Advisory Committee (NAVSAC), the Merchant Personnel Advisory Committee (MERPAC), and the National Boating Safety Advisory Council (NBSAC). Information on these groups can be obtained directly by accessing our web page at http://www.dot.gov/dotinfo/uscg/hq/g-m/advisory/index.htm.

As you read this issue, you may conclude (rightfully) that our mutual interests and goals for cleaner, safer and more-efficient waterways are intertwined, and that real and lasting gains are only possible through continued involvement by our many valued customers, like you.

BY THE WAY

EDITOR'S POINT OF VIEW

By Cheryl Robinson

Proceedings magazine, as always, strives to keep you informed about all aspects of the maritime industry.

Our theme for this issue is "General Marine Industry Information." We are closing 1997 with a variety of articles on current developments, lessons learned, PTP, future trends, and electronic technology, and our goal is to put you in the best position to respond to the changing demands of the industry. Next year, we will look at other global issues such as the USCG Year 2000 Management Plan and specific worldwide maritime challenges.

Our staff hopes you have received some new information and useful ideas. As several readers have noticed, we are in need of photos and would appreciate your submissions. We will run a "Photo Opportunity" Contest in the next issue. If you have any topics you would like to see in upcoming issues, send in your idea and we will do the rest. Suggested themes are only limited by your imagination.

A special thank you to all our readers!

NEXT ISSUE:

"ANNUAL INDEX/SURVEY & REORGANIZATION ANALYSIS"

UPCOMING ISSUES:

"NATIONAL POLLUTION FUNDS CENTER"

"REGULATORY REINVENTION & STANDARDS DEVELOPMENT"

"HAZARDOUS MATERIALS"

Yesterday's Spill Data, Tomorrow's Cleaner Bay

USCG/USN Partnering

The Marine Safety Office (MSO) in San Diego had a problem; the unregulated US Navy vessels were spilling oil while the regulated mobile transfer facilities weren't spilling any. The Navy wanted to reduce their oil spills but traditional regulatory methods were unavailable. The mobile transfer facilities, specifically those handling oily water and bilge slops, felt that their regulatory burden and compliance costs were far too great. Strong partnerships were formed with the Navy and the local mobile transfer facilities and an analysis plan was drafted. Different issues, same strategy—using risk management methods to examine and learn from past spill data.

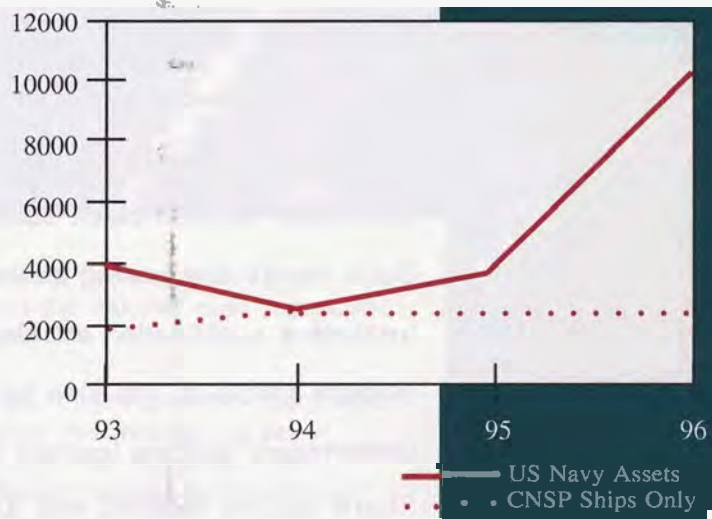
By CDR James A. Watson, LTjg John V. Reinhert, and LCDR Joseph A. Servidio

As a result of the Navy partnership and risk based analysis, thirteen specific recommendations were made. If fully implemented, the Navy's annual oil spill rate will be reduced by more than 25%. In addition, the partnership with the mobile transfer facilities yielded four likely regulatory alternatives that have been approved by the Captain of the Port. It is anticipated that through the use of these regulatory alternatives, mobile transfer facilities are expected to save over $150,000 a year, with no reduction in transfer safety.

NAVY OIL SPILL PREVENTION

In the past four years over 26,000 gallons of oil were spilled into San Diego Bay from hundreds of U.S. Navy ships and barges. Last year proved to be a particularly bad year; the Navy spilled over five times as much oil as all of the other sources in San Diego combined (figure 1). This was unacceptable to the Commander, Naval Surface Forces, U.S. Pacific Fleet (SURFPAC), so he decided to partner with MSO San Diego and do something about it.

Fig. 1. Oil Spilled in San Diego Harbor by Navy Ships



The project started in August 1996. Each contracted with Designers and Planners, Inc., of Arlington, Virginia, to conduct a single analysis of the data from hundreds of SURFPAC spill reports. The contractor used a combination of MSOSD spill data files, SURFPAC spill reports, and first hand surveys of the crews aboard eleven ships in San Diego to determine the highest risk oil handling operations. As expected, procedural and equipment errors were found to be equally responsible for most of the spills (figures 2 and 3). Other known causes such as structural failures accounted for about a third of the total gallons spilled, but were a small percentage of the number of spill incidents. PTP methodologies for identifying root causes and determining preventative action were chosen to develop the spill reduction recommendations.

Fig. 2 Relative Risk of Oil Operations on CNSP Ships

Operations	Mishap Probability	Hazard Severity	Risk Assessment
Oily Waste Handling	B (6.21)	II (82.0)	Serious
Internal Transfer	C (3.75)	I (119.9)	Serious
Refueling	B (4.71)	III (25.9)	Moderate
Defueling	D (0.96)	III (37.7)	Negligible
Equipment Testing	D (0.96)	III (18.2)	Negligible
PMS	C (2.25)	IV (4.1)	Negligible
Unknown	B (5.76)	III (37.3)	Moderate

Mishap Probability Criteria (# of spills per quarter)	*Hazard Severity Criteria (average spill in gallons)*
Category A - at least 8	Category I - 100 or more
Category B - 4.0 to 7.99	Category II - 50-99
Category C - 2.0-3.99	Category III - 6-49
Category D - less than 2.0	Category IV - 1-5

The contractor used PTP risk analysis scenario forms to document the data analysis and survey information in a format that led to ranked recommendations. Refueling, internal transfers, and oily waste handling were the top three operations described in these scenarios. These forms proved to be particularly effective because they forced the user to identify apparent, propagating and originating root causes along with four different types of potential preventative actions. The PTP methodology also required each potential

Primary Cause	Percentage of Total Oil Spills
Procedural Error	34.8%
Equipment Error	33.6%
Unknown	25.8%
Other	6.0%

preventative action to be ranked for risk control and cost.

The thirteen recommendations in the final report were selected because they provided the most risk control for the least expense. You may recognize that many are regarded as good marine practices and contained under the Code of Federal Regulations. They include:

Recommendations for Preventing Oil Spills

1. Avoid topping off service tanks unnecessarily.
2. Require a checklist procedure for every fueling and waste oil handling event.
3. Limit in-port oil operations to normal daylight working hours.
4. Modify the scheduling of the barge that receives vessel's oily wastes.
5. Reduce the refueling fill rate to 500 gpm.
6. Use easier to read black background sounding tapes.
7. Blank flange any fueling station not in use during refueling.
8. Institute a qualification standard for oil handling personnel.
9. Require follow-up inquiries for all oil spills.
10. Disseminate lessons learned from spill incidents throughout the fleet.
11. Share lessons learned with appropriate supporting organizations.
12. Encourage a redesign of Navy tank level indicator systems.
13. Encourage a redesign of Navy oily water separator systems.

Fig. 4 Before Implementation

Operation	Mishap Probability	X	Hazard Severity	=	Quantity Spilled/ Quarter
Oily Waste Handling	6.21	X	82.0	=	509.2
Internal Transfer	3.75	X	119.9	=	449.6
Refueling	4.71	X	25.9	=	122.0
Unknown	5.76	X	37.3	=	214.8
Total					**1295.6**

After Implementation

Operation	Mishap Probability	X	Hazard Severity	=	Quantity Spilled/ Quarter
Oily Waste Handling	3.105	X	82.0	=	254.6
Internal Transfer	1.875	X	119.9	=	224.8
Refueling	2.355	X	25.9	=	61.0
Unknown	3.84	X	37.3	=	143.2
					683.6

The Navy's Operational Risk Management (ORM) method, initially developed for managing safety risks, was adopted to predict the benefit of implementing these recommendations. The contractor predicted that effectively implementing these recommendations will cut the mishap probability for the operations involved by half. Using quarterly averages, a prediction was made to reduce the gallons spilled per quarter for these operations. That reduction equates to 26.7% of the average amount of oil spilled from SURFPAC ships, for all causes, over the four year period (figure 4).

MOBILE TRANSFER FACILITY ALTERNATIVES

Case Study: Risk Management in San Diego

Oily water and bilge slops being transferred to a vacuum truck.

In January 1996, a Risk Management Team (RMT) was convened to measure the risk of non-bulk transfers being conducted by mobile facilities in the Captain of the Port, San Diego area of responsibility (AOR). Industry had long held the position that transfers of oily water and bilge slops posed less of a risk to the environment than "real" oil transfers. Because of this, they felt they were "exempt" from 33 CFR regulations. An analysis of oil spill data revealed that less than 2% of the annual spills within the AOR were from mobile facilities and that these spills accounted for less than 1% of the total petroleum product spilled. Still, the Captain of the Port interpreted the regulations as being applicable as necessary to maintain consistent training and safety standards for industry personnel. In lieu of an exemption, the Captain of the Port (COTP) sanctioned the RMT to study current regulations, assess the risks of each regulation and recommend regulatory alternatives as appropriate.

RMT members included representatives of industry, their regulators and major local customers. The first order of business was to define the transfers to be discussed. It was concluded that only transfers of a liquid with 5% or less of petroleum product per volume by a Mobile Transfer facility would be considered. It was further decided that only mobile facilities with a non-fixed (vessel side) vacuum system transferring at 80 psi or less would be discussed. Initial pumping of tanks, even if they met the above criteria would not be considered, however initial pumping of bilge spaces meeting the above criteria would be included.

Next, fourteen regulatory items were ranked on a 1-4 scale. The ranking gauged the severity of safety and environmental damage that would occur if the item failed, with 1 being most severe environmental consequence (figure 5). Five items were rated as 3's, while nine others were rated as 4's.

Fig. 5

Severity	Definition	Ranking
	Death, System Loss	
CATASTROPHIC	Severe Environmental Damage	1
CRITICAL	Sever Injury, Illness, Major Environmental Damage	2
MARGINAL	Minor Injury, Illness, Minor Environmental Damage	3
NEGLIGIBLE	Less than Minor Injury or Damage to Environment	4

The annual cost associated with each item was then discussed, defined and categorized (figure 6).

The RMT then focused on items with the lowest safety and environmental consequences (highest numerical severity ratings) and highest costs (figure 7). Each item was examined for any possible lower cost regulatory alternatives offering the same level of safety; if none could be identified, the item was removed from consideration. In August, 1996 four alternatives were submitted and subsequently approved by the COTP for use in San Diego's AOR. Each alternative was for medium cost items with negligible safety / environmental consequences. The alternatives affected regulations for the following areas:

Declaration of Inspection (33CFR156.150),

Hose Assemblies (33CFR154.500),

Qualification of Persons in Charge (33CFR155.710), and

Communications (33CFR154. 560).

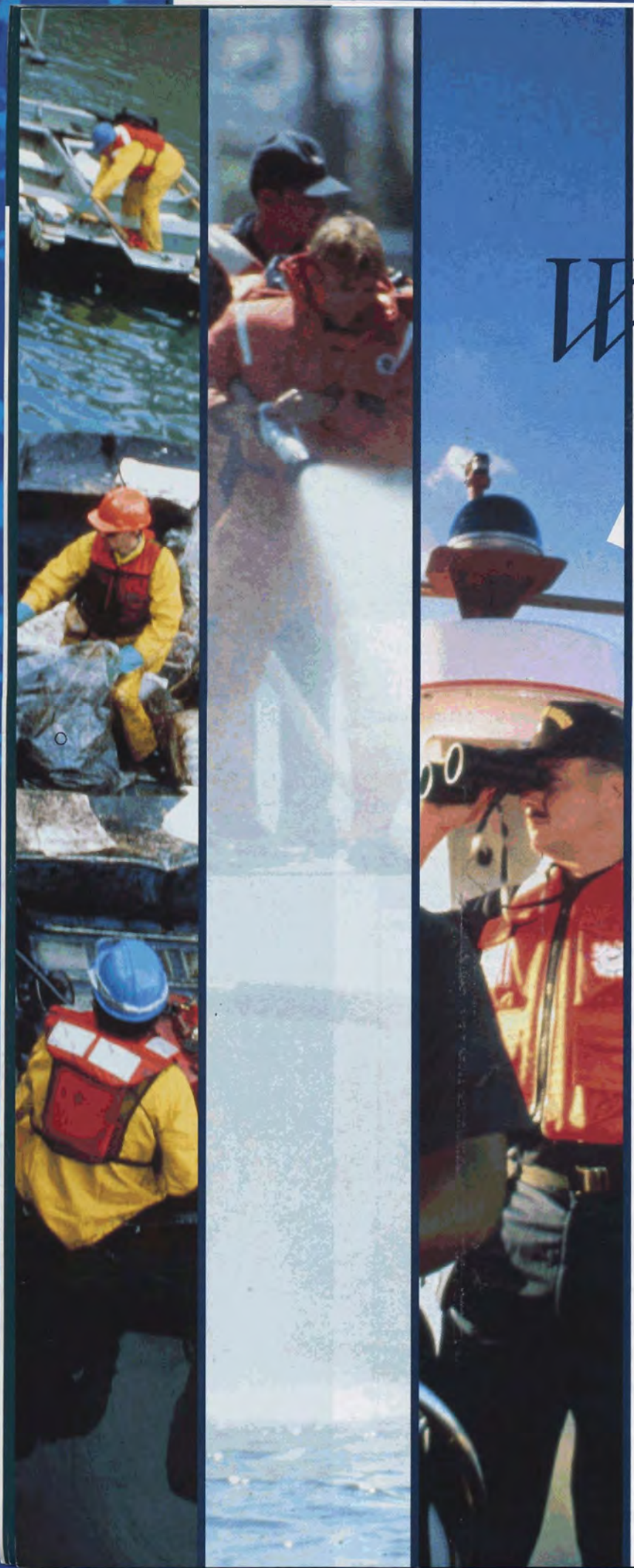
Fig. 6

Cost Association Definitions		
MINOR	Less Than $500.00	Annual Cost
MEDIUM	$500.00 to $5,000.00	Annual Cost
HIGH	More Than $5,000.00	Annual Cost

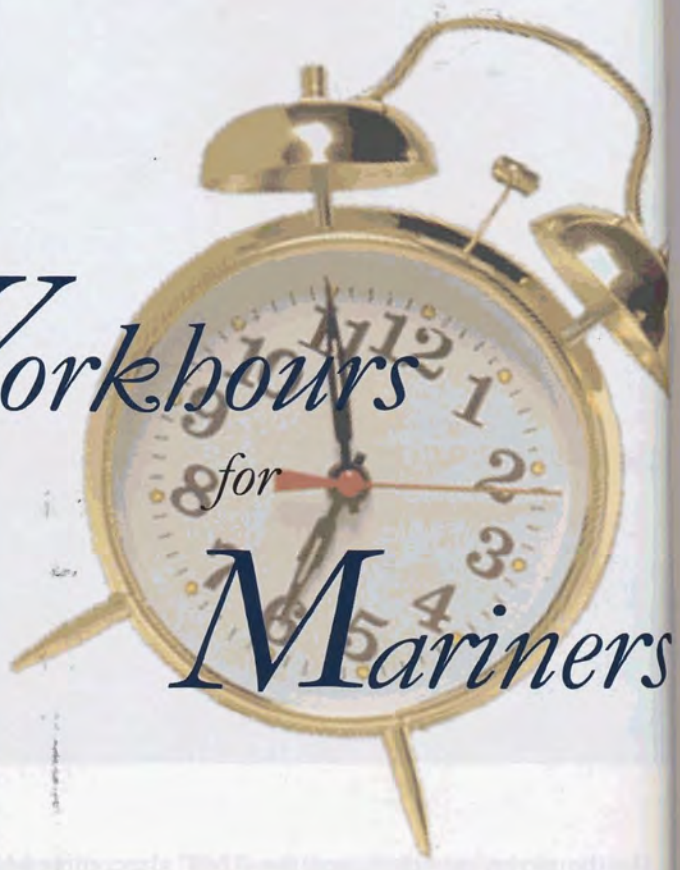
In the seven months since the RMT's recommendations were implemented, 17 companies have adopted these regulatory alternatives, saving industry an estimated $170,000 annually.

Fig. 7

Requirement	Severity	Cost
Operational Manual Available and Current	4	Minor
Common Language Fluency	3	Minor
Hose Testing	4	Medium
Hose Marking	4	Medium
Small Discharge Containment	4	Minor
Emergency Shutdowns	3	Minor
Communications	3	High
Vessel Person in Charge Training and Designation	4	Medium
Terminal Person in Charge Training and Design	3	Medium
Hotwork and Open Flames	4	Minor
Blanked Unused Hoses	4	Minor
Transfer Hose Conditions	4	Medium
Declaration of Inspection	4	Medium
Pre-Transfer Meeting	4	Medium



Workhours for Mariners



By Dr. Marc B. Wilson, CPE

Fatigue is a major factor, if not the most important factor, to consider when deciding crew work hours and rest periods. In the January 1990 meeting of the International Maritime Organization (IMO) Subcommittee on Standards of Training and Watchkeeping, fatigue was defined as "the degradation of human performance, the slowing down of physical and mental reflexes, and/or the impairment of the ability to make rational judgments; induced by such factors as prolonged periods of mental or physical activity, inadequate rest, adverse environmental factors; and/or stress or other psychological factors (Pollard, Stearns and Sussman, 1990)."

The term fatigue means psychological (mental) fatigue and physical fatigue (Brown, 1994). Psychological fatigue, which does not expend considerable energy, is an experienced tendency to not continue performing a task. This usually results in staying on task or focusing problems. On the other hand, physical fatigue does expend energy. It is a result of either dynamic muscular work, where there is alternating relaxation and tension of the muscles, or static positioning, where muscles remain

FATIGUE: the degradation of human performance, the slowing down of physical and mental reflexes, and/or the impairment of the ability to make rational judgments.

in a state of increased tension. Fatigue is a compounding of both psychological and physical fatigue.

In order to control shipboard fatigue, one has to control the three basic mechanisms that affect it:

- the number of hours worked,
- the ability to get regular or uninterrupted sleep, and
- exposure to stressful conditions, both psychological and physical (Pollard, Stearns and Sussman, 1990).

Fatigue can, therefore, be controlled by controlling the number of hours required to accomplish the ship's work, having schedules that have the least disruption of crew "sleep time," and ship design and operations which limit adverse environmental, workload and other effects.

In their report on "Shipboard Crew Fatigue, Safety and Reduced Manning" (DOT-TSC-MA-90), Pollard, Stearns and Sussman categorized these factors that influence fatigue. The major categories are organizational factors, voyage and scheduling factors and ships' design factors.

ORGANIZATIONAL FACTORS

These factors basically deal with how ships are managed. They include factors such as training, work rules, continuity, standardization, paperwork and pay systems.

Ship continuity, for instance, has been instrumental in reducing crew fatigue. In a survey of ships, it was found that Captains and crews who had worked together aboard the same ships for long periods of time had much lower levels of fatigue than those who worked on ships with frequent changes of personnel (Pollard, Stearns and Sussman, 1990). In cases with ship continuity, crew members can do their jobs with little instruction or supervision, whereas in cases without continuity, workload is increased because officers spend too much time training and supervising and/or being trained and supervised.

Standardization, or standard operating procedures, is another element in the group of organizational factors. Standardization closely interacts with ship continuity and has a significant impact on workload. Organizations operating ships with low levels of ship-to-ship standardization will require more work hours to accomplish their mission, and therefore increase the psychological and physical fatigue of the crew.

VOYAGE AND SCHEDULING FACTORS

An element in this group of factors is the frequency of port calls. Fatigue increases as more port calls are made in quick succession, such as ferries. Officers must continuously monitor critical activities such as loading and unloading. Operating in congested waters, unpredictable arrival and departure times, which disrupts crew sleep, circadian rhythms, and long duty tours, especially in excess of 75 days, are other elements in this group of factors that cause fatigue.

FATIGUE can be CONTROLLED by controlling the number of hours required to accomplish the ship's work.

SHIPS' DESIGN FACTORS

Features such as the level of automation affect workload and, therefore, fatigue. Proper automation on ships requires less work from the crew. Clumsy automation gives a false sense of security and increases workload. Other elements of the environment, such as noise, vibration, temperature and ship motion also affect the physical stress level of the crew and their ability to sleep. This, of course, affects their levels of fatigue. Environmental factors are mainly associated with physical fatigue. Research has shown that activities which require continuous physical exertion and/or exposure to environmental hardships such as temperature and humidity extremes, result in physical fatigue (Pollard, Stearns and Sussman, 1990). Other elements in this group include excessive noise levels, severe physical vibration, mechanical shock and extreme motions.

DISCUSSIONS

Time and distance of voyage length greatly influences the maximum and minimum work hours and rest periods that should be permitted. Longer voyages with few port calls make possible the implementation of work-rest cycles that have little disruptive effects on the ship-based circadian rhythms of the crew. Circadian rhythm refers to a time period that imprecisely approximates 24 hours in duration, ranging from 20 to 28 hours (Wells, 1992).

It is commonly applied to rhythmic biological functions which are geared to an internal sleep-wake cycle. During longer voyages, the crew have longer periods to adjust to their schedules. The three-section watch schedule used on voyages of more than 600 miles and or larger ships allows for an eight-hour rest period assuming normal operations and no port call (Pollard, Stearns and Sussman, 1990). On the other hand, the two-section watch schedule, normally used on shorter voyages, does not allow for any more than six hours off duty or the readjustment of the circadian rhythm of the crew. However, less maintenance is done and more sleep is taken.

Vessel type is another variable that must be given serious consideration before work hours and rest limits are set. For example, ships with high levels of unclumsy automation and ergonomic designs do not require the crew to expend tremendous energy in performing their duties in hazardous conditions, fire fighting, or other physically demanding conditions. In 1988, Sean Connaughton, a marine safety specialist, noted that, concerning automation, certain traditional practices - like engineers standing watch in a fully functioning engine room - can be done away with. Today, in open unrestricted water, even deck watch standing can be done away with. This is in keeping with the Coast Guard's equivalency policy.

Various day/night schedules should also be taken into account when considering work hour/rest limits. Ship crews working at night should consistently have the same schedules so as to thoroughly adapt. Research has shown that the great test risk of accidents is between midnight and 0600 hours (Pollard, Stems and Sussman, 1990). With this in mind, safeguards, such as assigning personnel to work or stand watch according to their own biological clock, should be put in place. There are night people and day people. Select the night person for night operations and the day person for day operations.

With this awareness of possible factors and variables, one can begin to determine numerical values for work hours and rest period limits. In 1965, Murrel developed the formula

$$R=T(W-S)/(W-1.5)$$

which was used to estimate the total amount of rest required for any given work activity (Sanders and McCormick, 1993). Where R = rest required in minutes. Rest in this case does not necessarily mean sleep, but means any activity that requires an energy expenditure of 1.5 kcal/min or less. The estimation of energy expenditure during sleep is 1.3 kcal/min, so sleep will qualify as rest.

R=T(W-S)/(W-1.5)

T = total work time in minutes

W = average energy consumption of work in kcal/min

S = recommended average energy expenditure in kcal/min usually 4 or 5 kcal/min).

1.5 = the energy expenditure (in kcal/min) at rest

Giving a very heavy work environment, W=10 kcal/min, S=5 kcal/min, and R=8 hours, then T=13.6 hours.

CONCLUSION

With an estimated eight hours of rest, total work time is thirteen hours. This leaves three hours for hygiene and eating. Without taking concerns of design, environment, and organization, one can conclude that the following times or numerical values should apply to crew members on U.S. merchant ships:

Maximum work hours permitted in any 24-hour period = 13 hours. This was derived by using Murrell's formula, as noted above.

• Maximum work hours permitted in a period longer than 24 hours (e.g., 72 hours) = 36 hours. This time limit of 36 hours was arrived at by subtracting an hour from the maximum 13 hours for each 24 hours and multiplying by 3 to get the limit for 72 hours. The time limit was reduced by an hour per day when it applied to a period of time longer than 24 hours. Recall, fatigue increases with the inability to get regular and uninterrupted sleep or rest. Taking circadian rhythms calibration error as iO.02 or 30 minutes, 1 hour is a reasonable correction.

• Minimum continuous period to be available for rest in any 24-hour period is 6 hours. Using a two-section watch schedule, the crew will at least have 6 hours off duty. A three-section watch schedule is preferable but if it is not possible, then the two-watch system, enabling 6 hours off, will satisfy this requirement.

• Maximum duration of any single watch is 6 hours. Using the same arguments as above, the less desirable two-watch schedule will require a maximum of 6 hours on duty.

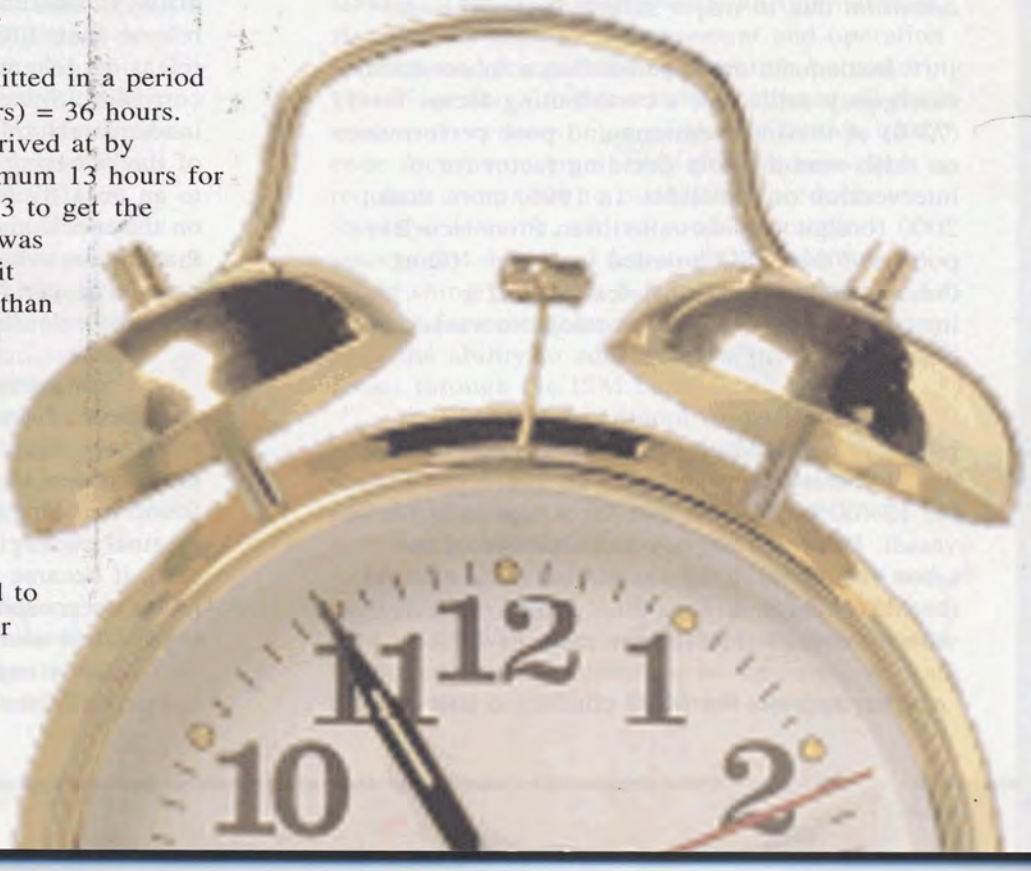
• Minimum continuous period to be available for rest immediately prior to taking watch is 6 hours. For the same arguments as used above, 6 hours of rest immediately prior to taking watch can be provided by the less desirable two-watch schedule. This minimum limit would assure adequate rest.

However, when ergonomic design, environment, and organization behavior are inadequate, the numerical values are substantially less. How less can only be determined on a case-by-case basis. Suffice it to say that the numerical values are maximums. When the situation deteriorates, the numeric values deteriorate, too.

Acknowledgment

I thank Mr. Jacob Fohtung, a student researcher, for his effort in drafting a similar paper.

Note: For references, please contact the author.



Targeting Crew Proficiency

By LT I. Lui

The Coast Guard started to enforce a new Chapter XI to the International Safety of Life at Sea (SOLAS) convention entitled "Special Measures to Enhance Marine Safety" in April of 1996. This new chapter gave Port State Control (PSC) programs across the world the authority to conduct a SOLAS intervention when there are "clear grounds" for believing that the Master or crew are not familiar with essential shipboard procedures relating to ship safety. In particular, crew performance during emergency fire and abandon ship drills is now evaluated for Coast Guard conducted annual PSC examinations. When crews do not perform satisfactorily, the vessel can be detained by means of a SOLAS intervention until adequate performance is demonstrated.

Recognizing the importance of crew proficiency in preventing marine casualties, the Coast Guard Marine Safety Office (MSO) San Francisco Bay, CA embarked on an aggressive campaign to conduct and evaluate shipboard drills. In the port of San Francisco Bay, the local Captain of the Port (COTP) conducted 23 SOLAS interventions in 1996 which lead to detention due to major safety discrepancies.

Inadequate crew performance in conducting emergency drills was a contributing factor for 17 (73%) of the interventions and poor performance on drills was the sole deciding factor for intervention on 2 vessels. In 1996, more than 2000 foreign vessels called San Francisco Bay ports and the MSO boarded just over 400 of these vessels. This translates to a 5.2% intervention ratio of interventions to vessel boardings.

For the first 10 months of 1997, 20 interventions leading to detention involved unsatisfactory crew drills as an additional factor for 12 (60%) of them and the sole reason for one vessel. Between January and October of the same year, over 1600 vessels have arrived and the MSO boarded more than 350 of these vessels with an overall intervention ratio of 5.7%.

In contrast, the MSO conducted just over 500 vessel boardings in 1995 out of more than 2,000 total vessel arrivals and intervened on 10 vessels, resulting in an intervention ratio of 1.9%. One reason for this current increase in the intervention ratio is the fact that emergency drills are now being conducted and evaluated.

USCG vessel inspections are conducted by qualified marine inspectors. Typically, it is this Marine Inspector who will make the initial determination that intervention on a vessel is required based on noncompliance with international standards. Interventions for drills are based on a failure to follow the basic criteri outlined in International Conventions as found i International Maritime Organization (IMO) Resolution A.787(19). The most common problems encountered at MSO involved drills taking an inordinate amount of time, unfamiliarity with provided equipment or posted duties, not following procedures as listed on the vessel's muster list and emergency instructions, unsafe practices, poor communication between key personnel, missing or dilapidated safety equipment and poor direction and control.

At times, both crew knowledge and poor maintenance attributed to an overall problem on drills. In one case, the crew could not properly release their lifeboat into the water because the releasing gear was inoperable due to a heavy corrosion. Since the vessel's crew was inadequately trained in the proper maintenance of the releasing mechanism, its deterioration led to an unsafe situation. In addition, maintenance on the mechanism had been ignored for so long that the crew had not even been instructed on how to properly release the lifeboat using the installed releasing mechanism.

Crew performance deficiencies have not only been observed on older vessels, but also or relatively newer vessels, including vessels on their maiden voyage. Some of the equipment found on these newer vessels were still in the original packaging and, upon the signal of a drill, it became obvious that the equipment had never been used or worn before by the vessel's crew. Crew members did not know how to put on fire suits and were not familiar with the operation of the equipment. As seen in the phot

Crew members practice fire drills. When crews do not perform satisfactorily, the vessel is detained by means of a SOLAS intervention until adequate performance is demonstrated.

the individual looks properly outfitted, but upon closer examination the air bottle is worn upside down. This is a potential problem because the harness is designed to hold the bottle securely and comfortably on the wearer and if worn improperly, can impede the movement of the wearer or slip off.

A USCG Port State Control Officer (PSCO) is guided by IMO resolution A.787(19), in carrying out the authority in Chapter XI of SOLAS. Prior to this new chapter, the PSCO relied upon a review of vessel logbook entries and records to determine if emergency drills were conducted. Now, resolution A.787(19) allows a PSCO to actually witness a fire and abandon ship drill to ensure that crew members are familiar with their duties and procedures as described in the vessel's muster list, as well as the proper use of the ship's installations and equipment. All drills, as far as practicable, should be conducted as if there were an actual emergency, ensuring that all associated gear is complete, properly donned, and the crew is familiar with the emergency or lifesaving equipment.

Consistent practice and training in accordance with recommended standards is the key to maintaining a crew's familiarity with emergency equipment and procedures. The International Convention on Standards of Training, Certification, and Watchkeeping (STCW 1978) was adopted by the IMO in 1978 to establish common international standards for training, certification, and watchkeeping for worldwide seafarers.

The 1995 amendments to STCW 1978 became effective in February 1997 and expanded the code to include more detailed minimum standards for training, including knowledge for emergency drills. Seafarers who have had the required training in emergency procedures will then receive certification that the training was completed. Typically, vessel crews have presented proper documentation that they have received required training on emergency procedures. However, in some cases the initial training has not been adequately reinforced on vessels since some crews have had to conduct drills several times to demonstrate compliance with minimum standards.

MSO San Francisco Bay's experiences are that Flag State representatives have readily addressed vessel material deficiencies, but not crew performance problems. The pending International Safety Management (ISM) Code, like the STCW code, is an avenue to bring Flag States closer to crew performance concerns. The ISM code becomes effective on July 1, 1998 for many ships including passenger ships and tankers. This code will provide an international standard for the safe management and operation of ships and for pollution prevention by requiring vessel operators to accurately document all their routine procedures. One particular section of the code focuses on emergency preparedness and requires companies to establish procedures to identify, describe, and respond to potential emergency shipboard situations, in addition to establishing programs for drills and exercises to prepare for emergency actions. Flag States now have the ability to address crew proficiency issues through the ISM code.

No single action will solve the problem of crew competency on emergency drills, and a concerted effort on the part of all Flag States embracing the minimum standards on an international level is needed. The measures and guidelines from the IMO such as the STCW and ISM codes will make significant strides towards improved crew performance in the future so long as Flag States globally continue to support them.

Propulsion Failures

A vessel which suffers a propulsion failure and loses the ability to maneuver could create a serious marine casualty, if it occurs in the midst of other vessel traffic, obstructions or shore. The cost of closing the ports of Los Angeles and Long Beach for just one day due to a serious vessel casualty is estimated at $500 million. The environmental impact of an oil spill due to a tank vessel running aground, or perhaps a collision with another vessel which had lost its ability to maneuver could be devastating. For these reasons, the safe movements of vessels in and out of this port complex is a primary concern for the U. S. Coast Guard in its mission of protecting life and property at sea and the marine environment. To better understand the nature of these failures in and around the ports of Los Angeles and Long Beach, the Coast Guard has analyzed local propulsion incidents during the three year period from 1994 through 1996. This study was conducted to better identify and manage the risks involved with vessel movements and advise the Marine Industry of lessons learned to reduce the risk to shipping and the ports.

LT Kathy Moore, USCG

The Los Angeles-Long Beach (LA/LB) Vessel Traffic Information Service (VTIS) monitored 16,130 deep draft vessel arrivals from 1994 through 1996. During this period, 115 propulsion problems occurred which represent 0.7% of the total arrivals. Propulsion incidents were divided into two categories. The first category is *Failures*, where the vessel loses the ability to use its main propulsion. The second category is *Maintenance* where the master elects or requests to reduce speed or shut down main propulsion in order to effect an adjustment or repair.

The following conclusions were drawn from this analysis:

- Direct drive diesels incur 99% of the propulsion incidents identified in this study. The air start, lube oil and fuel oil systems on direct drive diesels are the predominant systems that fail.
- Of over 16,000 deep draft vessels entering the port complex, 115 or 0.7% incurred propulsion problems.
- Container vessels suffered 62% of the incidents. Bulk cargo vessels suffered 24% of those incidents. Tank vessels suffered only 5% of the 115 propulsion incidents.
- Of these 115 propulsion incidents, 39% were propulsion failures where the vessel lost use of its main propulsion.
- The largest number of failures occurred within three miles of the Los Angeles-Long Beach breakwater.

For inbound transits, failures were most often associated with the starting air system, comprising 38% inbound failures.

- Outbound transit failures were most often associated with fuel and lube oil systems where fuel systems accounted for 33% failures and lube oil systems accounted for 24% outbound failures.

INTRODUCTION

A vessel which suffers a propulsion failure and loses the ability to maneuver could create a serious marine casualty, if it occurs in the midst of other vessel traffic or near shoals or shore. The cost of closing the ports of Los Angeles and Long Beach for just one day due to a serious vessel casualty is currently estimated at $500 million. The environmental impact of an oil spill due to a tank vessel running aground, or perhaps a collision with another vessel which had lost its ability to maneuver is potentially extremely high. For these reasons, the safe conduct of vessels in and out of this complex is a primary concern for the U. S. Coast Guard in its mission of protecting life and property at sea and protecting the marine environment. The port complex continues to expand and is the site of the largest dredge and fill project in the country, which means the waterways are becoming much more complex to navigate.

Propulsion problems may include outright failures or incidents requiring reduced speed or special navigating constraints. A vessel with main propulsion has a greater likelihood of reduced ability to maneuver or suffering a loss of running aground, allision or collision. The magnitude of a vessel casualty resulting from a propulsion failure can be seen in the allision of the M/V BRIGHT FIELD with the Riverwalk commercial development in New Orleans in December, 1996.

The port complex at Los Angeles and Long Beach is in the midst of a multi-million dollar expansion, and is the site of the largest dredge and fill project in the country. The expansion of port facilities means an increase in both the number of vessels visiting the port and the size of these vessels. It also means a significant reduction of over 800 acres in the navigable waters within the ports' breakwater.

Propulsion incidents occurring in the vicinity of the LA/LB port complex have been collected and analyzed, so that preventive measures can be identified to reduce the risks to vessels and the port facilities. In most cases, a vessel notifies VTIS or VTIS observes a propulsion incident. The incident is then reported to the COTP via a VTIS Incident Report.

Steps have already been taken to tighten the safety net in this port complex. The Los Angeles-Long Beach Harbor Safety Committee meets monthly to discuss regulatory changes, "standards of care" and recent incidents in order to promote safe vessel movements. The committee has representatives of both port pilot organizations, executives from both ports, and representatives from the towing and vessel assistance industries. VTIS/Marine Exchange is also a member and the Commanding Officer of the MSO/Group LA-LB holds a non-voting position. As a result of the committee's work, tug escort requirements are already in place for oil tankers through an agreed upon "standard of care" rather than resulting from regulation.

Problem Statement

In order to better understand the nature of these failures in and around the ports of Los Angeles and Long Beach, the Coast Guard has completed an analysis of propulsion incidents for 1994 through 1996. The Coast Guard Captain of the Port in Los Angeles/Long Beach is focused on appropriately managing the risks involved with vessel movements within this area. The unit also shares lessons learned from previous incidents with the marine industry to reduce the potential for future incidents and thereby the risk to the ports.

The vessels included in this study were deep draft commercial vessels of U.S. and foreign registry. The ferries which transit between Long Beach or San Pedro and Santa Catalina Island were excluded from the study, as were public vessels, such as USCG cutters, NOAA ships and U.S. Navy vessels, and towing vessels.

The analysis set out to characterize the data to answer the following questions: What was the severity of an incident— was it an unscheduled repair or a loss of main propulsion? What type of vessel was having propulsion problems? Was there a high incident rate for a particular vessel type, flag state, or were vessels of a particular age especially prone to failures? Where were vessels having propulsion problems; that is how close to the entrances to LA or Long Beach harbors were incidents most commonly occurring? When were vessels having incidents?

Was there a difference in the incident rate for inbound or outbound transit? What was the cause of the incident? Each vessel system involved with the incident was recorded as well as the exact cause of the problem whenever that information was available. Finally, have there been propulsion problems with a particular vessel in the past? Propulsion casualties were identified for U.S. ports for each vessel in the study.

Port Overview

The Los Angeles and Long Beach port complex, the third busiest in the world, is the site of over 5,500 vessel visits annually transporting $170 billion in trade annually. Projections indicate the volume of trade through these two ports could double by 2005. Both Los Angeles and Long Beach are currently engaged in aggressive expansion programs adding land, container terminals and a dry bulk terminal, and greatly increasing rail access to the waterfront. Dredging projects, increasing channel and pier side water depths are also currently underway. Container vessels up to 950', 5,000 TEU and tank vessels up to 1100' and 265,000 DWT are regularly visiting this port.

The Los Angeles-Long Beach Vessel Traffic Information Service is a novel approach to vessel traffic management. It is the nation's only jointly operated VTS, operated by both the U.S. Coast Guard and the Marine Exchange of Los Angeles-Long Beach Harbors, Inc., supported entirely by vessel user fees and continually staffed by representatives of both organizations. A sophisticated computer radar system tracks vessel movements within a 20 nautical mile radius of Pt. Fermin Light, excluding Santa Monica Bay.

PROCEDURE

VTIS and Data Collection

Propulsion incident data came primarily from reports of propulsion problems given to the Vessel Traffic Information System (VTIS) during vessel transits or vessel speed changes noted by watchstanders. Propulsion incident reports were summarized and the following information was collected: date of the incident, vessel name, flag, Lloyds number, length, build date and classification society, the type of vessel and the nature of its cargo, the system that suffered the failure and the exact cause of the failure if known. The vessel's position was recorded along with whether it was an inbound or outbound transit. Also collected was information concerning reportable marine casualties involving propulsion failures in this and other U.S. ports by the same vessel. A reportable marine casualty involves the loss of the ability to maneuver in accordance with 46 CFR 4.05-1(a)(3).

Another source of vessel amplifying information was the U.S. Coast Guard Marine Safety Information System. This system collects data on vessels throughout the country including documentation information, inspection results and casualty reports. The information relies on data input from Coast Guard personnel in U.S. ports and is sometimes lacking information because of the failure of vessels to report marine casualties.

In depth information regarding the causes of failures was gleaned from conversations with vessel masters and chief engineers at the time of the incident, casualty reports submitted to the Coast Guard, reports from Coast Guard Marine Safety vessel inspectors and class society surveyors, as well as information obtained from interviews with vessel agents and telex's from the ships.

DISCUSSION AND RESULTS

Scope of the Problem

VTIS monitored 16,130 deep draft vessel arrivals during the three years 1994, 1995, and 1996. This represents a minimum of 32,260 transits, and does not include vessels shifting from berth to anchorage, or to a different berth. During this same period 115 propulsion problems occurred with the vessels covered by the study which represents 0.7% of the total.

Establishing Incident Severity

A deep draft vessel propulsion incident includes a variety of propulsion problems ranging from the need to slow in order to effect a minor engine adjustment or repair, to a complete loss of the propulsion plant and with it,

the ability to maneuver the vessel. Clearly the range of incident severity constitutes a range of risks to the port. The data was reviewed and two categories of vessel incident were identified.

The first category is *Failures*. A *Failure* has occurred when the vessel has lost the ability to use the vessels main propulsion. In this case, the master does not have control of the vessel's propulsion. This may include the inability to start, or the inability to get an ahead or astern bell when maneuvering. It may also involve the unanticipated loss of automated control and the need to engage manual or emergency controls.

The second category identified is *Maintenance*. A *Maintenance* incident has occurred when the master elects to reduce speed or shut down main propulsion in order to effect an adjustment or repair. The vessel is able to maneuver and it is at the discretion of the master that a departure from normal operating procedures be made. Although this incident may involve extended repair times and had not been scheduled, the master's ability to maneuver the vessel and chose the time and location of the incident separates this type of incident from a *Failure*.

Of the 115 incidents documented for the three year period, only 45 or 39% of the incidents were *Failures*. The remaining 61% were *Maintenance* incidents, involving the decision of the master on when and where to make repairs or adjustments.

Characterizing the Vessels Involved

For the analysis, vessels were categorized by the type of cargo the vessel carries. The vessel types are: car carrier/RO/RO, break bulk cargo, combination cargo, bulk cargo, container vessel, passenger ships and tank vessels. The number of incidents for each type of vessel was normalized against the total number of these vessels entering port and the results are shown in figure 1.

Clearly the highest rate of incidents among the vessel types occurs with bulk cargo vessels, while the lowest incident rate is for break bulk, passenger and tank vessels. Container vessels are 3 to 6 times more likely to have a propulsion problem. A bulk cargo vessel is three to four times more likely to have an incident than a container vessel.

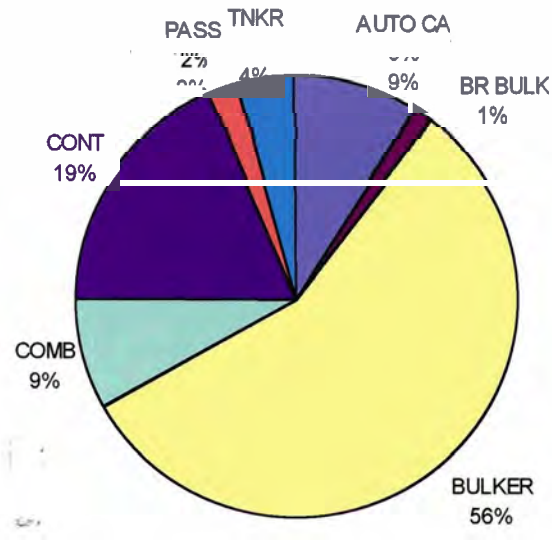


Figure 1: Propulsion Incidents by Vessel Type Normalized to Port Arrivals

When comparing the vessel type results against all the propulsion incidents, the results paint a quite different picture. Figure 2 shows bulk cargo vessels represent only a quarter of all the propulsion incidents while 62% of all the incidents occurred on a container vessel. This is principally because container vessels represent almost 60% of the vessels visiting this port and the propulsion plant on these vessels is direct

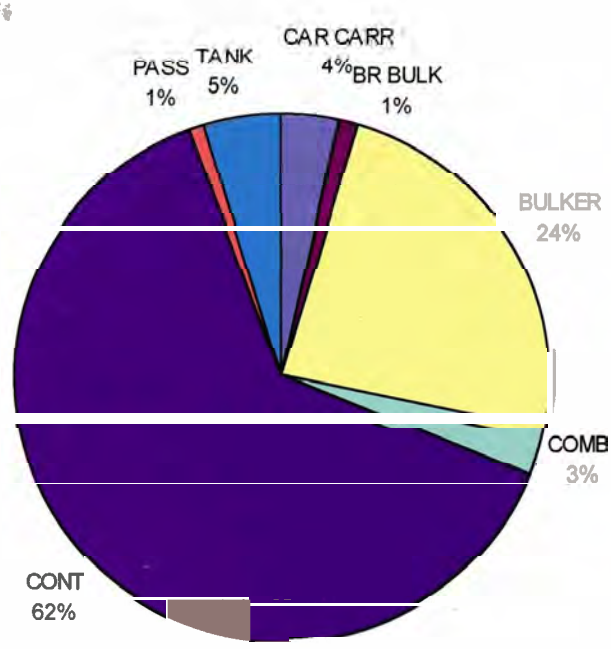


Figure 2: Propulsion Incidents by Vessel Type

terminal on the West Coast, petroleum terminals, bulk coal and petroleum coke facilities, etc. The port complex is bounded by a breakwater with two openings: Angel's Gate opening to the Port of Los Angeles and Queen's Gate, opening to the Port of Long Beach. The channels and basins shown constitute the Inner Harbor while the open water within the breakwater is designated the Outer Harbor. The area within the breakwater is designated in the data as Zone 1. The area from the breakwater and out, three nautical miles is the Regulated Navigation Area (RNA), or Zone 2. The area between the RNA boundary and the beginning of the north and south bound traffic lanes is the Precautionary Area, or Zone 3. Finally, from the boundary of the Precautionary Area out to a 20 nautical mile radius from Point Fermin Light.

Incidents were identified both by the zone in which they occurred as well as whether it was an inbound or outbound transit. Figure 3 shows the numbers of incidents occurring in each of the four zones. Zone 2, the Regulated Navigation Area (RNA) accounts for 40% of the incidents. Since this area includes the three miles approaching Angel's Gate and Queen's Gate, it represents an area of highest risk because vessels converge from a variety of directions, making speed and direction changes, in order to proceed through the gates or to traffic lanes. The number of incidents in this small area, 39, includes nearly as many propulsion *Failures* as *Maintenance* incidents. In fact, this small zone accounts for more propulsion *Failures* than any other zone monitored.

In consideration of the area and nature of vessel movements within Zone 2, this area becomes the primary focus for developing recommendations and procedures aimed at reducing the number of propulsion *Failures* in this zone.

The number of incidents within the breakwater, in Zone 1 is lower than any other zone. There are several reasons why this number may be artificially low. The area of Zone 1 is outside the VTIS Area of Responsibility (AOR) and therefore the VTIS is not obligated to closely monitor vessel movements in this area. Those reported Zone 1 incidents are the result of vessel masters or pilots advising VTIS of these incidents. In addition, there is little incentive for masters to report propulsion problems when tugs may be already alongside to aid maneuvering and the inability to engage an engine or reverse directions presents little problem at the low speeds used in the vicinity of berths. Risks in this zone are low due to the presence of tugs and the reduced speed of transiting vessels. Incidents in this zone are important to diagnose so that problems do not recur on departure.

***Failure* and *Maintenance* Incidents by Zone**

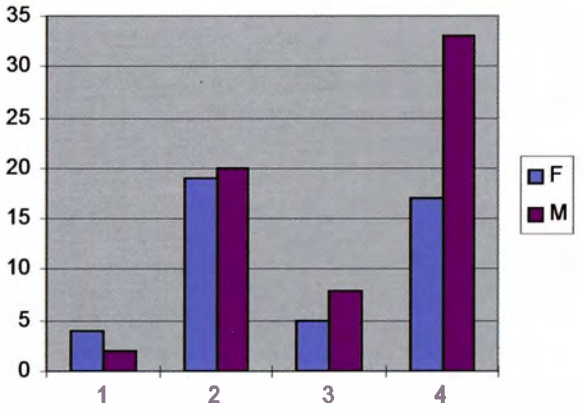


Figure 3: Propulsion Incidents by Zone

The number of incidents in Zone 3 is low and only 42% of the incidents were failures. Risk associated with propulsion failures in this zone is relatively low because of ample maneuvering room.

Zone 4, which includes the traffic lanes to a 20 nautical mile radius of Pt. Fermin Light, had the highest total, 50 vessel incidents. Although this number is high, only about a third of the incidents are propulsion *Failures*. The Coast Guard is not concentrating on this area because of the low number of failures and the ample sea room available for vessels to maneuver.

Figure 4 shows the distribution of these incidents by inbound versus outbound transit as well as by Zone. Here we see that for inbound transits, Zone 2,

Incidents by Zone and I/B vs O/B

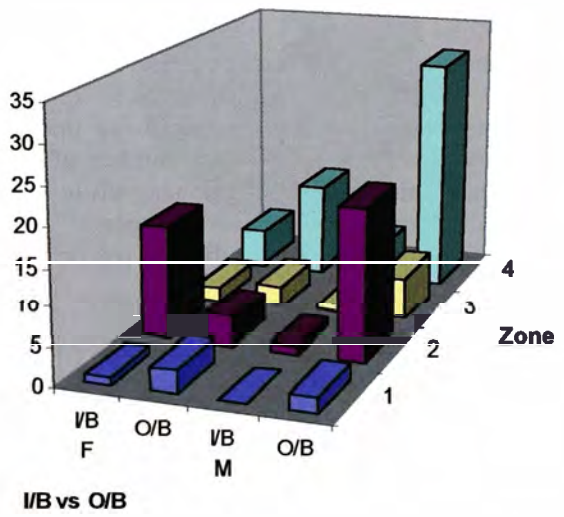


Figure 4: Propulsion Incidents by Direction of Transit and Zone

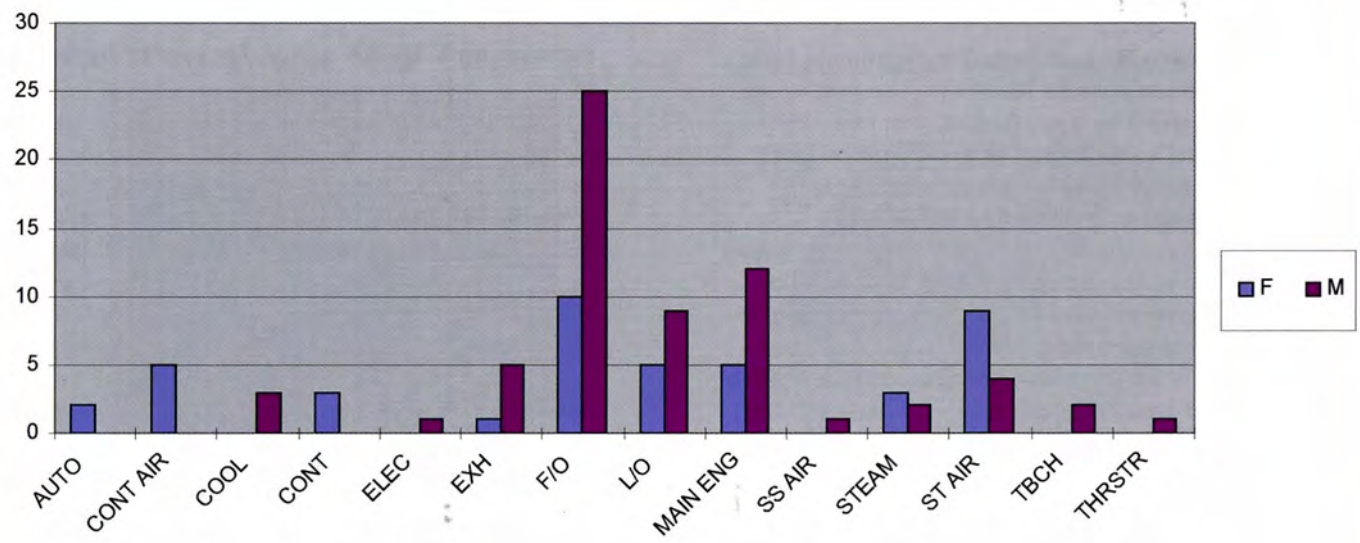


Figure 5: Propulsion Incidents by Vessel System

The number of incidents in Zone 3 is low and only 42% of the incidents were failures. Risk associated with propulsion failures in this zone is relatively low because of ample maneuvering room.

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Figure 4 shows the distribution of these incidents by inbound versus outbound transit as well as by Zone. Here we see that for inbound transits, Zone 2, the RNA, sees the overwhelming majority of propulsion *Failures*. Outbound transits have more failures in Zone 4, in open ocean. The figure also shows that inbound transits have the lowest number of *Maintenance* incidents for all zones, while Zone 2 and Zone 4 are the site of most *Maintenance* incidents for outbound traffic.

The Zone 2 value for outbound *Maintenance* incidents may be artificially high since a vessel's first communication to request an anchorage with VTIS is normally when exiting the breakwater. The vessel may have noticed the need to perform maintenance on the propulsion system within the breakwater but may not have advised the traffic service of the problem until exiting the breakwater.

Identifying Systems Involved with Incidents

Determining the cause of a propulsion incident is the most complex part of the study. Initial information from the master may describe a failure that is only symptomatic of a malfunction with a completely different vessel system. The actual cause of the incident may be discovered by the chief engineer and never relayed to either the master or the vessels agents. Unless Coast Guard inspectors or investigators actually board the vessel, interview the crew and observe repairs or replaced parts, the actual cause of the failure may not be accurately recorded. Furthermore, valuable information for accurate risk management may be lost. Nonetheless, whenever possible, the system suffering the failure as well as the exact cause of the failure has been recorded.

Direct drive diesel engines accounted for nearly all of the propulsion incidents studied. In fact steam plant maintenance incidents comprised only 3 of the incidents recorded. This may contribute to the low incident rate for tankers since most tankers visiting these ports are steam powered vessels.

Figure 5 shows the greatest number of *Failures* are associated with the Fuel System and the Starting Air System contributing 19 of the 45 *Failures*. The Lube Oil, Control Air and Main Engine Systems combine equally for another 15 of the *Failures*. The cause for 25 unscheduled maintenance stops was due to Fuel System problems. Lube Oil and Main Engine problems

combined to cause an additional 21 *Maintenance* incidents.

Figure 6 shows the system involved with a propulsion incident and whether it was an inbound or outbound transit as well as whether it was an actual propulsion failure or a maintenance incident. Nearly every incident associated with the Starting Air system occurred inbound and resulted in a total loss of the plant or the vessel's ability to maneuver. Control Air, Controls, Fuel Oil and Main Engine incidents made up the remainder of inbound failures where outbound failures were mostly associated with Fuel Oil and Lube Oil. The majority of incidents associated with the Fuel Oil system occurred while the vessel was transiting outbound.

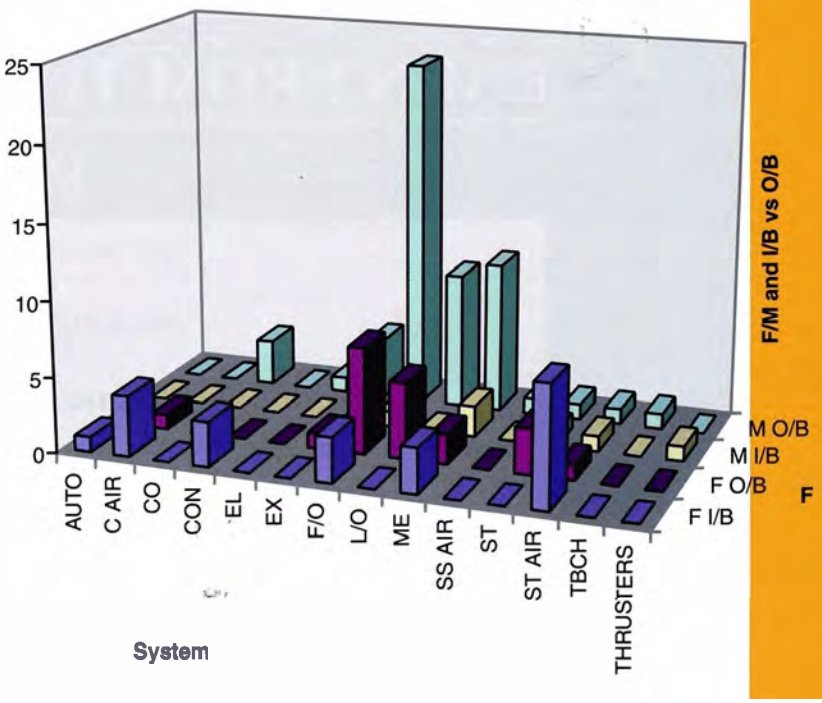


Figure 6: Failure and Maintenance Incidents by System and Direction of Transit

Have they had problems before?

A search of the Marine Safety Information System was conducted for each vessel involved in a propulsion incident. Figure 7 shows 15% of the vessels involved had suffered a reportable marine casualty involving a loss of propulsion in this or another U. S. port. The lack of familiarity of foreign vessel masters with the marine casualty reporting requirements of the United States suggests they may be significantly under-reported. It is significant then to reflect that although only 0.7% of the vessels arrivals in this port complex involved propulsion incidents, 15% of these vessels had propulsion failures in the past. The one percent is where the Coast Guard does not have historical data for the vessel in U.S. ports.

Future Work

The tracking of deep draft propulsion incidents continues with the aid of the VTIS. In addition to the data collected for this study, vessel masters, chief engineers and agents are being asked to identify if the system or component involved in the incident was a part of the vessel's preventive maintenance plan. If the component is part of such a plan, the determination will then be made if it was an Early, On-Time or Late failure. This will better identify the high risk systems and parts as well as the role of vessel management companies in this facet of safe vessel operations.

Another step being taken to enrich the data collected from this point on, is more extensive interviews with vessel personnel by Coast Guard Inspectors. They will be trying to find the role of the human element in these incidents, when human error created the incident or when aspects of human factors may have contributed to a casualty. This is the most challenging facet of the data collection because of frequent language barriers between foreign vessel crews and Coast Guard inspectors.

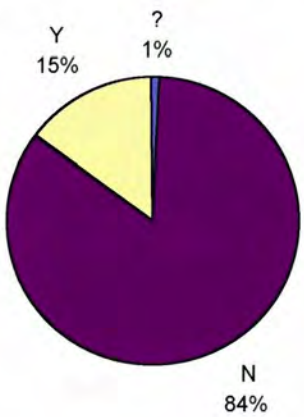


Figure 7: Percentage of Vessels Reportable Propulsion Failures in other U.S. Ports

Special thanks to Captain Richard McKenna of VTIS for providing three years of statistics for vessels utilizing the VTIS-Marine Exchange. Acknowledgment is also made to the editorial contributions of CAPT E. E. Page, CDR Keane, CDR Harmon, and LCDR Steinhilber.

LEARN FROM THE PAST

PREDICT THE FUTURE

Making Use of a 3-D Life-Cycle

Safety Management Information Highway

By Randy Gilbert, Retired USCG
Maritime Consultant and Director, Institute of Safety Management International (ISMI)

Ladies and Gentlemen, We Have a Problem

I have been speaking with the leaders of many shipping companies lately. Most CEO's tell me that at times they feel they are not making intelligent and informed decisions regarding safety. These forthright executives reluctantly admit that there is not enough "good" safety information; all they have is just data — random and scattered.

Why, in this day of "information overload," is relevant safety information not readily available to decision-makers? CEO's tell me that their company's data is either stored away in paper files, in piecemeal databases, or worse yet, remains only in the heads of a few individuals who are often not available for questioning. Some CEO's believe that some of the information could be made available if time allowed, but in most cases there is not enough time to obtain reliable or complete information.

Only "Good" Information Leads To Safe Decisions

The marine industry is not going to make a significant improvement in safety if its leaders cannot make good, timely decisions regarding safety management. If the CEO is ever to understand his role in implementing the Coast Guard's Prevention Through People (PTP) initiatives or in complying with the International Safety Management (ISM) Code, an information highway for safety management must be built. Together, we must build a system that learns from the past, so that we can predict the future.

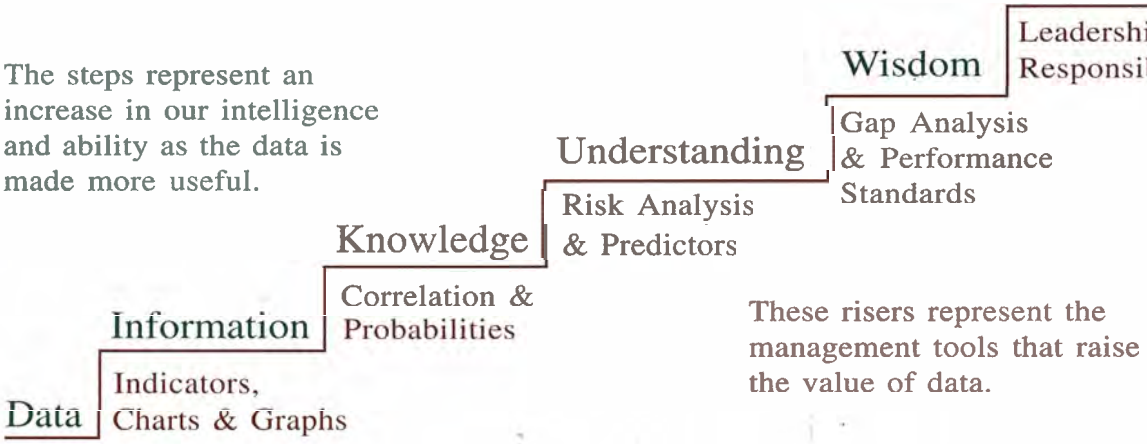
Safety is Not Magic

Safety, like customer satisfaction, is a relational outcome of good planning. I believe that the safety and pollution prevention goals that the marine industry is striving for will come only by way of pro-active safety management. I have adapted my wife's "Stairway To Excellence" illustration, which she uses in her field of education, and I now call it the "Pro-active Management Staircase."

The company that uses pro-active management will turn its data into good information, which can be used to strategically plan for higher safety. The

Pro-Active Management Staircase

The steps represent an increase in our intelligence and ability as the data is made more useful.



These risers represent the management tools that raise the value of data.

management tools that are depicted as the risers in the staircase are widely available for quality management manufacturing and service businesses. These are now being converted into tools that are usable for safety management as well. One such tool is called TEAM ASSESSOR. It has been developed by IQ Company and is a versatile tool for use during internal auditing or assessments of the ISM Code compliance.

Data, Data, Everywhere, But Not A Byte to Think With

The ISM Code will require an ocean full of data to be gathered. Shipping companies must plan to convert their data into useful information, lest it become a wasted commodity. For instance, section 9 of the ISM Code will require "procedures ensuring that non-conformities, accidents and hazardous situations are reported to the Company, investigated and analyzed with the objective of improving safety and pollution prevention." Vast amounts of data will be collected as problems are reported by ship Masters and designated persons. This data will be extremely useful if organized and stored in a rational way. As indicated by this ISM Code requirement, each Company must develop a method for investigating and analyzing the information so managers can take corrective-actions that might prevent the problems from recurring.

Technology Is Available

The availability and accessibility of safety information can be achieved by taking advantage of the enormous developments in information technology. It is becoming easier for up-to-date companies to gather, share and utilize information through networked tools. Software management tools are becoming relatively inexpensive and can be tailored to specific company needs. These technologies have a high return-on-investment potential. Reducing the risk of human error by even a small percentage could result in millions of dollars saved. However, we face three major challenges:

- Collecting safety data and converting it into good information.
- Organizing the information so that it can be used to strategically plan for safety.
- Protecting the data from litigation.

Safety, like customer satisfaction, is a relational outcome of good planning.

Only "Good" Information Leads To Safe Decisions

Indicators Can Turn Data Into Good Information

The data that is being gathered must not be left in its raw state. It must be manipulated into indicators that are useful to managers and top executives. For instance, it would be absurd to have displayed on the dashboard of a car the angular rotation of the tires, which the driver would then need to multiply by tire diameter, pi, and a few other conversion factors to get miles per hour. It would be equally absurd to display the number of speeding tickets the driver has received and expect that information to help with judging the current speed of travel. It is much more effective to have a speedometer as a useful indicator. Now the driver has the right information, which will allow him to control his vehicle and prevent dangerous speeds.

Safety information can be correlated and turned into safety knowledge. This is described as learning from the past. Through risk analysis, the safety knowledge can then be developed into predictors, which give the company a comprehensive understanding regarding safety. This understanding gives the company executives a high level of confidence in predicting the future outcome we call "safety of life at sea" and "pollution prevention." Developing indicators is not the focus of this article. For the time being, accept the fact that data can be turned into good information by using indicators.

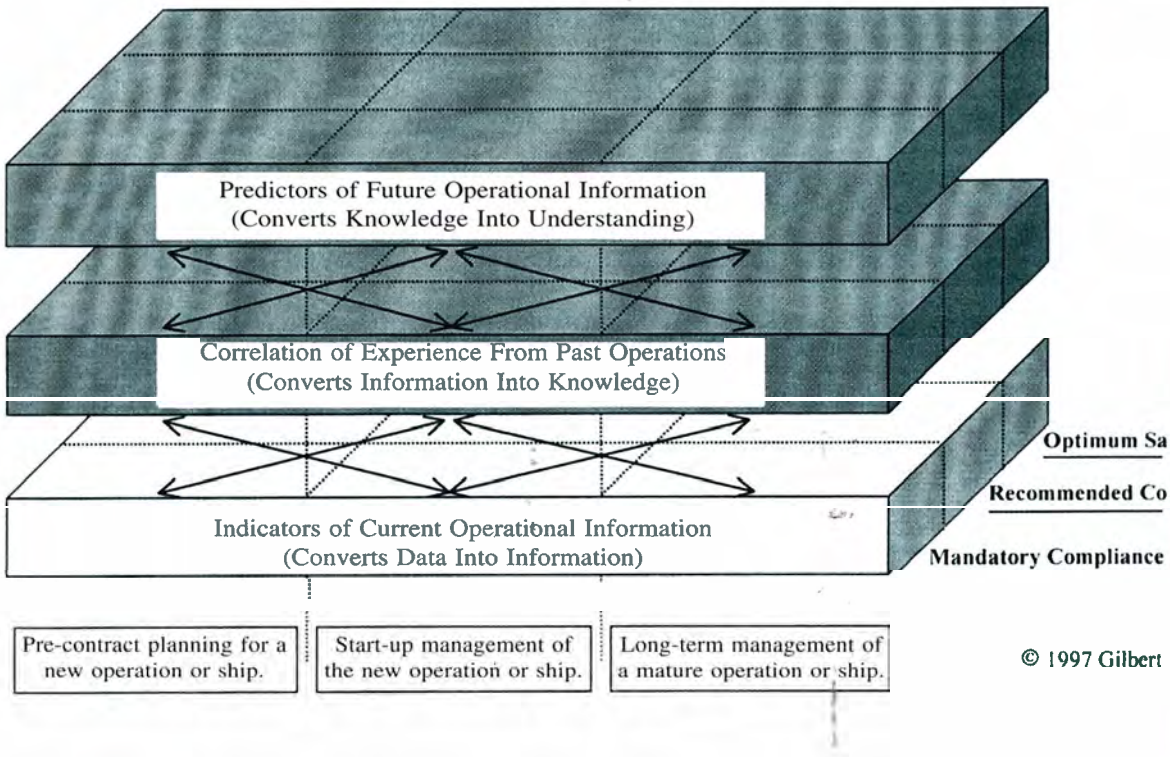
Develop a 3-D Life-Cycle Database

The company's safety information will become extremely useful when organized into a 3-dimensional (3- D) life-cycle database. The first dimension is divided up into stages of the operational "life-cycle" of a shipping company. The second dimension categorizes and sorts the safety management information into three areas: mandatory, recommended, and optimum compliance data. The third dimension splits the database into three parts relative to time: past, present, and future. The data is systematically gathered in the present and turned into indicators. The indicators are then integrated with the information of the past. The future part of the database contains predictors that can be used for evaluating future operations. By using this 3-D format, all of the safety management information can be viewed graphically. Even the user interface can be graphical and easy to use.

This approach will give company managers and shipboard officers the flexibility of looking at an overview of the entire situation or of focusing on selected views which will meet specific needs. The 3-D database will help users select the type of information that is relevant to them at that particular point in time. For example, the CEO buying a new ship will view the company's global structure and estimate future costs. The Vice President of Operations, who is setting up the new operation, will view the areas related to manning for this particular type of ship to ensure that qualified people are hired.

This Information Highway Facilitates Timely Decisions

This type of database will help leaders know where they stand and the best direction to proceed in order to reduce whatever particular risk is being considered. Special routines could be developed so that the user need only specify the type of analysis desired and the relevant information will be extracted, analyzed, and the results presented in a graphical format. Some examples are as follows. The designated person will need to have indicators of the effectiveness of the company's safety management system. He might want them separated by type of ship. The master of a ship may need to look at the current level of competency for the crew on board so he can prioritize training efforts. The viewpoint would again



be different for the company's attorney, who is looking to investigate the company's legal liabilities.

Protect Your Data From Legal Liabilities

The third challenge is becoming a large factor in what kind of data is recorded and how it is stored. If a company maintains certain data showing that the company has not been safe at some particular time, such data may later be used against them in a lawsuit. I believe that an important feature must be built into this safety management information highway. I call it a firewall against litigation. The details of how such a firewall might withstand the heat of an actual court case are being debated. However, the advantage of the proposed 3-D life-cycle database is that the raw data can be discarded rapidly once the "learning process" has taken place.

A company should have the option of digging deeper and looking at all of its own information from any point of view. Others who may want to know about the company's data should only be allowed to view indicators. For instance, Flag Administrations and Port States may want the indicators to prioritize their resources so that they can focus on less favorable companies. Displaying safety indicators may someday provide a very strong economic incentive for increasing safety, because insurance rates may be based on a per voyage risk factor.

A Highway That Has No End

The utility of this 3-D database could be extraordinary. It would support the flow of information that brings about continuous improvement. Knowledge is established, recorded, and is readily available when needed. This is a systematic approach that supports good decision making and improves the level of safety for the Company's entire fleet of ships.

Is History Prologue?

By Tom McNiff

Recently, one of the officers in the San Diego Marine Safety Office who is a military history buff shared with me a book entitled "The U.S. Coast Guard in World War II", published by the U.S. Naval Institute in 1957. It is undoubtedly the most complete documentation of the activity of the U.S. Coast Guard in World War II and also includes extensive coverage of the Coast Guard Auxiliary. I thought that our present-day Auxiliarists might enjoy reading about what our World War II compatriots accomplished for their country.

Interestingly enough, President Clinton recently announced the formation of a committee composed of General Powell, President Bush, President Carter, President Ford and other noteworthy civic leaders to encourage more volunteer involvement by our citizens. As the Coast Guard Auxiliary is one of the largest volunteer organizations in the United States, a representative should be invited from the Auxiliary to participate in the Presidential Conference. Let's take a look at this history of volunteer service on the part of the U.S. Coast Guard Auxiliary.

As we all learned in our initial "BQ" indoctrination, our organization was founded in 1939 and consisted of non-military United States citizens owning yachts. It grew rather slowly at first, but December 7, 1941 changed all that! By nightfall on that "Day of Infamy", auxiliarists in Seattle manned their vessels and activated for nighttime patrols. In the following days, they were followed by other flotillas throughout the United States, particularly on the East Coast where the German U boat commanders were having a "turkey shoot" using our coastal freighters and tankers as targets. The East Coast was presented with nightly fireworks displays of our burning and exploding merchant shipping. Even Japanese submarines were finding targets along the West Coast. By June 1942, the Auxiliary membership had grown to 11,500 members with 9,500 of the boats from 44 flotillas. Many of these vessels were sailboats which proved to be very effective in quietly stalking the German U boats that had to surface to charge their batteries at night.

It soon became apparent to Admiral Waesche USCG, who was Commandant of the Coast Guard during World War II, that the civilian status of Auxiliarists would limit their effectiveness as the war tempo increased. The Coast Guard desperately needed large numbers of patrol craft and also personnel to man port security billets. The Geneva Convention also entered into the urgent need to place the Auxiliarist in armed forces status. If any of the civilian volunteer Auxiliarists were captured, Geneva Convention Rules would permit the enemy to shoot them as spies. This may have been a moot point as the German U boat commanders were not noted for taking any prisoners from vessels they sank. In fact, they normally machine-gunned the survivors in the water.

Commandant Admiral Waesche knew his history. In a speech urging Congress to change the law and allow the Auxiliarists to become volunteer members of the Armed Services, he noted the following: In 1775, the Minute Men were civilian military volunteers, the Texas Rurales who fought the Mexicans even before war was declared, and Teddy Roosevelt's Rough Riders who stormed San Juan Hill were all civilian volunteers. As the Admiral pointed out: "Now, in the present struggle, by far the greatest which our country has been fated to endure, we hail the advent of a group of devoted citizenry yielding nothing to their predecessors in zeal and thoroughness."

As a result of U.S. Coast Guard and U.S. Navy lobbying efforts, Congress approved the formation of the Temporary Reserve which was open to all citizens from 17 to 70. In its early stages the personnel were all volunteers but were considered a part of the Armed Services. The Temporary Reserve's initial influx of personnel came from the Auxiliary, which was fortunate as the Auxiliary provided the instructors to train the Temporary Reserve personnel and provided the much-needed patrol craft. The upper draft age was set at 45, whereas, the Temporary Reserve age limit was 70, thus opening door to senior citizens.

As an interesting aside, part of the Temporary Reserve law is still in effect. It authorizes the Commandant to directly commission a civilian into the Coast Guard. During America's Cup, the Coast Guard's "downsizing" efforts made it difficult for the patrol

commander to properly staff his command. Consideration was given to having an Auxiliarist serve as a Temporary Reserve Coast Guard officer. However, investigation into the legal aspect disclosed that a person may hold only one commission in the armed service. The Auxiliarist in question was a retired naval officer receiving retired pay. The project was abandoned when the Auxiliarist was informed that a resignation of his Navy commission and loss of retired pay would be necessary to receive an unpaid commission as a Coast Guard officer.

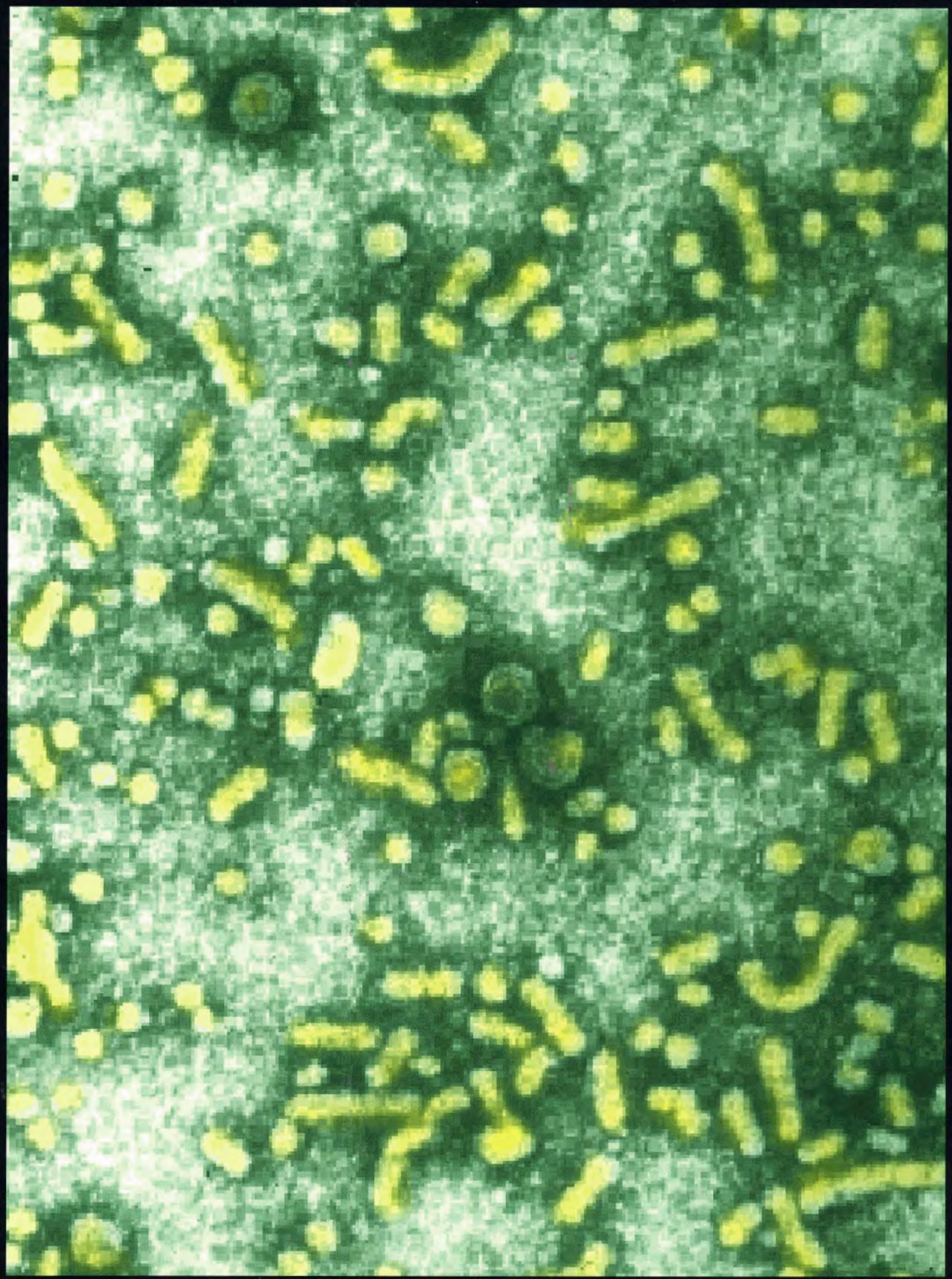
In closing, it is interesting to note how in the recent decade the Auxiliary is moving away from its post-World War II role of close alliance with the yachting community and almost a second cousin status with the regular Guard. In essence, the Auxiliary imitated the activities of the Power Squadron which is very closely aligned with the yachting society. In fact, the Auxiliary as does the Power Squadron carries the yacht club leadership titles of Rear Commodore, Vice Commodore, and Commodore.

During the past eight years, Mr. Joe Gordon, who served as National Legal Officer for the Auxiliary, has worked diligently lobbying Congress to approve legal changes which would more closely align the Auxiliary with the Coast Guard and truly make it a One Team Coast Guard. Title VIII was passed in 1996 as an amendment to the Coast Guard 1996 authorization act, thus taking a giant step toward achieving the One Team Coast Guard concept.

One can only wonder if the next step might be the transition of the Auxiliary to include service in the Armed Forces. It took World War II to authorize Auxiliarists to serve as members of the armed forces. Today no such war threat exists but there is another potent force which might well again bring the Auxiliarists into service in the military and that is the current political effort to downsize the federal agencies to achieve a more balanced budget.

The recent establishment of the Presidential Volunteer Committee, which has bipartisan support, would certainly give a clear sign that volunteerism is the course of the future. Obviously, the Coast Guard is becoming increasingly aware that well-trained volunteers are a valuable resource. We can expect to see more and more tasking placed on our organization. The past 58 years that our organization has been in existence indicate that our members will respond to the call.

Our Commandant Admiral Kramek, while recently discussing reduction in the 1996 Coast Guard budget pointed out: "We have reduced 12 percent without reducing service to the public. This has been accomplished by using the Auxiliary, and help from the Reserve." In the same article, Admiral Kramek mentioned: "I am worried about 1998, 1999, 2000, 2001, and 2002. The President and Congress said they are going to balance the budget while keeping social security and the Defense Department sound. That means all other federal agencies have to reduce their budgets by 35 percent - everybody, including the Coast Guard."



HEPATITIS

A SERIOUS HEALTH HAZARD TO SEAFARERS

By Janice L. Gray, Retired USCG

Hepatitis is a serious health hazard for people who travel to high risk areas, such as third world countries. Traditional treatment has been through immune globulin injections. Although effective immediately, globulin is only effective for 3-6 months; and, availability of globulin is decreasing. Now treatment is available in vaccination. A two shot series takes longer and is more expensive than globulin, but provides protection for 20 years or longer. Vaccination is the treatment of choice for military and travelers such as mariners, who repeatedly visit high-risk areas; it is endorsed by the US Center for Disease Control (CDC), the US Coast Guard and other military services.

WHAT IS HEPATITIS AND HOW IS IT CAUSED?

Hepatitis is an inflammation of the liver. This is detected in most people by changes in the liver enzymes in the blood. In the vast majority of causes the liver continues to function properly making the proteins, including coagulation proteins, that it normally produces. At present Hepatitis C is a cause for concern for people who received treatment with clotting factor concentrates before 1989.

The term "viral hepatitis" is commonly used for several clinically similar diseases that are quite distinct. Seafarers are particularly susceptible to two of these; hepatitis A and hepatitis B. Unfortunately, millions of US travelers are unaware that they are visiting at risk areas. Fortunately, however, there are safe and effective vaccines available to prevent these insidious diseases.

HEPATITIS A

Hepatitis A (HAV) is the predominant form of viral hepatitis in the United States, and is endemic in many developing countries. Often called "Travelers Hepatitis," Hepatitis A is primarily transferred by person-to-person contact, generally through fecal contamination and oral ingestion.

Transmission is facilitated by poor personal hygiene, poor sanitation, and intimate (intrahousehold and sexual) contact, according to the US Centers for Disease Control. It is now recognized as the most frequently occurring vaccine-preventable infection among nonimmunized travelers. The hepatitis A virus is highly contagious and extremely hardy — it remains effective at room temperature for up to 4 weeks. Currently, there is no treatment for hepatitis A, though rest and proper nutrition can relieve some symptoms.

Hepatitis A is an acute liver disease with debilitating symptoms which can last up to one year. Common symptoms include jaundice (yellowing of the skin and eyes), fever/chills, fatigue, nausea, vomiting, light-colored stool or diarrhea, pain in the liver area, dark urine, pain in the abdominal area and appetite loss. Respiratory symptoms, rash and joint pain may also develop. An estimated 100 deaths occur in the U.S. each year from hepatitis A. The incubation period for HAV is 20 to 50 days. Incubation is shorter with increasing age.

The CDC recommends pre-exposure hepatitis A vaccination of international travelers to endemic areas. Likewise, the Armed Forces Epidemiological Board, in addition to the medical branches of all of the armed services and the Center for Maritime Education, recommends vaccination of personnel deployed to endemic areas. In the United States and other developed countries, people potentially susceptible to catching hepatitis A include:

- Those who travel less developed areas of the world where hepatitis A is common. These areas include Africa, Asia (except Japan), the Mediterranean basin, Eastern Europe, the Middle East, Central and South American, Mexico and parts of the Caribbean.
- Military personnel.

The annual direct and indirect costs of treating causes and controlling outbreaks of hepatitis A in the United States are estimated to be $200 million.

Common Symptoms of Hepatitis A

- Fatigue
- Nausea
- Vomiting
- Fever/Chills
- Jaundice
- Pain in the Liver area
- Dark Urine
- Light-colored stool; diarrhea
- Abdominal pain

Symptoms to Look For:

Tiredness
Fever
Dark-colored urine
Light stool
Loss of appetite
Vomiting
Yellow skin & (jaundice)

CDC officials believe that the most effective means of achieving control of HAV infection would be to add hepatitis A vaccine as a routine vaccine to the childhood vaccination schedule, but admits that it will take time before this is actually implemented.

Hepatitis A (HAV) is a highly contagious virus that attacks the liver and accounts for as many as 65% of all viral hepatitis cases in the U.S. each year. However, the Federal Centers for Disease Control and Prevention (CDC) estimates that there are approximately 143,000 HAV infections in the United States each year.

The primary vaccine injection protects adults against hepatitis A for up to one year. A booster dose should be administered 6 to 12 months after the initial dose to prolong protection. Hepatitis A vaccine should protect virtually 100% of those vaccinated, according to the CDC who state that protective levels of anti-HAV could persist for at least 20 years. For more information about Hepatitis A, call the information line at (800) HepA-Vax.

Hepatitis B

World wide, Hepatitis B is a major cause of acute and chronic hepatitis, cirrhosis, and primary hepatocellular carcinoma. In the US each year, an estimated 200,000 to 300,000 are infected with hepatitis B. One-quarter become ill with jaundice, more than 10,000 require hospitalization, and an average of 250 die. The US currently has an estimated 750,000 to 1,000,000 infectious carriers. Approximately 25% develop chronic active cirrhosis, Hepatitis B carriers also have a risk of contracting primary liver cancer that is 12 to 300 times higher than that of other persons. An estimated 4,000 people die each year of hepatitis B-related cirrhosis, and more than 800 die from hepatitis B-related liver cancer. The estimated annual cost of hepatitis B infection in the US is over $700 million.

Hepatitis B is extremely contagious - 100 times easier to catch than HIV, the virus that causes AIDS. The virus is prevalent in blood and other body fluids and can live for days outside of the human body. Hepatitis B is an inflammation of the liver which can be asymptomatic, flu-like, or more severe in nature requiring hospitalization. The signs and symptoms of hepatitis B include anorexia (diminished appetite), fatigue, abdominal discomfort, an enlarged liver, and jaundice. It may take anywhere from 28 to 160 days after exposure for symptoms to appear. Hepatitis B is often unknowingly spread from person to person. As with hepatitis A, there is no cure for hepatitis B.

People who are sick with hepatitis B need rest, fluids, and the right diet. This means avoiding alcohol and some medicines. Ask your doctor for further information.

Immunization with hepatitis B vaccine is the most effective means of preventing HBV infection and its consequences. The CDC recommends hepatitis B vaccination for international travelers who plan to reside in endemic areas for more than 6 months and who will have close contract with the local population. Vaccination usually consists of a three dose series which provides long-term protection. For more information about Hepatitis B, call the information line at (800) HEPB-873.

With regard to immunizations and prophylaxis against hepatitis A, the Coast Guard established policy for personnel with potential for exposure in February of 1996; after basic sanitation and safe food handling practices, long-term prevention is with the two dose series of hepatitis A vaccine, short-term prevention is through immune globulin. The Coast Guard recommends similar consideration be given to other potentially exposed mariners.

Hepatitis A and B vaccines are available in the US. For free information, call (800) 826-8898 (Smith-Kline Beecham Pharmaceuticals Customer Account Vaccine Information Line).

Looking to the Future

According to the American Liver Foundation, learning more about the viruses responsible for chronic hepatitis and how to control them will occur in the next decade. Similarly, learning about the body's immune system and how to control it has already begun. Preventive efforts will be enhanced so that fewer cases of chronic hepatitis will develop. The goal of eliminating this group of diseases seems to be just over the horizon, and while our skills at transplantation are rapidly increasing, the form of therapy for chronic hepatitis, like the disease itself, will disappear according to the American Liver Foundation. For more information write or call:

American Liver Foundation
1425 Pompton Avenue
Cedar Grove, NJ 07009
1-800-223-0179

How Can Hepatitis A Be Prevented?

Historically, the most common preventative has been immune globulin administration, which is effective for about three to six months. Now, however, there are two vaccines that provide longer-term protection and eliminate the need for repeated shots. These vaccines typically are administered as one initial shot followed by a booster shot in about six to eighteen months.

Prior infection with hepatitis A confers lifetime protection against a second attack. If in doubt, a blood test can determine if an individual has had hepatitis A in the past or needs protection.

Ethics & RESPONSIBILITY

By Virginia Harper-Phaneuf, M.A.

Marine Surveyors have one of the most responsibility laden jobs in the boating industry. While most are independent contractors working for themselves either as "dba's", partnerships, or firms, all share a common responsibility: determining the "seaworthiness" of a vessel for banks, insurance companies, boatyards, boatbuilders, yacht brokerages and that most demanding customer of all — the private recreational boater who often blindly and trustingly relies on the marine surveyor's opinion about his vessel. In addition, once the survey is completed it is the final say on whether banks or insurers will finance or underwrite a boat. Boatyards, boatbuilders, accident investigators, and salvers usually demand that adjusters surveyors tell them if a vessel is worth saving and how much it's going to cost.

Yacht brokerages want the simplest and quickest way to close a sale. These business people, while not always understanding a marine surveyor's profession, usually know the need and role of the surveyor to do business. The private recreational boater (RB), however, is the most demanding of all customers for all of us in the boating business and particularly so for the surveyor. The RB wants to know in the purist of all fashions — Will it float and am I paying the right price? What a professional burden to place on a boating business professional! Think about it. The marine surveyor has, as a popular pop rock song says, "got the power...".

Navtech Marine Education and US Surveyors Association, a private school and trade association, trains over 500 business professionals a year, teaching them, enlightening them, and informing and aiding them about the surveying business and its proper procedures and techniques through our immensely successful correspondence course "The Navtech Marine Surveyors Guide: Recreational and Small Commercial." For the past ten years, we have collected USCG information, Navigation and Inspection Circulars (NVICS), inspection guides, organization standards and refined and developed an overview training guide which started out as 200 pages in 1987 and now numbers over 700 pages, includes a video and option disc for preformatted forms. We have added a specialized commercial inspection course and through US Surveyors Association have added a fishing vessel certification. Our program is a step by step process based on USCG compliance both required and suggested regulations for all vessels.

We do not claim to be the foremost authority on how to survey vessels, nor do we claim that our students, the majority of whom are knowledgeable boating professionals in their own right and already in the boating business in some form or fashion, can only participate in our program to get the training and certification they need. But we do claim that our students and members will know the best of what a surveyor should know to operate a professional business, ethically, responsibly, and adhering to the highest and most thorough safety standards for the recreational boater. One of the most nebulous areas in the surveying business is "certification."

There is no one federal license nor do we necessarily advocate there be one. Certification

comes in many guises and with many names. Our designation for our members is Master Marine Surveyor (MMS). SAMS uses Accredited Marine Surveyor (AMS) and NAMS uses Certified Marine Surveyor (CMS). Each organization marches to the beat of their own drums which, while encouraging competition and credibility, may or may not be a good thing for public education and those who are survey shopping. That remains to be seen as the surveyor's and adjuster's role becomes ever more important with each passing hurricane, storm, flood or natural disaster.

It is true we have faced criticism for the "correspondence" nature of our training. But I believe our qualification process is lengthy enough and difficult enough to weed out those boaters who are not already marine professionals or who are looking for a new life and think our program is a quick fix. Of the 20 to 25 inquiries I answer a day about our program, perhaps only one has the qualifications, stamina, and business acumen first to actually have an understanding of the nature of the boating business and then to follow through with the steps in proper training.

Indeed, I know our program does contain the proper training, and if we don't have the answer, or don't know the answer, we know where to get it and so will our students. No one channel marker identifies a professional and ethical surveyor more than the Condition and Valuation form he or she uses. Fifty years ago and perhaps as late as 10 years ago, the narrative form was the survey assessment instrument of choice for most surveyors. That narrative style is no longer enough nor does it ever objectively address the vessel for our litigation happy world. Always we have advocated a thorough checklist combined with space for narration for iniquities of each vessel. While this demands closer scrutiny on the part of the surveyor a lengthier checklist combined with individual notations is a must. Boating safety is the primary goal of our surveyors for their customers. If the boat isn't safe afloat it shouldn't be operated, shouldn't be financed and shouldn't be insured. There are no shortcuts.

Indeed, over the years we have honed and refined our surveyor forms, so that safety comes first. I do not like the term "seaworthy" when used in conjunction with a marine survey. It is, at best, a user friendly term which may make the owner or master feel secure, falsely or not, and

at worst, a nebulous feel good shortcut for a surveyor who may be unable to efficiently identify hidden particular problems which not obvious will sink a boat without proper attention. The boat may look great, be maintained properly and even be brand new. But if the surveyor has not addressed items such as submerged thru-hull fittings, the correct type of PFDs, the placement of fire extinguishers and even boating accident information aboard, the vessel can sink in the wink of a seagull's eye.

I strongly believe that using the word seaworthy on a vessel inspection report is irresponsible and unethical for a surveyor. Furthermore, for liability purposes it can mark a dangerous course for a surveyor concerning his or her own liability. I am sure you have all heard horror stories in some way about vessels sinking shortly after leaving the dock after having been declared by a marine surveyor as "seaworthy." How does a surveyor then protect himself/herself, the profession, liability, credibility and display ethics, responsibility, and professionalism all at the same time and without providing job security for the lawyers?

At Navtech we suggest to our students that they use specific checklists with particular and specific safety considerations to give the customer a better idea of the vessel's use and condition. For safety aboard, we require students to compose a form using basic boilerplates to expand upon, which addresses USCG requirements and recommendations. We also strongly recommend using ABYC and NFPA and UL recommendations and ratings. We suggest having an attorney review or compose warranties and disclaimers, having customers present to initial disclaimers and searching out O & E insurance, if possible. A very difficult insurance to find, but not impossible.

Surveyors are respected and often held in awe by their peers. They command a very important role. They can also lose this respect in an instant. Professionalism and ethics are demanded whether the surveyor is an adjuster, investigative inspector, loss evaluator or an expert witness. The surveyor can only accomplish his professional stature through education, and education is never complete. Regulations change, equipment becomes

obsolete, and safety is never out of style. No surveyor can possibly instantly know every requirement. But the good surveyor knows where to get the information.

I suggest that a good surveyor knows what a USCG NVIC is, knows what ABYC is and where it is, knows how to obtain CFR's, knows where the Government Printing Office is, and knows how to stay in touch with peers. The ethical surveyor is aware, practices continuing education, bases inspections first and foremost on USCG safety requirements, and recommends voluntary compliance with suggested rules. For a surveyor to be ethical and responsible, nothing less is acceptable nor should be acceptable in our industry. I have composed the following list of what we consider to be the minimum safety concerns while a surveyor is inspecting a recreational boat.

We always add "and anything or any appurtenance aboard or not aboard that contributes to the vessel's safety and use." These concerns should be addressed in light of both federal and any state requirements that apply on every surveyor's form.

The list to the right addresses the vessel. But what about the surveyor personally? How should surveyors conduct themselves within the business? What are the basic ethics since we have no national licensing of surveyors nor do we have a way to nationally test surveyors on USCG basic safety compliance. The federal government may never take the task of "licensing" surveyors upon itself. I do, however, believe that private organizations and qualified organizations will continue to work with the U.S. Coast Guard to similarly qualify civilian surveyors and inspectors on certain vessels much like what happened with the fishing vessel safety certification process.

In closing, I call for all vessel inspectors, surveyors, appraisers, adjusters and accident investigators to make USCG safety compliance the first and foremost inspection target. This is where a surveyor's credibility begins and ends.

Minimum Safety Concerns

Vessel's USE and RANGE NUMBERING, DOCUMENTATION, DISPLAY OF NUMBERS,

SOUND EMISSION DEVICES

POLLUTION PLACARDS

NAVIGATION RULES

FCC MARINE RADIO LICENSE

SPECIAL DECALS REQUIRED

VISUAL DISTRESS SIGNALS

NAVIGATION LIGHTS AND SHAPES PLACARD

FLOAT PLANS, CHARTS ABOARD

VESSEL'S CARRYING CAPACITY

PFDS (Number and type)

FIRE EXTINGUISHERS (Suitability, approval, inspections current, accessibility)

GUEST, CREW, SAFETY INSTRUCTION

HULL CONSTRUCTION MATERIAL FOR INTENDED USE THROUGH HULL (hose clamps, seacock type, double hose clamps below water line, material construction)

ELECTROLYSIS PROTECTION

WIRING INSTALLATION (APPROVED FOR MARINE USE, SECURED, TYPE, HEAT SOURCES, ADEQUATE)

BILGE PUMPS, SIZE TYPE, CLEAN,

BATTERIES, SIZE TYPE, SECURED, VENTILATED

FUEL SYSTEM: GROUNDED, TANK CONDITION, ENGINE COMPARTMENT CONDITION, BLOWER, FUEL LINES USCG APPROVED

RIGGING, SIZE TYPE, SECURED

GROUND TACKLE, SIZE TYPE, SECURE

STOVES: MARINE USE, LPG, CNG STORAGE, INSTRUCTIONS, WARNINGS, ACCESSIBLE FOR INSPECTIONS,

MSD, SIZE, TYPE, SUITABILITY, ENVIRONMENTAL COMPLIANCE

RADIOS, EPIRBS, SATNAVS

LIGHTNING PROTECTION

SURVIVAL EQUIPMENT LOCATION AND INSTRUCTIONS

****and any other appurtenance or piece of equipment that makes the vessel in compliance with safety practices. Every vessel will have its own unique features, its own hull design, its own posture in the water.*

HAZMAT

LT Wayne F. MacKenzie,
CIH, First Coast Guard District
Safety and Environmental Health Officer
DC1 Dan Reynolds, Port Operations Dept.,
Marine Safety Office Boston, MA

Aluminum phosphide fumigants are widely used by the marine industry to eliminate insect and rodent pests that can infest perishable cargoes. Although they are extremely effective agents, these chemicals can also present a serious health threat to marine workers when used improperly. Aluminum phosphide fumigants have been responsible for previous illnesses and at least one documented fatality aboard a cargo vessel in the United States. This article summarizes a recent incident involving an aluminum phosphide fumigant, and discusses the unique hazards of this chemical and presents recommended safe work practices for marine safety personnel.

Summary of Incident

On 16 January 1997, Marine Safety Office Boston personnel and the First District safety and health officer responded to a hazardous material incident at a local container pier involving an unknown chemical. Two days earlier, an intermodal shipping container of wicker furniture from Hong Kong was offloaded to a truck and transported to a U.S. Customs bonded warehouse for inspection. The furniture was manually removed and later repacked into the shipping container. While unpacking the container, a warehouse worker noticed what looked to be a crushed yogurt cup containing white powder and some spilled white powder on the deck of the container. Thinking this was trash, he kicked the cup off the loading dock to the ground. After two days at the Customs warehouse, the container was then driven back to the Port Authority container pier. At a check station, the truck driver and Port Authority clerk noticed a small deposit of a white powder along the rear trailer chassis at the base of the container. As the driver attempted to unfasten a pin connecting the container to the chassis, a flash occurred in the vicinity of the white powder. According to the clerk, the material burned for 2-3 minutes, releasing 1 inch flames prior to burning itself out. He reported this incident to his supervisor, who subsequently notified the Coast Guard Marine Safety Office. The container was taken to an isolated area of the pier while emergency responders developed an action plan.

The MSO called the Customs warehouse to determine if they had noticed any white powder while stripping the container. The warehouse worker retrieved the yogurt cup from outside and brought it his supervisors office. The worker then claimed to have been overcome by "fumes" emitted from the cup. He experienced dizziness, chest tightness, and nausea. He threw the yogurt cup into a plastic bag which he then loosely closed. The worker got some fresh air, washed up and soon felt better. When he returned downstairs he heard an explosion in the warehouse. He saw a 4' high flame in the vicinity of the plastic bag which was followed by a big puff of smoke. He ran upstairs to notify others in the building, vented the area by opening doors and windows, and then notified the local fire department. The warehouse worker was treated and released at a local hospital. He continued to feel sick and was unable to work for five days following the exposure.

At the container pier, hazardous materials teams were assembled from the fire department, the state police and the Coast Guard. The shipping agent informed emergency responders that the cargo had been treated with aluminum phosphide, a fumigant chemical. A Material Safety Data Sheet for the product revealed that the substance reacts with moisture in the air to produce toxic phosphine gas. Although aluminum phosphide is not flammable, the phosphine gas can ignite spontaneously in air concentrations above its lower explosive limit. The Port Authority hired a hazardous materials contractor to assist with the response. The state police attempted to open the door of the container with their remote-controlled robot, however it was not able to

per 1000 cubic feet of space. The recommended dosage for a typical 40' container would be 720-0.6 gram pellets, or 432 grams. If applied correctly, all of the AlP reacts with atmospheric moisture after 3-8 days after application, leaving behind a relatively harmless residue of aluminum hydroxide and other inert ingredients. If too much AlP is used to fumigate a space or atmospheric conditions are unusually cool and dry, it is possible to have chemically active AlP remaining at the end of the voyage.

According to the applicator's manual, proper handling of treated shipping containers at their destination is the responsibility of the consignee (or receiver). The consignee should be familiar with the properties of phosphine fumigants, worker exposure limits, as well as symptoms and first aid treatment for phosphine poisoning. The consignee should also be able to make gas concentration measurements.

AlP pesticides are also listed in the 49 CFR 172.101, Hazardous Materials Table and are given a hazard class of 6.1 - Poison. These regulations do not apply to fumigated containers, since the quantity of AlP is incidental to the cargo being treated. Requirements for containers fumigated with Class 6.1 materials are provided in 49 CFR 173.9. First, the container may not be delivered until 48 hours have elapsed since application of the fumigant, or the container has been sufficiently ventilated to remove any toxic or flammable hazards. Second, the container must be placarded on each door with an EPA "FUMIGANT" placard consisting of red letters on a white background. The placard must contain the name of the fumigant. It must also alert personnel to ventilate the container prior to unloading and to remove all poisonous material before releasing the empty container.

Lessons Learned

The greatest factor contributing to the container incident was the failure to properly placard the container. This constituted a violation of DOT

Regulations

Fumigated transport units (containers) on ships are governed by DOT regulation 49 CFR 176.76 (h):

1. The fumigated transport unit may be placed on board a vessel only if at least 24 hours have elapsed since the unit was last fumigated;
2. The fumigated transport unit is accompanied by a document showing the date of fumigation and the type and amount of fumigant used;
3. Prior to loading, the master is informed of the intended placement of the fumigated transport unit on board the vessel and the information provided on the accompanying document;
4. Equipment that is capable of detecting the fumigant and instructions for the equipment's use is provided on the vessel;
5. The fumigated transport unit must be stowed at least five meters from any opening to accommodation spaces;
6. Fumigated transport units may only be transported on deck on vessels carrying more than 25 passengers; and
7. Fumigants may not be added to transport units while on board a vessel.

regulations. Nobody at either the Port Authority pier or the Customs warehouse was aware that this container had been fumigated. The warehouse worker who was sent to the hospital stated afterwards that he would have handled the container differently had he known it was fumigated. He definitely would have ventilated the container by opening the doors for several hours prior to unloading. He would have suspected that the cup containing white powder was associated with the fumigant and would have been much more careful in handling it.

These actions would most likely have prevented his overexposure to phosphine gas and the explosion in the Customs warehouse.

After discussing the incident with the manufacturer of the chemical and reviewing their applicator's manual, it appears that the pesticide may not have been applied properly.

Because the product was placed in a cup, only the top surface may have reacted with atmospheric moisture. This can result in decreased efficacy due to poor gas release and may leave an active residual which contains considerable amounts of unreacted A1P.

Also, the shipper may have applied too much A1P for this size container. Either of these errors may be responsible for the overexposure and explosion at the warehouse. The use of special packaging consisting of A1P powder in Tyvek bags greatly reduces worker exposures associated with the product. The bag prevents ruptures and leakage, which eliminates direct contact with the product. The bags are penetrable to water vapor, but are impenetrable to liquid water which significantly reduces the fire and explosion hazard. Although not required by regulation, this form of packaging is highly desirable for fumigation of shipping containers.

We should mention that there are no requirements for labeling a container fumigated with A1P pesticide as "water reactive." Both the explosion in the warehouse and the "flash" at the Port Authority check station were probably caused by rain water contacting the unreacted A1P powder. These incidents clearly demonstrate the hazardous nature of the chemical. Reaction with water causes


Phostoxin Pellets

large amounts of phosphine gas to be generated which is both highly toxic and spontaneously flammable. When transported as a cargo, aluminum phosphide belongs to Hazard Class 4.3, and must be labeled as "dangerous when wet, poison" cargo per 49 CFR 172.101. However, aluminum phosphide pesticides are Hazard Class 6.1, and must be labeled as a "poison" only. Since most pesticide formulations contain at least 50% A1P, we feel that these should also be labeled as water reactive cargoes. When A1P fumigants are used in a container, we think it would be prudent to also list this warning on the fumigant placard that is currently required by regulation.

The entire marine community should be educated regarding the hazards of A1P fumigants. When used properly, these chemicals are effective against a wide variety of insect and rodent pests. If these chemicals are applied or shipped improperly, they can pose a serious threat to human health.

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The Container Inspection Program

A Local Perspective

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Marine Safety Office Boston

Three years ago, the Coast Guard launched the Container Inspection Program (CIP). At MSO Boston, our experience and analysis reveals that relatively minor operational changes that can have a significant, positive impact on the effectiveness of the CIP.

According to Journal of Commerce statistics for 1994, Boston ranks 23rd in container volume in the United States. The two principal terminals handle 7% of the 403,229 TEUs (Twenty-foot Equivalent Units) of the nearest port, New York. The size of the port allows us to focus on several areas of container operations to a degree not possible in larger ports. In implementing the Container Inspection Program, MSO Boston adopted the strategies outlined below which have increased the effectiveness of Coast Guard enforcement activities without a major impact on commerce. The adoption of voluntary safety rules by Boston container terminals has yielded benefits of improved coordination during two minor HazMat incidents over the past year. By making Shipping Papers a focal point, we have expanded both the scope and the efficiency of each visit.

Implementation of Safety Rules

Internal inspection of placarded containers only addresses part of the problem of Hazardous Material cargo. Even when Hazardous Material is correctly stowed, placarded, and manifested within a container, that container still poses a threat to the container terminal. Hazardous Materials can be released due to external events such as storms, vehicle accidents and fires. Coast Guard waterfront facility regulations which apply to container terminals (33 CFR 126) were written in the 1950s before the advent of containerization. The authors did not envision today's modern terminal with containers stacked up to five levels high and truck and cranes wheeling about, and as a result, the regulations may not fully address many safety issues.

Prior to initiating container inspection, MSO Boston, like other MSOs nationwide, worked with the local Fire Department to develop safety practices. In Boston, local container terminal operators adopted these Voluntary Safety Guidelines:

1. Tracking Hazardous Materials: A listing of placarded containers, showing location and hazard class, shall be immediately available to emergency response personnel at the front gate.

2. Segregation and Stowage: As far as practicable, stowage of Hazardous Materials on the facility shall follow the principles in Title 49, Code of Federal Regulations part 176 subpart D regarding segregation and stowage.

3. Fire Plan: A detailed fire plan, showing the

layout of the facility, fire protection equipment, emergency staging areas, and isolation areas for Hazardous Materials shall be immediately available to emergency response personnel at the front gate.

4. Staging Area for Emergency Responders: Each facility shall designate a staging area within the facility for response personnel and equipment.

These rules require no additional Coast Guard resources, and have been fully embraced by local container terminals. The concepts were based upon existing requirements for vessels. The fire plan at the front gate is similar to the SOLAS plan required at the gangway on ships, and the list of Hazardous Materials is a Dangerous Cargo Manifest for the facility. Implementation can be completed quickly at little or no cost to the operators. These rules greatly enhance the ability of emergency agencies to evaluate and properly respond to a HazMat incident at a terminal.

Centering Inspection Process Around Shipping Papers

A vast majority of violations found in Hazardous Material shipments are often due to improper documentation—missing or improper Shipping Papers. This was demonstrated during the pilot program in the 1980s and has been reiterated in every study and report on the program. In the Port of Boston, over 75% of discrepancies involve Shipping Papers. Moreover, many other discrepancies, such as incorrect or missing placards, cannot be identified without reference to Shipping Papers.

While proper blocking and bracing of Hazardous Materials within a container is very important, it will not prevent discharge if the container is involved in an accident. In that instance, the critical issue is for emergency responders to know what they are dealing with. Proper placarding and shipping papers should be an equally important part of Coast Guard enforcement efforts. However, under current policy guidelines, Shipping Papers are checked only for those containers that are opened. Moreover, containers missing placards are less likely to be inspected.

The current inspection procedure described in Chapter 9 of the Marine Safety Manual is inefficient. It calls for inspectors to tour a container yard, pick candidates for inspection, and "After selecting the containers to be inspected," to obtain the Shipping Papers for those containers. Thus, only a small sampling of Shipping Papers are examined and many discrepancies may not be detected. If a container is not placarded, or missing a placard on the side visible to the inspector, that container will escape scrutiny. Also, containers may depart the terminal with missing or improper Shipping Papers.

A slight change in procedure can dramatically improve effectiveness. During visits to the container terminals, MSO Boston personnel examine all Shipping Papers prior to touring the yard. They use the Shipping Papers to select candidates for internal examination, and to ensure that all HazMat containers on the yard are properly placarded. This methodology produces a significant increase in "paperwork" inspections. Multiple shipping papers can be reviewed in the time it takes to perform a single container inspection. In addition to finding and correcting numerous Shipping Paper discrepancies, MSO Boston inspectors have discovered many instances of unplacarded containers and improper placards using this method. Almost all of these problems would have gone unnoticed without an initial review of Shipping Papers.

The order of the inspection process should be reversed. Upon arrival at a container facility, Shipping Papers for all containers carrying hazardous materials should be reviewed. Candidates for internal inspection could be chosen based upon the information in the Shipping Papers. Containers with improper Shipping Papers should be prime candidates for internal exam, but containers could also be opened if discrepancies are noted during the tour of the yard. After this review, inspectors would tour the yard to identify damaged or improperly placarded containers. During the tour, they also should spot-check HazMat containers to ensure that they are placarded and that the placards match the Shipping Papers. This simple change in procedures will allow inspectors to conduct a more thorough inspection and increases the likelihood of discovering and correcting problems.

In the first week that CIP enforcement efforts were initiated in Boston, less than 10% of the trucks departing Container Terminals with Hazardous Materials had Shipping Papers. While that problem has been rectified, it is hard to believe that a practice so common here was unique to Boston. Current practices do not require the Coast Guard to check for Shipping Papers on containers going on the road. However, if the purpose of the CIP is to prevent incidents within the "national surface transportation systems," maybe we should reconsider.

MSO Boston practice is that no container may depart the container terminal until the truck driver has proper Shipping Papers (export containers are covered by the vessel's Dangerous Cargo Manifest). This appears to follow the intent of promoting safety throughout the entire transportation network, not simply for waterborne shipments. We have coordinated our enforcement policy with both state police and local fire departments.

COMPLACENCY ON THE HIGH SEAS

By LT Joseph E. McKechnie
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Marine Safety Office Boston continues to develop and fine tune the process for performing Control Verification Examinations on Foreign Passenger Vessels. The process has evolved into what we now call the "TEAM APPROACH". The team approach incorporates a multi-faceted team of marine inspectors and boarding officers to ensure the examination is thorough, effective, and completed without vessel delay. We have come to the realization that to ensure a large foreign passenger vessel is in substantial compliance with all applicable U.S. and International Regulations, far more than a one or two person inspection party is required.

The following is a re-creation of the planning performed and the actual events encountered during a recent United States Coast Guard Control Verification Examination of a large foreign passenger vessel in the Port of Boston, Massachusetts. As you read on, try to imagine yourself as the team leader. The process begins when an application for inspection is received from a world-renowned operator of a five star foreign cruise liner. The pre-inspection package obtained from the Coast Guard's automated Marine Safety Information System and a review of the vessel's history reveal a ship that has performed admirably with little or no problems, and has achieved a remarkable safety record. The vessel owner and operator have recently received International Safety Management (ISM) Code certification from a recognized Classification Society. You are feeling very comfortable about the outcome of the upcoming inspection as you complete the planning process. You're looking forward to spending the day examining a first rate operation.

COMPLACENCY

The quality or state of being satisfied: a calm sense of well-being and security; satisfaction or self-satisfaction accompanied by unawareness of actual dangers or deficiencies.

Do you prepare for a full fledged assault on this vessel, or do you rely on the information you have gathered so far and assume all will go smoothly? You have every reason to believe it will be a "piece of cake". The vessel history and pre-inspection research has revealed nothing to make you think otherwise. BUT, what about those passengers? Your mind reverts to recent casualties, and you remind yourself that the passengers on board are relying on the United States Coast Guard's long history as the premier lifesaving organization in the world to ensure their safety. You have an obligation to the passenger, yourself, your unit, and the USCG, to not assume anything.

The team is assembled, goals are reviewed, and priorities for the exam are set. You've decided to take nothing for granted and proceed with vigor. In the back of your head you store the vessel data. Should the vessel and crew be ready for the inspection, all the better. If not, you'll be "Semper Paratus".

The vessel arrives on schedule and moors port side to as requested. This will facilitate the lowering and testing of the starboard lifeboats. Things are looking good. The ship appears to be well maintained and clean. You're met at the brow by an enthusiastic owner's representative who escorts you aboard. The onboard brief proves positive, as all ship's officers introduce themselves. Language is not a problem, and they have served onboard this vessel for many years.

A review of the vessel's paper work indicates that all is in order and the recently issued Document of Compliance to the ISM Code is proudly displayed. The vessel's Master confidently requests to perform all required drills at the beginning of the exam, because the 500+ passengers are presently ashore. It is agreed, and the scenario is set. The vessel owner's representative suggests a dual fire scenario in order to exercise more than one fire party. You dispatch your people to the drill scene, the bridge and fire gear lockers. Your expectations are high. Everything points to a positive outcome.

The smoke alarm in the theater is activated, followed closely by a heat detector in the main galley. Master and crew learn for the first time where the "fires" are located.

From the outset of the drill, you note a lack of enthusiasm. The fire parties arrive on scene partially outfitted. Communication from the bridge is weak and lacking direction. A punch list ensuring a smooth sequence of events is not utilized. Other more serious problems begin to arise. Problems with the closure of fire screen doors; some fire fighting gear is in a state of disrepair; you witness a member of the fire party actually smoking a cigarette!

What's going wrong? This is nothing like what you had expected. A critique is held following the drill. Input from all sides is taken and absorbed. Your dissatisfaction with this turn of events is openly communicated. It's agreed to try again later in the day.

You move on to the abandon ship drill. The alarm is sounded and the word is passed. Again you witness confusion, unfamiliarity with equipment, and some alarming questions go unanswered. A boat captain is asked how many passengers are expected in his boat. He does not know, and can only answer with the total capacity of his boat! What if only 100 people show up, is that OK or not? He can't answer because no one has ever asked that question before. The same response comes from virtually all of the boat captains. The ship's procedures don't cover the possibility of sailing with anything but a full boat! On this particular cruise, the vessel is not full to capacity.

The drill progresses with all starboard boats lowered to the water, released, and gotten underway. This is accomplished, thankfully, with no injuries and only one equipment failure. Not bad considering the potential consequences. Once again a critique is held and it is agreed to give it another try. Your mind is telling you it is not supposed to be unfolding this way, something is wrong, but you can't put your finger on it.

The material inspection of the ship is now at hand, and the ship's officers are teamed with members of your inspection party. One team is assigned to the engineering spaces, one to the lifesaving equipment, and one to the fire fighting/ structural fire protection.

Word back from the engine room is positive. The ship is not new, but not an old steamer either. No deficiencies are noted. The chief engineer has a system of checks and balances in place. Finally a little good news!

The lifesaving equipment inspection party reports finding numerous "little items". Attention to detail on the part of the crew is lacking. Navigation lights don't work on the lifeboats, ring buoys require replacement, and a boat's capacity is improperly labeled, only allowing 70 versus the 90 authorized.

Where do those twenty people report to?

The manual release inflatable life rafts are stowed 21 meters above the waterline. A stencil on the cover of the raft in three languages tells you not to store them more than 18 meters above the water. "I never noticed. That is where they've been stored for fifteen years", is the response when you inquire. There it is again, the inattention to detail. The responsibility to ensure it's right is lacking and the ship is suffering because of it.

The team leader for the fire fighting/structural fire protection party arrives with a worried look on his face. "We've got some problems that require immediate attention" is his first report. You're briefed on an inoperable C02 system for the paint locker. It seems that the ship's force has purposely disabled the C02 bottle by opening a locked cabinet, breaking a lead seal, and closing off the ball valve at the top of the bottle. Additionally, the ventilation duct running through the paint locker has been modified allowing exhaust air from the main dining room scullery located on the opposite side of the bulkhead to supply air into the paint locker, effectively opening the paint locker into the scullery space.

Picture it; a fire in the paint locker; not that hard to imagine, since that's the reason for the fixed system in the first place. The Boatswain follows the posted directions, secures the ventilation in the area, and pulls the remote handle to release the C02 with the thought of extinguishing the fire. Not this time. No C02. The fire continues, the alarm is sounded, but before you know it, the scullery is full of smoke and flames with the main dining room filling with smoke. Or consider the other possibility with an operational C02 system and the modified ventilation ducting. A fire breaks out, the C02 is activated and is forced into the scullery—killing the unsuspecting dishwasher before he knows what hit him. The fire continues in the paint locker because the C02 is ineffective, having passed into the scullery. How and why did this go undetected by the ship's officers?

The second fire protection issue, and most alarming problem of all, is that 38 fire screen doors are not working properly. This totals over 25 percent of all the fire screen doors onboard. Making matters worse is the fact that they are primarily located in way of the after stairtower, off the MAIN DINING ROOM!

An alarm goes off in your head. Fire in the paint locker, no CO2 system, open ventilation ducting, a path for the fire, a lack luster performance by the fire party, smoke and flames in the main dining room, and now the fire screen doors won't work in the stairtower off the main dining room. Is the ships force blind to this? When did they last test the fire door releases?

You pull the Master and owner's representative off to the side and politely inform them you've seen enough and the ship will not be sailing without some

significant and immediate remedies to the problems at hand. They offer no argument whatsoever. They realize something is very wrong! Work commences in earnest and many items are corrected quickly and simply, the way they should have been long before your inspection team arrived. The Chief Engineer seems to take the lead. He's a relatively new Chief onboard, and recognizes the problem, but actually tries to explain it away.

Work continues into the evening hours with most items being corrected, except the fire screen doors. Each and every inoperative door is tested locally, minor adjustments are made and the number of "defective" doors is now down to 33. Still far from satisfactory. A third test of all doors is performed from the bridge control station. Still 33 doors won't close. What is the commonality with these 33 doors?

Over the two-way radio from deep down in the ship comes a voice from the ship's Electrician inquiring as to whether a particular switch had been activated. A heated discussion ensues between the Electrician and the operator of the control station, the ship's Safety Officer, in a language other than English. Another test is initiated with the Electrician calling the shots over the radio. All the fire screen doors CLOSE! The ship's Safety Officer did not fully understand the operation of the fire screen door control panel, and had one ON/OFF switch in the wrong position!!!

You are astonished, the master is red-faced, and the owner's representative is mortified. But you've finally got it; you understand what has been eating at you all day. The majority of the ships officers have been onboard too long, they have become blind, COMPLACENT!

COMPLACENCY: the quality or state of being satisfied: a calm sense of well-being and security; satisfaction or self-satisfaction accompanied by unawareness of actual dangers or deficiencies.

The inherent safety features built into the ship and the checks and cross checks performed by the owner and classification society audits were all undermined by the overwhelming "human factor". The long-standing and respected policy of staffing a vessel with highly qualified personnel, keeping them aboard, and fostering pride in their ship, receives a fatal blow. Lives had been placed at risk due to complacency!

All in all, over twenty five deficiencies were noted and corrected during the above-mentioned examination. Another nine requirements were issued to the ship upon its departure from the Port of Boston. Yes, the drills were run again, and sufficient improvement was noted, allowing the vessel to sail; however additional drills were required at the next U.S. port.

The team approach worked! The necessity of a Marine Safety Office's Inspection Department to effectively manage its resources to accommodate this type of inspection was proven! Had you taken the initial audit at face value and assigned one or two inspectors to the mountainous task of performing the annual CVE on this vessel in the allotted time, it more than likely would have sailed with the majority of the deficiencies still present. In assessing the risk associated with this type of vessel and the potential loss of life, the decision to dedicate significant resources to this exam was the right one. To ask two qualified inspectors to accurately assess a ship of over 600 feet, 13 decks, 400+ crew, and the capacity to carry in excess of 600 passengers in the time normally allotted, is too large and complex a task to expect of anyone. As a manager, the old adage "don't expect more from others than you do from yourself" should come to mind when assessing each and every job.

What did I as a Marine Inspector and future "Auditor" take away from this experience? First and foremost, we must remain ever vigilant in today's environment of paper-based management. "Auditors" versus Inspectors is the wave of the future. However, it must be kept in mind that there was every reason to believe this vessel would pass with "flying colors" and the inspection would prove the auditing system true. It did not! It reaffirmed the fact that materiel inspections still count and no amount of auditing will ever make a vessel "sailor-proof". As we continue to fine tune the prevention through people concepts and hone the philosophical shift in this new approach to safety at sea, we cannot forget that COMPLACENCY on the part of a vessel's crew or by Coast Guard Marine Inspectors can, and will, cost people their lives.

A BLACK BOX FOR SHIPS:

Voyage Data Recorders and The International Maritime Organization

By Christopher Young
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A new SOLAS regulation is working its way through the negotiating process at the International Maritime Organization (IMO) to require certain ships to be fitted with a voyage data recorder (VDR). Such a regulation is likely to be included in a proposed revision to SOLAS Chapter V (Safety of Navigation) when the IMO's Maritime Safety Committee (MSC) takes up consideration of revisions to SOLAS as early as two years from now. The MSC has already agreed to performance standards for VDR; and these standards were considered for adoption by the 20th IMO Assembly in November 1997. This article briefly summarizes recent developments at IMO that are increasing the prospect that investigators of future maritime casualties will have a new tool in the form of a "block box" for ships, similar to those required on commercial aircraft.

Proposed New Regulation on VDR

Although the concept of a VDR has been under discussion at IMO in connection with the loss of bulk carriers, the issue received more attention after the capsizing of the ro-ro passenger ship Estonia in September 1994. At its meeting in December 1994, the MSC agreed to a proposal by the Secretary-General that a panel of experts be established to conduct a thorough review of the safety of ro-ro passenger ferries and make recommendations for new requirements. Among the many proposed new requirements, the panel proposed a new SOLAS V regulation (V/23) to be worded as follows:

1 Ro-ro passenger ships shall be fitted with a voyage data recorder (VDR), capable of floating free if the ship sinks. The VDR shall be fire and water proof and shall be fitted with a device, enabling it to be located after it has floated free from the ship for the purpose of assisting in a possible casualty investigation.

2 At least the following information would be recorded over a 24 hour period:

.1 ship's position, course and speed;

.2 raw radar information;

.3 engine orders and responses;

.4 rudder orders and responses;

.5 status information about hull openings;

.6 watertight and fire doors status information;

.7 main alarms;

.8 bridge conversation, including loudspeaker messages given and received;

.9 VHF ship-shore-ship and ship-ship communications; and

.10 wind speed and direction.

Note: No manual deletion of recorded information shall be possible by unauthorized persons.

3 All equipment to which this regulation applies shall be approved by the Administration.

Such equipment shall conform to appropriate performance standards not inferior to those adopted by the Organization."

At that time, performance standards had not yet been developed for application under this proposed new regulation.

After receiving the report of the panel, the MSC instructed the Sub-Committee on Safety of Navigation (NAV), at its 41st session in September 1995, to consider those recommendations which related to the revision of SOLAS Chapter V, including requirements for a new VDR.

According to the Sub-committee's report, "a number of members of the Sub-committee considered it was premature to include a regulation on voyage data recorders in the set of ro-ro amendments under consideration as there needs to be more in-depth study and clearly developed standards for such equipment.

Some delegations however were of the opinion that such equipment was readily available at present. The Sub-Committee did not discuss the contents of draft regulation 23 and agreed to leave the regulation in square brackets." (Square brackets are used in IMO documents to indicate a consensus has not yet been reached and the issues will require further consideration before a decision can be made to keep, delete or modify the text.) These comments went to a Working Group on Ro-ro Ferry Safety which met in October 1995.

A subsequent working group on Ro-ro Ferry Safety viewed most of the details in the draft regulation on VDR as developed by the panel to be matters addressed in performance standards. The Group amended the panel's recommendations to read as follows:

"As from [1 January/July 2000] every ro-ro passenger ship shall be fitted with a voyage data recorder which shall conform to appropriate standards approved by the Administration, taking into account the performance standards developed by the Organization."

This text was included in the package of SOLAS amendments submitted to the Conference

of Contracting Governments to SOLAS held in November 1995. The Conference was not able to agree on new SOLAS amendment on VDR. As a compromise, the Conference adopted a resolution which in part said:

"The Conference,

"Being of the opinion that it would be desirable that ships, in particular passenger ships, are fitted with a voyage data recorder to assist in investigations into casualties,

"Requests the Maritime Safety Committee of IMO to:

"(a) develop, as a matter of urgency, operational requirements and performance standards for voyage data recorders, taking into account any potential human element implications;

"(b) consider developing carriage requirements for voyage data recorders for inclusion in SOLAS, at the earliest opportunity."

The United States took the opportunity of the 42nd session of the NAV Sub-Committee, in July 1996, to propose wording for a new VDR regulation in the package of SOLAS Chapter V amendments being considered. The U.S. proposal was worded as follows:

"1 This regulation applies to ships of [3000 gross tonnage] [85 meters in length] and upward engaged on international voyages. Administrations shall determine the applicability of these requirements to smaller ships and ships engaged on domestic voyages.

"2 Ships subject to this regulation shall be fitted with a voyage date recorder (VDR) for the purpose of assisting in a possible casualty investigation. The VDR shall meet technical requirements and performance standards which are

not inferior to those adopted by the Organization and shall be fireproof, waterproof, shockproof, and secure against tampering."

The United States noted that the references to tonnage or length thresholds were used only for illustration, and application based on other criteria (i.e., categories of ships) should be considered. The U.S. also identified specific types of information which should form the core of VDR data being captured. These are discussed further on under performance standards.

By the conclusion of the 42nd session of the NAV Sub-committee, the following draft for a new regulation on VDR was included in the package of SOLAS amendments—but only for further consideration at the 43rd session:

"[All] ships shall be fitted with a voyage data recorder (VDR) for the purpose of assisting in a possible casualty investigation. The VDR shall meet technical requirements and performance standards which are not inferior to those adopted by the Organization."

This was regulation V/22 in the draft package of SOLAS amendments. A separate provision is draft regulation V/1 addressed the scope of application and date of implementation, as follows:

"Regulation 22 applies to ships of [3000] gross tonnage and upwards engaged on international voyages on or after [1 January 2001]. Administrations shall determine the applicability of the requirements of regulation 22 to ships less than [3000] gross tonnage and ships not engaged on international voyages."

Discussion of a possible new VDR regulation continued at the 43rd session of the NAV Sub-Committee, in July 1997. Although performance standards were finally agreed (as discussed below), there was no final consensus on the wording for a new VDR regulation. The draft to go forward to the 44th session in July 1998 will reflect that there is general agreement that a new VDR requirement should apply to ro-ro passenger ships engaged on international voyages; but as to any other category

'... Every ro-ro passenger ship shall be fitted with a voyager data recorder which shall conform to appropriate standards approved by the Administration.'

- Proposed Regulation
Ro-ro Ferry Safety Working Group

of ships, the draft text will only include them in square brackets for further discussion. The draft text of regulation V/22 now reads as follows:

1 The following categories of ships engaged on international voyages shall be fitted with a voyage data recorder (VDR) for the purpose of assisting in a possible casualty investigation:

.1 ro-ro passenger ships;

.2 [all ships;]

.3 [ships of 3000 gross tonnage and upwards;]

.4 [passenger ships of 20,000 gross tonnage and upwards;]

.5 [ships of 20,000 gross tonnage and upwards carrying oil, gases or chemicals in bulk;]

.6 [bulk carriers;] [and]

.7 [mobile offshore units, including non-self propelled units.]

2 The VDR shall meet performance standards which are not inferior to those adopted by the Organization and shall be of a type approved in accordance with regulation V/19 [approval and surveys of navigational systems and equipment].

The 43rd session also completed work on a proposed IMO resolution with performance standards for VDR.

Performance Standards for VDR

The issues have surrounded the development of performance standards for VDR at IMO: (1) how much technical details should be included in IMO's performance standard; (2) who should have access to the data being captured by a VDR; and (3) should a VDR be "float-free" (in other words, should it automatically be released from a sinking ship, and drift to the surface to facilitate recovery).

As noted above, the United States had proposed to the 42nd session of the NAV Sub-Committee that any performance standard on VDR should include certain essential elements of information. The U.S. proposal was worded in part as follows:

'... The purpose of a voyage data recorder is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a vessel over the period leading up to, and following, an incident having an impact thereon.

"The VDR should capture the following basic technical information relating to the ship's operational circumstances, the status of shipboard navigational equipment, and the condition of the ship and its vital systems:

.1 ship's position, course and speed;

.2 radar/ARPA contacts (targets) for a period of not less than [24 hours];

.3 information as displayed to the officer of the navigational watch on ECDIS, when fitted;

.4 activated alarms on the bridge and in the engine-room/control-room.

The VDR should capture, continuously, for a period of not less than [24 hours], the following data:

.1 bridge conversations;

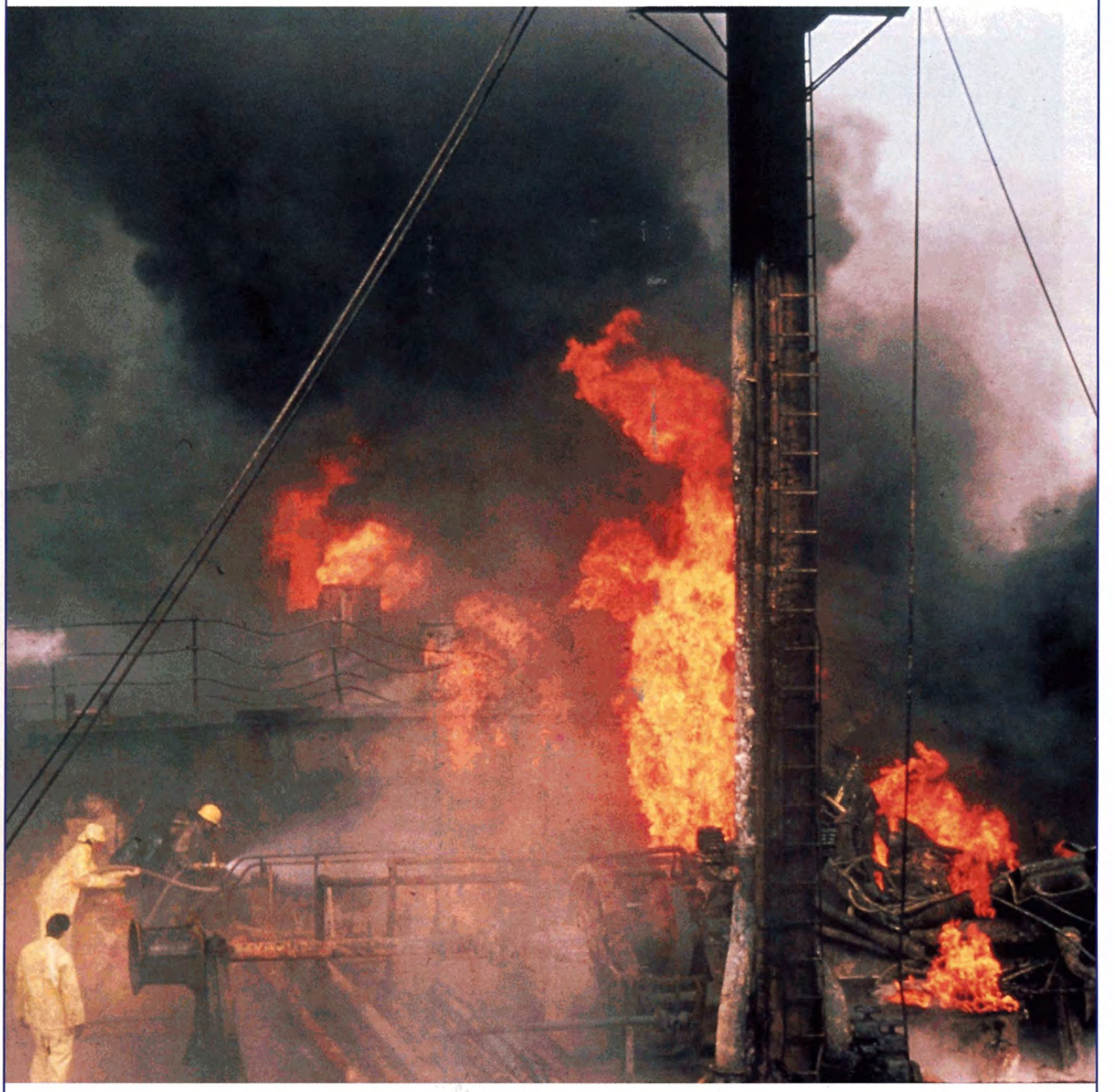
.2 automated engine-room (control-room conversations;

.3 bridge communications with engine-room and master's quarters; and

.4 VHF ship-to-ship and ship-to-shore communications."

The United States also said consideration should be given to requiring VDR's to capture other information (such as weather conditions; hull stress data; engine speed, water and firetight door status, and rudder angle position). However, some of those involved in the discussion recognized that adding too much to the performance standard might make the black box a more expensive "golden box" which would be an easier target for those who might prefer not to see any new requirements for VDR. This was also a major consideration in the debate over making VDR's "float-free."

The 42nd session of the NAV Sub-Committee (July 1997) prepared a draft recommendation on performance standards for VDR which contained a limited amount of technical detail (such as



"withstand fire for a minimum period of 1 hour"), and also included the following statement of purpose:

"The purpose of a voyage data recorder is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a vessel over the period leading up to, and following, an incident. Information contained in a VDR should be made available [only] to the Administration and used in the investigation of the accident in order to find the root causes of the accident and use the information to avoid similar accidents in the future."

As the square brackets around the word "only" indicate, there was a degree of disagreement in the NAV Sub-Committee over whether access to VDR data should be extended beyond the flag State Administration, to those such as the company that owns or operates the ship.

When the Maritime Safety Committee (MSC) received the draft recommendation from NAV, it decided the whole performance standard need to be reviewed by the Design and Equipment Sub-Committee (DE) which had already been instructed to look at VDR's in connection with bulk carrier safety.

At its 40th session in February 1997, the DE Sub-Committee revised the performance standard by phrasing the standards without imposing specific technical requirements. For example, instead of referring to fire resistance for one hour, or to float-free capability, the DE text expressed broad performance criteria and was neutral on the means of meeting the criteria:

The final recording medium should be installed in a protective capsule which should meet all of the following requirements:

.1 be capable of being accessed following an incident but secure against tampering;

.2 maximize the probability of survival and recovery of the final recorded data after any incident;

.3 be of a highly visible color and marked with retro-reflective materials; and

.4 be fitted with an appropriate device to aid location.

The MSC, at its 68th session in May 1997 approved the performance standard for submission to the 20th IMO Assembly (November 1997), but also invited the NAV Sub-Committee to add any final changes at its 43rd session (July 1997). In the end, the NAV Sub-committee made only editorial modifications. There was general agreement that technical standards to support the performance standard could be more appropriately developed by an industry standards-setting body. Work along these lines is underway in the International Electrotechnical Commission (IEC).

The performance standard that went to the IMO Assembly in November includes the following statement of purpose:

"The purpose of a voyage data recorder is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a vessel over the period leading up to, and following, an incident having an impact thereon. Information contained in a VDR should be made available to both, the Administration and the shipowner. This information is for use during any subsequent investigation to identify the cause(s) of the incident."

The associated SOLAS regulation will be discussed again at the 44th session of the NAV Sub-Committee before it is submitted to the Maritime Safety Committee as part of a package of proposed amendments to SOLAS Chapter V. At this time, the most likely date for such a new regulation to come into force is July 2002. Meanwhile the National Transportation Safety Board (NTSB) has placed the mandatory installation and use of such devices on its list of "Most Wanted" safety improvements.

To receive a full text of the assembly resolution, please contact the author of this article at (202) 267-0216.

USCGA Cadets Participate in PTP and Want to Do More!

By LCDR Vincent Wilczynski, Ph.D.
Mechanical Engineering, Dept. of Engineering, U. S. Coast Guard Academy

Cadets majoring in engineering at the U. S. Coast Guard Academy (USCGA) often challenge their instructors with questions such as "Where does the Coast Guard use this course material?" Such inquiries reflect the cadets' strong desires to connect their education with Coast Guard missions and indicate their drive to do "real Coast Guard work." Thanks to a partnership between the USCGA Department of Engineering and USCG Marine Safety Office Portland (ME), the Prevention Through People (PTP) program has provided cadets with answers to such questions.

The PTP goals of knowing more, doing more, and cooperating more are the foundation of the relationship between the USCGA and MSO Portland. To help prevent future catastrophes, MSO Portland is interested not only in the physical conditions of failure, but in establishing the operating scenario that leads to component failures. For example, rather than just knowing that a lobster boat sank because of a cracked sea-water inlet valve, the PTP initiative explores the reason behind why the valve cracked and how the commercial fleet can prevent such failures in the future.

Under the PTP program, MSO Portland provides the USCGA with artifacts from marine casualties for cadets to examine. The forensic casualty investigations conducted by the cadets benefit both parties; the MSO is provided with an engineering analysis on the casualties that is beyond the resource capabilities of the MSO, and the cadets are motivated by working on real Coast Guard issues. Also, these engineering cadets are exposed to the Service's marine safety field and experience a segment of the Coast Guard that they may not otherwise see as a cadet. One example illustrates the scope of projects the USCGA and MSO Portland have worked on together.

An MSO investigation of the sinking of a 30 foot fishing boat in 60 feet of water off the coast of Maine determined the casualty resulted from an apparent catastrophic failure of the rudder post stuffing box. This brass housing, though 0.5 inches thick, was subject to high impact loads and ultimately failed. The MSO turned to the USCGA Department of Engineering for a forensic investigation of the failed component.

Two USCGA cadets conducted the investigation as an independent studies course in the Mechanical Engineering curriculum. The cadets were briefed by the MSO Portland Marine Inspector on the background of the boat, its operating conditions, and possible scenarios to explain the failure. After establishing their own hypothesis for the material failure, the cadets conducted macroscopic, microscopic and chemical spectrograph analysis of the failed components. Once the chemical make-up of the component was determined, the material properties of the brass fitting were compared to the loads encountered for this vessel.

Their investigation produced evidence to support the leading MSO hypothesis to explain the failure. The sinking was not due to a catastrophic failure, but rather was the final result of many separate failures over the lifetime of the component. To share their findings with the marine community, the cadets documented their work in a report for the MSO and as an instructional video for commercial fishermen. The video explains the causes of the casualty and suggests proper operating techniques to avoid similar casualties on other

fishing boats. The quality of the cadet work was verified as their report received a national award from a professional society that promotes material research.

In the true spirit of the vision for PTP, there are many winners from this type of partnership. USCGA cadets applied their education, learned about CG mission areas, and made valuable contributions to the Service. MSO Portland received access to resources not normally available to an MSO, leveraged the expertise of their investigators, and contributed to cadet development. The ultimate and most important beneficiary is the marine community. Through PTP, separate units of the Coast Guard have pooled resources and cooperated to protect lives and prevent marine casualties.

MARINE SAFETY WORK CONDUCTED AT USCGA DEPT. OF ENGINEERING

(A PARTIAL LISTING)

◆ "The Impact of the Americans With Disabilities Act on the Small Passenger Vessel Industry" Cadet research project. This paper was presented at a meeting of the Society of Naval Architecture and Marine Engineering and won an award from the New England chapter of SNAME.

◆ "Feasibility Study and Preliminary Design of a Channel Buoy Mounted Oil Sensor System" Cadet research project. This paper was presented at a meeting of the Society of Naval Architecture and Marine Engineering and won a national award from SNAME. A revised version of the paper was subsequently published in the national journal Marine Technology.

◆ "An Alternative Approach to Determine a Vessel's Center of Gravity: The Center of Buoyancy Method" Faculty research. This paper was included in the 1993 USCG Vessel Stability Symposium and subsequently published in the international journal Ocean Engineering.

◆ "How Clean is Clean — A Paradigm Shift in Defining Environmentalism" Cadet research project. This paper was presented at a meeting of the American Society of Mechanical Engineers and won a national award in an ASME student paper competition.

◆ "Forensic Investigation of a Fishing Vessel Sinking" Cadet research project. This paper was prepared for MSO Portland to report findings from an MSO Portland case. The paper was entered in the Awards for Achievement in Engineering sponsored by the James F. Lincoln Arc Welding Foundation and received a merit award from the Foundation.

◆ "Explanation of a Vessel Sinking — A Video Presentation" Cadet research project. Video of a multi-media presentation prepared for MSO PTP program to educate New England fishermen.

◆ "Analysis of a Propeller Strut Failure" Cadet research project. This paper was prepared for MSO Portland to report findings from an MSO Portland investigation of a 65' whale watcher. The paper was entered in the Awards for Achievement in Engineering sponsored by the James F. Lincoln Arc Welding Foundation.

◆ "Comparing USCO Automation Regulations with Procedures Used by Other Federal Regulatory Agencies" Cadet research project.

◆ Logistics coordination of the 1993 USCG Stability Symposium held at the USCGA. Faculty service.

◆ Technical advice provided for various marine casualties investigations (most recently the BRIGHT FIELD investigation). Faculty service.

◆ Technical advice provided to the National Maritime Center concerning probability based risk assessment. Faculty service. Faculty from USCGA Dept. of Mathematics were/are also involved in this project.

Prevention Through People: Applying Risk-Based Technology

By Kriste Hall

Risk management is a valuable tool in today's high risk environment. The increasing traffic levels and the decrease of resources for regulators both contribute to the risks in our ports and waterways. In recognition of this fact, the ACMSEP produced a set of guidelines for risk-based decision making to assist Coast Guard field commanders in the use of these tools. In addition, the April-June 1996 issue of *Proceedings* presented a very technical and theoretical treatment of risk management in the maritime industry. What we are concerned with today is how those risk management theories are applied and how risk management is being used in the field. Each of the communities highlighted below used a similar procedure similar to the following:

1. Notice need or potential for improvement.
2. Gather together the interested/affected parties (the stakeholders).
3. Identify the hazards/risks in the problem area/situation.
4. Rank the hazards/risks according to the degrees of danger and likelihood of occurrence.
5. Brainstorm solutions/mitigating measures.
6. Rank the solutions/mitigating measures according to cost (financial, environmental, human, jobs), effectiveness, and other implementation issues.
7. Perform the solution/mitigation measure(s) chosen.
8. Review the results and modify the solution/ mitigation measure(s) as needed.

This is an iterative process that relies on continual observation. To do it right, you need to do it over and over. Many of the groups represented below have found that the review and fine-tuning reinforces the use of the tools created to solve or mitigate the initial hazard.

Port Vision 2000 (MSO Boston)— LNG Tanker Movement

In anticipation of a 300% increase in liquefied natural gas (LNG) shipments, the Port of Boston is in the midst of a human element risk analysis. This project, called Port Vision 2000, is based on the technique outlined in Appendix I of the PTP Quality Action Team report (published in July 1995 and available from USCG Headquarters PTP Office). The method relies on the development of realistic scenarios to analyze potential risks in the functions of the system (LNG importation), and the possible mitigating measures that can be taken. Using Appendix I methodology, scenarios are developed from accident data, near misses and expert opinion of casualties that may happen. Since the LNG industry has enjoyed a respectable safety record over the past 30 years, the Port Vision 2000 workgroup relies on the expert opinion of the stakeholders involved in the importation of LNG into Boston. Some stakeholders might include:

MSO Boston

DISTRIGAS of Massachusetts

Cabot LNG Corporation

MASSPORT

Pilots of the Port of Boston

LNG vessel agents, owners, operators and crews

Each LNG ship carries about 33 million gallons of flammable product. Since these 1000-foot ships transit directly through the heart of Boston, the vessels' movements and control are closely monitored by the Coast Guard. To provide further protection, the Coast Guard enforces a moving safety zone around the tankship. With a projected three-fold increase in vessel arrivals and the effects of streamlining in the Coast Guard, it became apparent that a review of the current procedures to safely import LNG was necessary, hence the advent of the Port Vision 2000 project.

This project is unique in that it is founded upon goals and objectives common to both the regulator and industry. These goals and objectives are to manage an increase in the annual number of LNG cargoes into the Port of Boston with no reduction in the current level of protection of life, property, and the environment, while optimizing resource utilization and minimizing the impact on other vessel traffic. The fundamental premise for this project is to identify all stakeholder port conditions challenging the safe transportation of LNG, provide prescribed responses where appropriate, and develop guidelines for making critical decisions in response to conditions/incidents that may occur during the transport of LNG within the Port of Boston.

The Boston group is in the middle of their process where they are finalizing and reviewing the risk scenarios. The scenarios will be reviewed on the basis of probability of occurrence, degree of hazards, and efficiency of the suggested countermeasure. Although the analysis is only partially completed, the stakeholders have begun the implementation of certain practices to reduce the risk associated with LNG importation. The team in Boston finds that significant progress can and is being made by using a step-by-step process of risk analysis.

Port of Savannah (GA)— Minimum Keel Clearances

One of the most commonly reported accidents is a grounding. To help minimize these occurrences, representatives from the Port of Savannah and the Port of Brunswick formed a Port Users' Workgroup in October 1996. The group worked together to develop proven guidelines and operating controls that will prevent economic and environmental loss as well as injuries caused by maritime casualties. The idea is to be able to do this without overly restrictive government regulations and controls. A set of guidelines were developed and implemented locally, and may be modified by a similar representative body of Savannah's port users.

The Guidelines are intended to prevent maritime accidents and casualties. They provide definitions of the applicable terms and give specific values for the minimum acceptable keel clearance. Also specified is who is responsible for the soundings, or depth measurement, of the waterways and how that information will be distributed. Other requirements include a pre-transit conference between the vessel's master and the appropriate pilot. During this conference the master and pilot

will decide how and when the vessel will travel the waterways, and they will also calculate the under-keel clearance. If the vessel's master and pilot agree to use high tide to provide extra clearance through the waterway, then the guidelines also specify that contingency plans are in place to keep the vessel from grounding. These guidelines are a specific example of a risk mitigation effort. The guidelines can be found on the Internet along with guidelines for Developing Tidal Lift Contingency Plans. Information regarding the Port of Savannah channel depths and ranges can be found on the Statistics page of MSO Savannah's web site

http://www.msosavannah.com/
then click on the
Ports and Waterways Management link.

Risk Management and Passenger Vessel Industry (MSO Juneau)

The land and waters of Southeast Alaska are very beautiful, and these days, very crowded. Cruising is growing as a viable vacation option for many people, and with this new popularity, more people are starting their own sightseeing businesses. The combination of congested waterways and inexperienced crews have reportedly brought about many near-misses, groundings and some collisions in the waters off the coast of Alaska. To address these problems, MSO Juneau and members of the local passenger vessel industry worked together to conduct risk assessments and develop risk mitigation measures.

The first group involved North West Cruise Ship Association, Holland America and Princess Cruises, Cruise Line Agencies of Alaska, and two of Alaska's pilot associations. Together these groups formed the Marine Safety Task Force. The task force set port specific guidelines for vessel scheduling, weather and ice criteria, maneuvering, and communications. The task force determined that the contents of the guide, if adhered to by all cruise ship operators, would significantly reduce the risk of marine casualties. The original guidelines, Southeast Alaska Voluntary Waterway Guide, were published in June of 1996. The Guide proved to be very successful. After the 1996 cruise season, the task force reviewed and updated the guidelines for the 1997 season.

A second effort was conducted by the small passenger vessel operators who use the Tracy Arm Waterway for glacier and marine mammal viewing tours. Tracy Arm is very scenic, but narrow and winding around rocks and floating ice. The Coast Guard and members of the small passenger vessel industry joined together to conduct a risk assessment of the waterway. They brainstormed undesirable events and analyzed the events using cause and effect diagrams. They then ranked the events using a severity/probability matrix to determine their relative risks. Finally, the group developed operating standards to prevent the undesirable events from actually occurring. All of this in an effort to improve passenger safety. The open environment promoted frank discussions about the risks of operation in Tracy Arm and enabled the operators to do a self-evaluation of the standards they currently use in their operations. The group published a guide of best practices guide called "Tour Operators' Suggested Guidelines for Vessel Operations in Tracy Arm." For further information or copies of the publications, contact MSO Juneau at (907) 463-2450.

The following people contributd to this article:

CDR Mark Skordinski (MSO Boston)

LCDR David Stalfort (MSO Juneau)

LT Joe McKechnie (MSO Boston)

MST1 Jeff Lang (MSO Savannah)

Marine Safety Lab: A Closer Look

By YN1 Arron Russell, USCG

There is a small unit in the Coast Guard that has a big environmental job. What unit is this? The Marine Safety Laboratory (MSL), a unit of the National Maritime Center. The Marine Safety Laboratory located in Groton, CT, provides forensic oil analysis and expert testimony in support of oil pollution law enforcement efforts for Coast Guard field investigators, districts, hearing officers, the National Pollution Fund Center, Department of Justice, and other federal agencies. The Lab also plans and conducts tests in specific areas identified by Program Managers in support of Coast Guard regulatory and international goals.

MSL's primary mission is to provide forensic oil analysis (finger printing) identifying the source of an oil spill by analyzing and comparing spilled oil samples with suspected source samples. The analytical evidence produced by MSL provides the US Coast Guard with both law enforcement and cost recovery benefits; and it provides the organization with a basis for legal proceedings in the case of "mystery" spill investigation which may lack other physical evidence. Additionally, MSL personnel provide expert witness testimony for hearing and court proceedings.

MSL is descended from the U. S. Coast Guard Oil Identification Laboratory, which resulted from a five year Research & Development Center (R&D) effort to develop the current Oil Identification System (OIS). The impetus to develop the OIS stems from the Federal Water Pollution Control Act (P. L. 92-500) which prohibits the "discharge of oil or hazardous substances into or upon the navigable waters of the United States, adjoining shorelines or into the waters of the contiguous zone." In 1978, the Central Oil Identification Laboratory (COIL) was established as the operating facility to implement the OIS. There have been several physical relocations, name changes, and moves within the organizational structure of "M". However, the day-to-day work of the lab has never been interrupted. Historically, the laboratory has supported the U. S. Coast Guard's efforts to establish responsibility for oil spills and has involved more than 30,000 samples representing more than 5,500 spill cases in their nearly 20 year history.

Personnel at the lab take pride in their responsiveness to the field and the specialized technical service they provide to the Coast Guard. As the Coast Guard's only laboratory, they have committed themselves to providing the best forensic support for the Coast Guard oil pollution law enforcement and are recognized world wide for their unique expertise.

Dr. Martha Hendrick-Smith contributed to this article.

Nautical Queries

Deck Questions

1. You are plotting a running fix in an area where there is a determinable current. How should this current be treated in determining the position?

A) The drift should be added to the ship's speed.
B) The current should be ignored.
C) The course and speed made good should be determined and used to advance the LOP.
D) The set should be applied to the second bearing.

2. What is official proof of a vessel's ownership?

A) Certificate of Documentation
B) Bill of Lading
C) Transfer Certificate
D) Logbook

3. A ballasted vessel sinks enroute to a drydock. Under these circumstances, the vessel's owner can claim _____.

A) actual total loss
B) constructive total loss
C) general average
D) particular average

4. What condition exists at perigee?

A) The Earth is farthest from the Sun.
B) The Earth, Sun, and Moon are in line.
C) The Earth, Sun, and Moon are at right angles.
D) The Moon is closest to the Earth.

5. Increasing the number of slack liquid tanks has the effect of raising the _____.

A) uncorrected KG
B) maximum allowed KG
C) virtual height of the center of gravity
D) metacentric height

Deck Answers:
1-C, 2-A, 3-A, 4-D, 5-C, 6-C, 7-C, 8-C, 9-C, 10-C

6. A vessel is equipped with cross-connected deep tanks. In which situation should the cross-connection valve be closed?

A) The tanks lie above the waterline and are filled.
B) The tanks are partially filled with dry cargo.
C) The tanks are partially filled with liquid cargo.
D) The tanks are filled and lie below the water line.

7. If your weather bulletin shows the center of a low pressure area to be 100 miles due east of your position, what winds can you expect in the Northern Hemisphere?

A) East to northeast
B) East to southeast
C) North to northwest
D) South to southeast

8. A light characteristic of composite group flashing indicates that there is a(n) _____

A) sharp turn in the channel
B) narrowing in the channel at that point
C) junction in the channel
D) obstruction that must be left to port

9. Fire extinguishing agents used on Class C fires must be _____.

A) able to absorb heat
B) water based
C) nonconducting
D) nontoxic

10. In order to reduce your wake in a narrow channel you should _____.

A) apply enough rudder to counter the effect of the current
B) change your course to a zigzag course
C) reduce your speed
D) shift the weight to the stern

Engineering Questions

1. Coast Guard Regulations (46 CFR) require hydraulic steering gear systems to be equipped with a means of steadying the rudder in an emergency. This may be accomplished with _____.

A) a suitable arrangement of stop valves in the main piping
B) a positive arrangement for stopping the rudder before the rudder stops are reached
C) a suitable arrangement of block and tackle powered by winches
D) buffer arrangements to relieve the gear from shocks to the rudder

2. Which of the devices listed is used to convert thermal energy to useful mechanical work?

A) Turbine
B) Condenser
C) Air ejector
D) Each of the above

3. When working around deck machinery it is a good safety practice to avoid standing in a bight "because _____."

A) it doesn't allow for proper faking of the line
B) the coil may become tangled and difficult to manage
C) a sudden yank on the line may trap your leg
D) a flemish may quickly knock you down

4. If the steam flow entering the evaporator steam supply orifice has a quality of 95%, which of the following statements would be true?

A) The steam at the outlet would obtain a higher degree of desuperheat.
B) The steam at the outlet would be at a higher superheat than when it is supplied at 100% quality.
C) The steam would obtain a lower absolute pressure than when it is supplied at a quality of 100%.
D) The entrained moisture will become a totally saturated vapor prior to any superheat being acquired by the steam.

5. During operating temperature changes, the ability of a lubricating oil to resist viscosity changes is indicated by a(n) _____.

A) API number
B) viscosity index number
C) seconds Saybolt Furol number
D) seconds Saybolt Universal number

6. Diesel engine valve springs function to

A) hold the valves open
B) keep the valves off their seats until the exhaust stroke is completed
C) close the valves
D) open inlet valves when the air injection cycle begins

7. A self-propelled ship of 400 gross tons, constructed in January 1974, may carry fuel oil in tanks forward of the collision bulkhead, if such tanks were _____.

A) designated for fuel oil carriage after Jan 31, 1975
B) installed for fuel oil carriage on August 1, 1974
C) designated, installed, or constructed for fuel oil carriage before July 1, 1974
D) designed for cargo oil using specifications from 1976 Pollution Prevention Regulations

8. Which of the energy forms listed is associated with the water of an operating boiler?

A) Chemical
B) Thermal
C) Mechanical
D) Specific

9. Oil transfer hose "defects are specified in the Pollution Prevention Regulations under 33 CFR Part _____."

A) 151
B) 154
C) 155
D) 156

10. A properly adjusted safety valve for an auxiliary boiler will _____.

A) attain maximum lift when it pops below its set pressure
B) open with a sharp, clear pop at its set pressure
C) close sharply when the pressure drops to its set pressure
D) operate most effectively when it has zero blowdown

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

Mariner's Seabag

Compiled by Peggy Celestin

Information For Merchant Mariners And The Marine Industry

World War II - Era Merchant Marine Veterans

Note: The U.S. Coast Guard is not an adjudication authority for World War II-Era Merchant Mariners seeking Veteran's Status.

The original instructions issued shortly after those individuals become eligible for veteran's status in 1988, direct applicants to contact one of the following agencies:

a) If they sailed commercially, write to the U.S. Coast Guard. The address is:

U.S. Coast Guard
National Maritime Center (NMC-4A)
4200 Wilson Blvd., Suite 510
Arlington, VA 22203

b) If they sailed as civil service mariners with the Army Transport Service, write to the U.S. Army. The address is:

Commander
U.S. Army Reserve Components Personnel
and Administrative Center
(ARPC-SFE-B4) (formerly PAS-EENC)
9700 Page Boulevard
St. Louis, MO 63132-5200

c) If they sailed as civil service mariners with the Navy Transportation Service, write to the U.S. Navy:

Bureau of Naval Personnel (PERS-32)
(formerly the Naval Military Personnel Command)
Navy Department
Washington, DC 20370-5300

Note: The Military Sealift Command is not the Bureau of Naval Personnel and does not process or maintain the records of former civil service mariners.

Shipping Articles and Certificates of Discharge

In the past, companies have been sending Shipping Articles (CG-705A), Master's Reports (CG-735T), and Certificates of Discharges (CG-718A), to the National Maritime Center. Form CG-735T is no longer in use. All information must be reported on Form CG-705A. When sending information to the National Maritime Center, the following information must be noted:

1) Only send the Certificate of Discharge (CD) the information from which is entered into one database. You must write "COPY ONLY" on the CD, otherwise, they will be returned to you.

2) Your company must retain copies of the CDs and Shipping Articles for a period of three years. After the three year period, they are then mailed to the National Maritime Center for storage.

3) A Navigation and Vessel Inspection Circular (NVIC) is being drafted to address this situation.

Copies of Form CG-705A can be obtained from one of the 17 Regional Examination Centers (REC) and it's free of charge. Forward all inquiries to the National Maritime Center at (703) 235-8488 and for RECs addresses, call (703) 235-0003.

Veterans Administration Benefits for Merchant Marine Veterans

Use DD Form 2168

On January 19, 1988, the Secretary of the U.S. Air Force declared certain merchant marine service as qualifying for Veterans Administration (VA) benefits. In order to qualify for veteran status under Public Law 95-202, a mariner must have served as part of the "American Merchant Marine in Oceangoing Service during the Period of Armed Conflict, from December 7, 1941 to August 15, 1945."

Also eligible are civil service crewmembers serving aboard U.S. Army Transport Service and Naval Transportation Service Vessels in oceangoing service. If you wish to be considered for VA benefits, you should apply for Discharge Certificate (DD Form 214) by completing DD Form 2168 and send to:

U.S. Coast Guard
National Maritime Center (NMC-4A)
4200 Wilson Blvd., Suite 510
Arlington, VA 22203

The discharge certificate issued by the Coast Guard will reflect dates of all wartime voyages. The remarks section will show the inclusive dates of each voyage. Each voyage will be considered a separate period of active service in determining eligibility for VA benefits and services.

In general, merchant marine veterans who obtain discharge certificates and their survivors may be eligible for the following benefits from the Veterans Administration:

Disability Compensation	Burial Benefits
Dependency and Indemnity	Compensation Pension
Dental Treatment	Medical Care
Home Loan Guaranty	Vocational Rehabilitation

There are two resolutions to extend the benefits of merchant mariners currently in the House of Representatives; however, they have not yet been approved.

For all inquiries regarding merchant mariner veterans' benefits, call the National Maritime Center at (703) 235-8488. For further information regarding veterans benefits, call the toll free number listed in the blue pages of your local telephone directory under U.S. Government, Veterans Administration.

Drop in for a visit. We're open 24 hours a day, 7 days a week!

www.dot.gov/dotinfo/uscg/hq/g-m/gmhome.htm

THEY KNOW WHAT THEY ARE DOING.

ROUTINE DANGERS IN THE ENGINE ROOM

By ENS Alexander Foos

Knowledge is Power. A simple phrase that is especially apt in the investigations field these days. Coast Guard Headquarters has recently received reports from the field on a number of engine room incidents. In both of these cases a total of five minutes of additional safety training would have been sufficient to provide the crewmembers involved with all the knowledge that they needed in order to stay safe.

Imagine, if you will, the common routine of a vessel in port. You have just returned from your latest voyage, and you have a good deal of work to do in order to maintain the ship. Nothing unusual there. Most likely there is some welding or cutting. As we all know large bottles of compressed gas are usually pretty helpful in completing jobs like this, and someone has to get these bottles from the storage area to the work site. As the First Engineer, you send a couple of guys to go move those bottles assuming they know what to do because, heck, *they do it all the time.* Well, now the stage is set for either another routine, unremarkable job, or a most unfortunate accident that we all can learn from. The title name of this column should cue you in as to where this story is going.

Your two trusted workers venture down to the bottles and find a great surprise. They have valve covers on them with "little handles that'll help us carry the bottle up the ladder." But that isn't all they find, or in this case don't find. There are no safe handling instructions on either the bottle, or the valve cover. Is this all that uncommon? Not really! Having now inspected the bottles and prepared for the move up the ladder out of the engine room our two unsuspecting crewmembers turn to it.

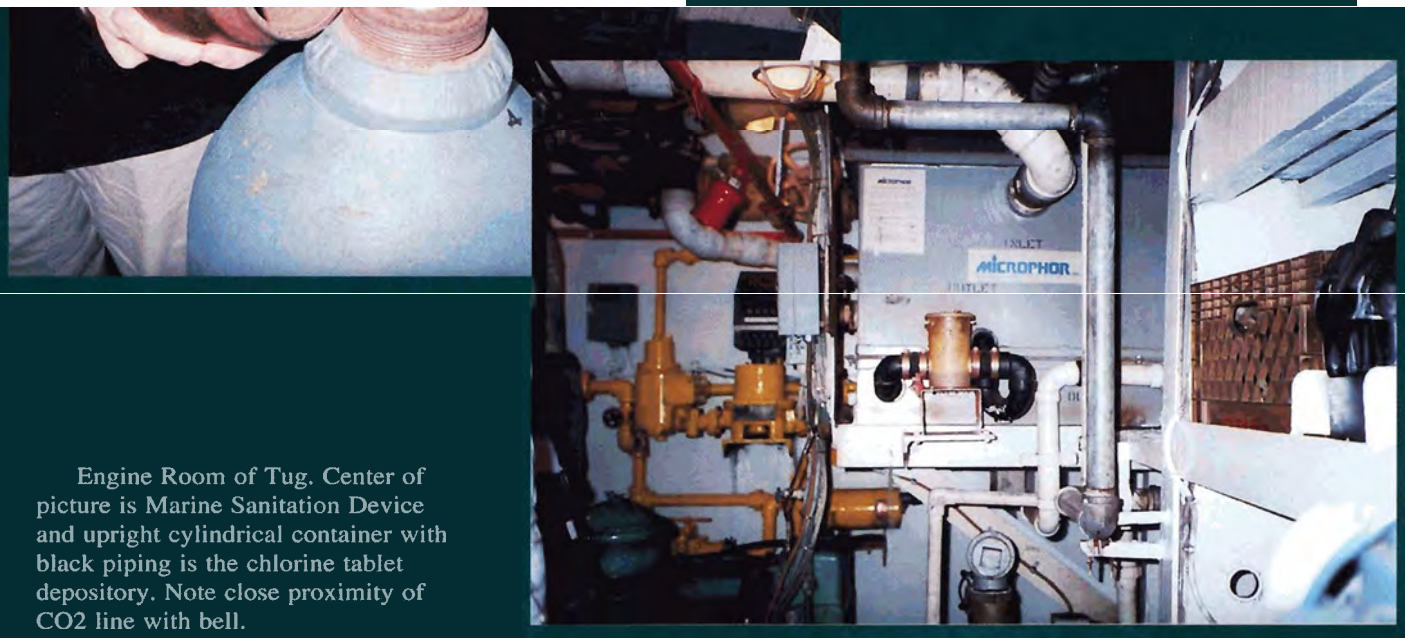
While going up the ladder the crew decides that it would be much easier if "you push while I lift on the valve cover with this handle". Sounds like a pretty good idea to me because why else would they put that "handle" on the cover. They must want us to use it, don't they? Too bad its not such a good idea as our two crewmembers found out. It seems that while carrying the bottle up the ladder the threads between the valve cover with that darn "handle" and the bottle decided it would be a good time to just strip.

I'll tell you what, if I had to be one of those two, I'd rather be the guy who had to fall up the ladder. The poor fellow who got the other end of that proverbial stick ended up not just falling down the ladder, but being followed quickly by a full bottle of oxygen. As we all know the law of inertia says that an object in motion tends to stay in motion unless acted upon by an outside force. In this case the outside force acting upon that bottle of oxygen was the poor crewman's leg. How does two months in the hospital with major injuries to **your** leg sound?

What do we learn from this? Get a valve cover with stronger threads? NO WAY!!!!! Here is where two and a half of those five minutes of training we talked about previously would have helped.

Information from the following sources (National Fire Protection Service, American Compressed Gas, National Welding Supply Association, and ANSUL [the company that distributes the bottles in this case]) states that it is **NEVER, NEVER, NEVER** safe to lift an oxygen bottle by the valve cover—**WHETHER OR NOT the cover has a handle. So what can you do? Consider developing a standard** procedure with appropriate equipment. Possibly you could try using a handcart or a pulley system through open hatches to get that bottle up and on deck, but definitely you could clearly communicate to your crew about the dangers of this practice. It doesn't take much time to do, and may ultimately save time and

◀ The O2 cylinder in question. Notice the handle on top of the valve cover. This is what was being lifted before the valve cover together stripped. screw threads holding the tank and the



Engine Room of Tug. Center of picture is Marine Sanitation Device and upright cylindrical container with black piping is the chlorine tablet depository. Note close proximity of CO2 line with bell.

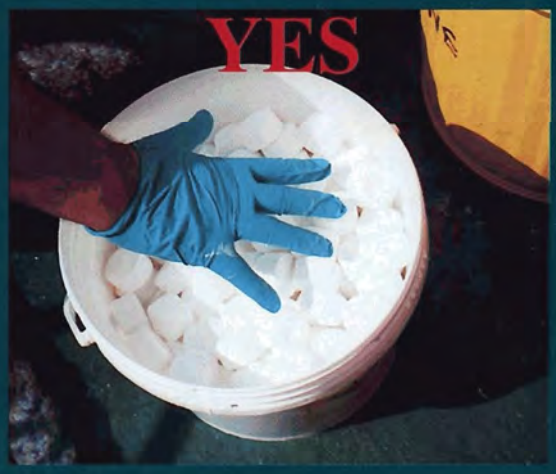
money otherwise lost when a member of the ships crew is lost to injury.

Let's move now from our two oxygen bottle movers and go to that most pleasant of engine room jobs aboard an uninspected towing vessel, maintenance of the Marine Sanitation Device (MSD). Somebody has to make sure this monster is running and is clean at the same time. This cleaning is accomplished through the addition of chlorine tablets to the MSD. Such a benign looking object like a chlorine tablet can cause a considerable amount of damage if not treated with care. And, unlike a bottle of compressed gas crashing down on your body, their danger is not always immediately apparent.

Again, the stage is set. The tug's engineer has found his hands once again coated in grease and oil from the daily toil in the engine room. Dealing with that MSD isn't a personal favorite, but he might as well get it out of the way. So the engineer goes to add the chlorine tablet that'll clean up the system. Such a simple task doesn't require too much thought and who really reads the safety message pasted to the container. It probably only says something like *poisonous* or *don't eat*. We all know that stuff is all just common sense. So he just reaches right into that bucket, grabs a couple of those puppies, chucks them into the MSD; job done and forgotten already. Now its coffee time.

Coffee comes and goes, so does lunch and dinner. A full two days actually go by and the engineer is relaxing in front of one of the many quality movies in the ship's collection when all of a sudden a fire alarm goes off. Fire in the engine room is not the most pleasant of situations to be in, especially if you're the person responsible for the space and, you guessed it, the fire itself. How could the engineer have started the fire by adding chlorine tablets to the system? He did it by not taking the time to read the safety label on the tablet's container. You know, the label that says *Don't Eat*. What did that label say anyway? Well, it said:

"**STRONG OXIDIZING AGENT:** Mix only with water. Use clean, dry utensils. Do Not add this product to any dispensing device containing remnants of any other product. Such use may cause a violent reaction leading to fire or explosion. Contamination with moisture, organic matter, or other chemicals



This is the recommended way to obtain MSD chlorine tablets.

This is how the responsible crew member picked up the chlorine tablets to put them into the MSD depository. This is the specific action we want to prevent.

will start a chemical reaction with generation of heat, liberation of hazardous gases and possible generation of fire and explosion. In case of contamination or decomposition, do not reseal container. If possible, isolate container in open air or well ventilated area. Flood with large volumes of water, if necessary."

Seems that greasy and/or oily hands, a staple in the marine industry, can cause more than just a foul taste in your food. It can start the chlorine tablets in the storage bucket to have a chemical reaction that creates enough heat that it causes the container to start to smolder and eventually ignite. Fire aboard ship is no fun, and this one could have easily been prevented. It could also have been worse. Remember that alarm that went off in the engine space? Well, that alarm and the fixed CO2 extinguishing system that went along with it are not required by the Coast Guard for these types of vessels. Without the timely alarm and fire fighting capability the damage could have far exceeded the $1000 repair cost the company did incur.

The remaining time in our five minutes of additional training gets used here. Informing the person tasked with the maintenance of the MSD, as well as the posting of proper warnings near the area of the MSD and chlorine tablets takes virtually no time and no money, and the potential savings are staggering. Forget about the savings in money and think about the savings in personnel. The risks involved with fighting a fire in the engine room, especially a chemical fire, do not nearly outweigh the importance of the time and effort involved with preventing that very same fire.

What are the safety measures that could have prevented this fire? A clean pair of latex gloves can not only prevent dishpan hands, but they can also prevent this type of fire. As long as the gloves themselves are clean they will keep the grease and oil from mixing with the chlorine and causing that chemical reaction that started the fire. Whatever method you use to handle these tablets ensure it is clean and dry, just DON'T use your bare hands!!!!

What is the common thread between these two accidents? It is simply that the people involved were not informed of the danger they faced in doing a job that had become routine. Complacency is not uncommon in any industry and is a cause of a great number of preventable accidents. A few minutes of training can go a long way to preventing accidents and avoiding the pain and suffering of all involved. If there is a safety label, take the time to read it. What can it hurt to be informed about the materials you are handling? And if you have identified a way to do something that is so much easier than "the old way," you might ask around first because someone else probably did the same thing before and ended up missing the ski season much like our oxygen bottle moving crewmember. And that is just not something we as a community can just sit by and watch happen.

Remember that the crew of your ship is your family. And family protects each other.

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HAVE YOU COMPLETELY ADDRESSED YOUR Y2K PROBLEM?

By now most of you are aware of the difficulties associated with your "information systems" caused by the previous industry norm of using "2 digits" when storing or calculating dates. What many of you may not be aware of however, is that virtually every "smart" device or electronic system we currently use (i.e. anything with a chip in it that performs sequencing or date calculations and/or storage) as well as any new devices we buy off the shelf today, are also at risk from this threat.

The insidious nature of this problem is compounded by the fact that virtually identical looking devices, sitting side by side and performing well today, may act very differently as the year 2000 approaches. This potentially drastic difference in performance is caused simply because a slightly different chip is embedded within them. It is recommended by the experts, that for any smart system or electronic device you are relying upon you should consider investigating whether there will be a problem: WHEN IN DOUBT, CHECK IT OUT!

With the aforementioned in mind, and in the interest of mutual safety on our shared waterways, the Coast Guard will act as a clearing house for any lessons learned or problems identified associated with this issue. Accordingly, we encourage anyone who experiences any Y2K related problems and/or identifies possible solutions to those problems, to share those experiences by using the Coast Guard WEB site at www.dot.gov/dotinfo/uscg/hq/g-m/nmc/y2k.htm or by contacting John Shonacher at the National Maritime Center at (703) 235-8453. By our combined vigilance and cooperation we may very well avoid serious safety and economic problems in the future.

WE LOOK FORWARD TO WORKING WITH ALL OF YOU

AS WE ADDRESS THIS POTENTIAL THREAT
TO OUR MUTUAL INTEREST IN MARITIME SAFETY.

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