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Our 56th Year

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Hazardous Materials and Annual Index

Features

Departments

Assistant Commandant's Perspective

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

Hazardous Materials – An Integrated Approach to Safety

Plastic containers, lawn fertilizer, automobile engine coolant, and gas heat for the home—what do they have in common? They are all products utilized by consumers on a daily basis. But they also have something else in common—they are all created from hazardous materials. The chemical industry has a major impact on global economics, with the United States exporting billions more in chemicals than it imports. Not surprisingly, the vast majority of hazardous materials transportation, both domestically and internationally, occurs by vessel. And the Coast Guard, in partnership with the maritime industry, ensures these chemicals are transported safely.

On occasion, hazardous materials live up to their name. In World War I, the town of Halifax, Nova Scotia was nearly destroyed when a ship carrying ammunition exploded. And in 1948, two ships containing ammonium nitrate fertilizer exploded in the harbor at Texas City, Texas, essentially obliterating the entire waterfront. More recently, an accident at a chemical plant in Bhopal, India released a large quantity of methyl isocyanate, killing thousands.

The Hazardous Materials Standards Division in the Office of Operating and Environmental Standards, Marine Safety and Environmental Protection Directorate, leads the Coast Guard's hazardous materials safety efforts. Other headquarters divisions and Coast Guard field units also play an integral role in influencing hazardous materials' safety through their efforts in vessel plan review and inspection, maritime personnel qualifications, and environmental protection and response. It is our ability to function effectively as a team that enables us to successfully carry out our mission.

Equally important is our relationship with the maritime industry. Through quality partnerships, we have utilized a non-regulatory approach to provide solutions to many issues of mutual concern—Prevention Through People, Mariner Health and Safety, and revisions to the Chemical Hazardous Response Information System to name just a few. The maritime industry has also been closely associated with the development of several new regulatory initiatives. Through their involvement on the Chemical Transportation Advisory Committee, industry members have played an active role in providing the Coast Guard with recommendations for revising existing regulations for marine vapor control systems and the carriage of bulk liquid hazardous materials by barge, as well as recommendations for new hazardous substances response plan regulations.

In this issue, you will learn about some current projects the Coast Guard is working on to promote safety, as well as several industry initiatives. With the ever-increasing trend towards movement of hazardous materials by water, the safe transportation of hazardous materials will require an integrated approach to safety involving both the Coast Guard and the maritime industry. Working together, we can meet this challenge.

EDITOR'S POINT OF VIEW

By Edward Hardin

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

By The Way

"Hazardous."

When we hear this word our first reaction is one of defense or caution. When we look the word up in the dictionary we read: "depending on a chance event, a source of danger, involving or exposing one to risk." When we put the word hazardous together with cargo we quickly realize how fragile our environment is. Just one single incident involving hazardous cargo has devastating effects on the ecological system in addition to putting humans in harms way.

The Coast Guard strives to minimize the chance of any incidents. We enforce the laws that are in place and work closely with the maritime community to find safer methods of moving cargo incident-free. We are aware that hazardous cargo is a necessary component to many valuable commodities that are used worldwide. In this issue of *Proceedings* you will read articles describing various methods of identifying, storing, and transporting hazardous materials. We even touch on the effects of plastic on our marine environment that makes us aware that we are all responsible for the future. Yes, we should be cautious, however we also must be knowledgeable, knowing what we are shipping, knowing the rules, knowing the laws, and applying all we know to make transporting hazardous materials as safe as possible.

Edward Hardin

A special thank you to all our readers!

NEXT ISSUE:

ADVANCES IN POLLUTION RESPONSE

UPCOMING ISSUES:

RISK MANAGEMENT

WATERWAYS MANAGEMENT

The NEW! and *Improved* CHRIS

by Alan L. Schneider
Hazardous Material Standards Division

What do you do when you need information about a cargo? Where do you turn to find that boiling point, or that density, or what to do if a cargo spills onto water? That's a big job, and it's tough enough if it's a common cargo such as gasoline or methanol but it's almost impossible if it has too many letters in its name to pronounce (try Trimethyl hexamethylene diamine). The best way is to turn to the Coast Guard's CHRIS, the Chemical Hazards Response Information System.

Why CHRIS?

Simply put, finding chemical, physical, toxicological, thermodynamic, and response information isn't easy. Data is dispersed throughout the chemical literature, but isn't really gathered together in a form useful to Coast Guard and marine industry personnel. In many ways, getting cargo data is one of the more difficult jobs Coast Guard and industry people face.

How Did CHRIS Start?

Over a quarter of a century ago the Coast Guard realized that the marine industry was expanding into chemical cargoes that were far different and potentially more dangerous than traditional cargoes —and that someday soon we would have to deal with cargo spills unlike anything before. So the Coast Guard created CHRIS and the Hazardous Assessment Computer System (HACS) to predict what would happen if a cargo spilled—for example, how far a vapor cloud could travel, the minimum safe distance from a burning pool, and the size of a spill pool. HACS is the computer version, CHRIS the paper and slide rule version. Since the computers of 1970 were slow mainframes, the CHRIS system was developed to provide guidance without using a computer. This was less accurate, but you could get results while the accident was in progress. And to provide data for these spill calculations, the CHRIS database was born.

What is Happening to CHRIS?

CHRIS is changing. Over the years, we increased the number of cargoes to 1305 and made corrections and other changes as appropriate, but we never systematically reviewed the data. This year, we examined the entire database, making corrections, adding data that was missing, and updating obsolete information. We deleted categories of information that are no longer useful and added many new fields that should prove very useful to users.

CHRIS used to have four manuals. Manual 2 is the CHRIS database; Manual 1 was intended for first responders. All the information in Manual 1 was contained in Manual 2, in the upper left-hand corner of Manual 1's first page for each cargo. The concept was that a small, condensed Manual 1 would be more portable and convenient for first responders. However, the Coast Guard determined that this was duplicative and no longer needed. Manual 3 contained the pencil and paper calculation techniques for modeling a spill, but the advent of faster computers and easier data input made Manual 3 no longer necessary. Finally, it was decided that Manual 4, containing response method recommendations, should be incorporated in Manual 2. This puts all of the information needed into one manual, and should be more efficient for the user. In this way CHRIS is now one manual rather than four. We have renamed CHRIS Manual 2 "CHRIS" for simplicity.

CHRIS will still be available in a printed version. However, we are developing an interactive version for computer use. We will place the entire database, approximately 2800 pages, on the Internet for anyone to use, at no charge. Also, we will make available a CD-ROM version for those preferring that form.

What is in CHRIS?

CHRIS begins with an introductory section. While you can use CHRIS without reading this section, it contains information you need to maximize CHRIS's utility. Topics covered include:

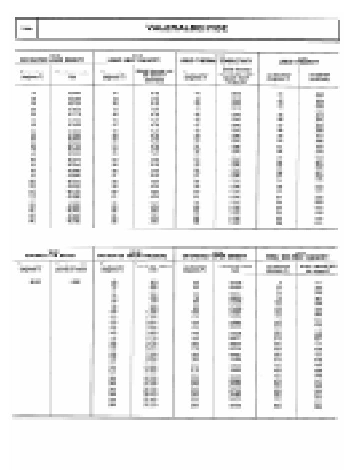
- Components of CHRIS—a discussion of CHRIS and HACS
- Explanation of Terms—important for understanding the data pages
- Other Information Systems—where to go to get additional information
- Conversion Factors—always useful since the measurement units you need seem always different from those you have
- Selected Properites of Fresh Water, Sea Water, Ice, and Air—useful data despite not normally being carried as cargoes
- Guide to Compatibility of Chemicals—many chemicals react spontaneously when mixed; this guide identifies these problem combinations
- Index of Synonyms—this is very important since most chemicals have more than one commercial and technical name
- Index of Codes—an index of the three-letter CHRIS codes
- Data sources—the references used in developing CHRIS

CHRIS has two pages for each cargo. The first part of the first page has general, nonnumeric information. This information is intended for Coast Guard personnel responding to a spill, but should be useful for those who want general, qualitative information rather than specific numerical values about a cargo. The data are presented in a series of boxes, and include the following items:

– Common synonyms
– State at room temperature (liquid, solid, or gas)
– Color
– Smell
– What happens if it spills into water?
– General advice for those responding to a spill
– What to do in a fire
– What to do if someone is exposed to this chemical
– General information on water pollution

The second part of the first page is divided into nine areas:

1. Corrective Response Actions: This is from the old, now discontinued CHRIS Manual 4, response methods handbook; users will find this much more convenient now that the information is located here instead of in a separate manual.



2. Chemical Designations: Users will find this especially helpful in dealing with regulatory issues. This section contains:

— Coast Guard Compatibility Class
— Chemical formula
— International Maritime Organization/UN designation
— Department of Transportation number
— CAS number
— North American Emergency Response Guidebook number
— Standard Industry Trade Classification number

3. Health Hazards: This information is useful both to those who are responding to spills and those concerned with general industrial hygiene. This section covers the following topics:

— Personal Protective Equipment
— Symptoms Following Exposure
— Treatment of Exposure
— Threshold Limit Value/Time Weighted Average
— Threshold Limit Value/Short Term Exposure Limit
— Threshold Limit Value/Ceiling
— Toxicity by Ingestion
— Toxicity by Inhalation
— Chronic Toxicity
— Vapor (Gas) Irritant Characteristics
— Liquid or Solid Irritant Characteristics
— Odor Threshold
— Immediately Dangerous to Life and Health Value
— OSHA Permissible Exposure Limit – Threshold Limit Value
— OSHA Permissible Exposure Limit – Short Term Exposure Limit
— OSHA Permissible Exposure Limit – Ceiling
— EPA AEGL

4. Fire Hazards: Users will need this information in planning and in responding to fires:

— Flash Point
— Flammable Limits in Air
— Fire Extinguishing Agents
— Fire Extinguishing Agents Not to Be Used
— Special Hazards of Combustion Products
— Behavior in Fire
— Ignition Temperature
— Electrical Hazard
— Burning Rate
— Adiabatic Flame Temperature
— Stoichiometric Air to Fuel Ratio
— Flame Temperature
— Molar Ratio (Reactant to Product)

5. Chemical Reactivity: Responders need this information to know how to avoid turning a small problem into a major one, with increased threat to life and property.

— Reactivity with Water
— Reactivity with Common Materials
— Stability During Transport
— Neutralizing Agent for Acids and Caustics
— Polymerization
— Inhibitor of Polymerization

6. Water Pollution: Responders and planners need to know what happens when each chemical enters the water.

— Aquatic Toxicity
— Waterfowl Toxicity
— Biological Oxygen Demand
— Food Chain Concentration
— Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) Profile

7. Shipping Information: This is very important information, information that is not available anywhere else. Before responding to a spill, personnel must have this information:

— Grades of Purity
— Storage Temperature
— Inert Atmosphere
— Venting
— IMO Pollution Category
— Ship Type
— Barge Hull Type

8. Hazard Classification: These ratings provide a good indication as to the dangers of a material, and give personnel a way to relate the dangers of one material to another:

– 46 CFR Category
– 46 CFR Class
– 46 CFR Package Group
– Marine Pollutant
– NFPA Hazard Classification
– EPA Reportable Quantity
– EPA Pollution Category
– RCRA Waste Number
– EPA FWPCA List

9. Physical and Chemical Properties: These data are probably more valuable to a planner than to the first responder; they are both useful and very hard to get from other sources. These include the following:

– Physical State at 15°C and 1 atm
– Molecular Weight
– Boiling Point at 1 atm
– Freezing Point
– Critical Temperature
– Critical Pressure
– Specific Gravity
– Liquid Surface Tension
– Liquid Water Interfacial Tension
– Vapor (Gas) Specific Gravity
– Ratio of Specific Heats of Vapor (Gas)
– Latent Heat of Vaporization
– Heat of Combustion
– Heat of Decomposition
– Heat of Solution
– Heat of Polymerization
– Heat of Fusion
– Limiting Value
– Reid Vapor Pressure

The second page for each cargo contains tables for eight properties at various temperatures. Such data is useful both in planning a response and in the response itself. These properties are:

- Saturated Liquid Density
- Liquid Heat Capacity
- Liquid Thermal Conductivity
- Liquid Viscosity
- Solubility in Water
- Saturated Vapor Pressure
- Saturated Vapor Density
- Ideal Gas Capacity

The Electronic CHRIS

The electronic version of CHRIS will be interactive. You will be able to call on specific data without having to go through the entire sheet. Furthermore, data will be expressed in English and metric units, so that the user will not have to convert values. You will also be able to take a property and determine which chemicals fit that property—for example, if you know that freezing point, the program will tell you which cargoes have that freezing point. Given the size of this database, users may find this interactive version much easier to use.

Adding CHRIS to the Coast Guard's web site will make the data instantly available to everyone in the world. And if we discover an error, we will be able to correct it overnight. Additionally, as data change—TLV's can and do change—we can update entries immediately rather than waiting for the next edition.

The Future

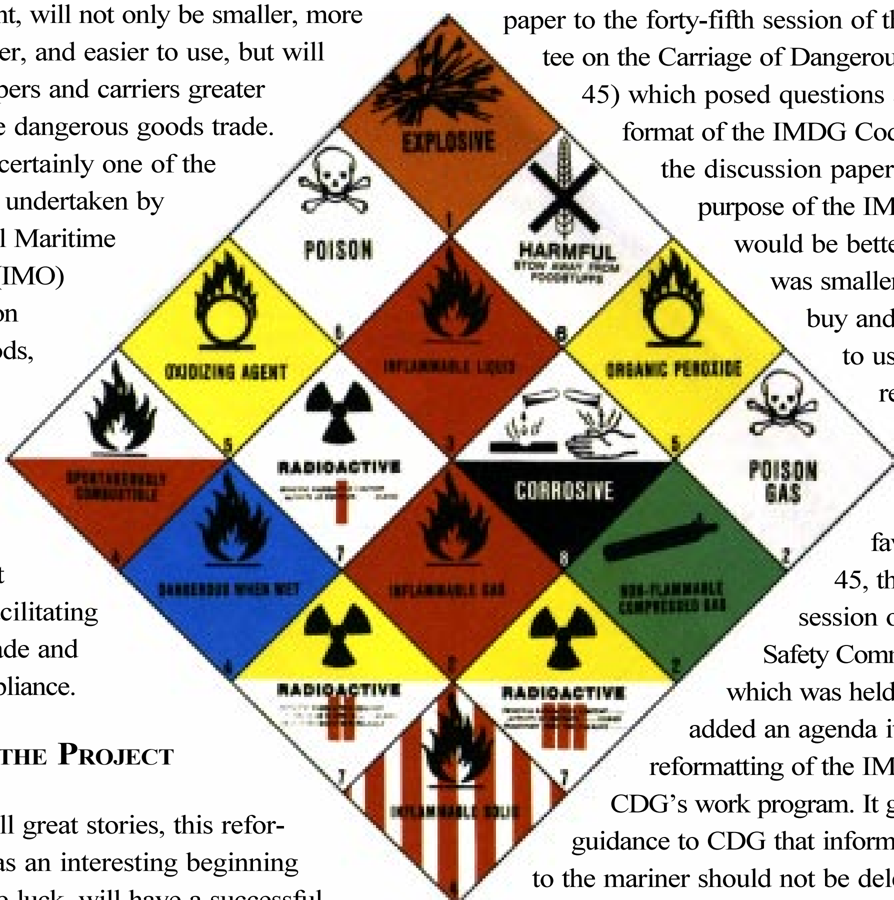
In the Coast Guard's spirit of continuous improvement, we intend to keep CHRIS up to date and add new cargoes as they enter the marine market. Please bring any problems, discrepancies, and errors to our attention by any one of the following methods:

Mail: Commandant (G-MSO-3)
U.S. Coast Guard Headquarters
2100 2nd Second Street, SW
Washington, DC, 20593
Telephone: 202-267-1217
Telefax: 202-267-4570
email: aschneider@comdt.uscg.mil

The New and Improved International Maritime Dangerous Goods Code

by LCDR John J. Plunkett, USCG

If you ship, transport, or regulate dangerous goods in the water mode, exciting changes in the international dangerous goods standards are on the horizon for you. Over the last four years, a major project, spearheaded by the United States, has been underway to reformat the IMDG Code. This reformatted Code, differing from the existing Code in both form and content, will not only be smaller, more portable, cheaper, and easier to use, but will also allow shippers and carriers greater flexibility in the dangerous goods trade. This project is certainly one of the most ambitious undertaken by the International Maritime Organization's (IMO) Subcommittee on Dangerous Goods, Solid Cargoes, and Containers (DSC) and has the potential to be one of the most successful in facilitating international trade and improving compliance.



History of the Project

As with all great stories, this reformatting saga has an interesting beginning and, with a little luck, will have a successful conclusion. When the IMDG Code was introduced some 30 years ago, it was an impressive publication—deemed exactly what the seafarer needed. One page per substance with much relevant information about a chemical's appearance, its properties, and how to pack and stow it, plus a color diagram of the relevant hazard warning label. The duplication of information in both the General Introduction and the introductions to each class was thought to be no bad thing. However, as parties distant from the ship-port interface (shippers, forwarders, consolidators, etc.) increasingly used the Code, it became apparent that changes in the format would be necessary. Based on input from U.S. industry and enforcement officers, the Coast Guard submitted a discussion paper to the forty-fifth session of the Subcommittee on the Carriage of Dangerous Goods[1] (CDG 45) which posed questions about the future format of the IMDG Code. The basis of the discussion paper was that the purpose of the IMDG Code would be better served if it was smaller, cheaper to buy and amend, easier to use, and more readily available to its users. Having been received favorably by CDG 45, the sixty-third session of the Maritime Safety Committee (MSC 63) which was held in May 1994, added an agenda item for the reformatting of the IMDG Code to CDG's work program. It gave clear guidance to CDG that information valuable to the mariner should not be deleted from the reformatted Code. CDG, or MSC, could never have envisioned the complexity or amount of work that would be needed to bring this project to fruition.

Although the seeds to reformat the IMDG Code were sown in CDG and grew in DSC, they received a great deal of additional nourishment from a number of other international groups, most notably the United Nations (UN) Committee of Experts on the Transport of Dangerous Goods. This committee, which is composed of 22 voting member countries, provides leadership in harmonizing regulations on the transport of dangerous goods by developing an internationally agreed upon regulatory framework. This framework manifests itself primarily as the UN Recommendations on the Transport of Dangerous Goods. For reasons of harmonization, the UN Recommendations and the IMDG Code are inextricably linked in many ways, including periodicity of amendment, content, and with the completion of the reformatting project, form. This link is more akin to an endless "do loop" than a one way path - with the UN Committee of Experts taking both input from the modal regulations and itself serving as input to the modal regulations.

In 1995, the UN Committee of Experts began work to reformat the existing UN Recommendations into a "model rule". This was about the same time that DSC, the UN/ECE Working Party on the Transport of Dangerous Goods[2] and the RID/ADR joint meeting[3] were beginning work to restructure their respective modal regulations. The basic premise of the "model rule" was to present a fundamental scheme of provisions (in form and to a lesser degree content) that would allow uniform development of national and international regulations governing the various modes of transport—road, rail, water, and air—yet remain flexible enough to accommodate any special modal requirements that might have to be met. Although the initial structure of the model rule was based loosely on the existing International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods By Air, it was modified in a number of ways based on input from international modal organizations. In 1997 the 10th revised edition of the UN Recommendations of the Transport of Dangerous Goods was published in the model rule format. With this template in hand, DSC continued their work in earnest to complete the reformatting project.

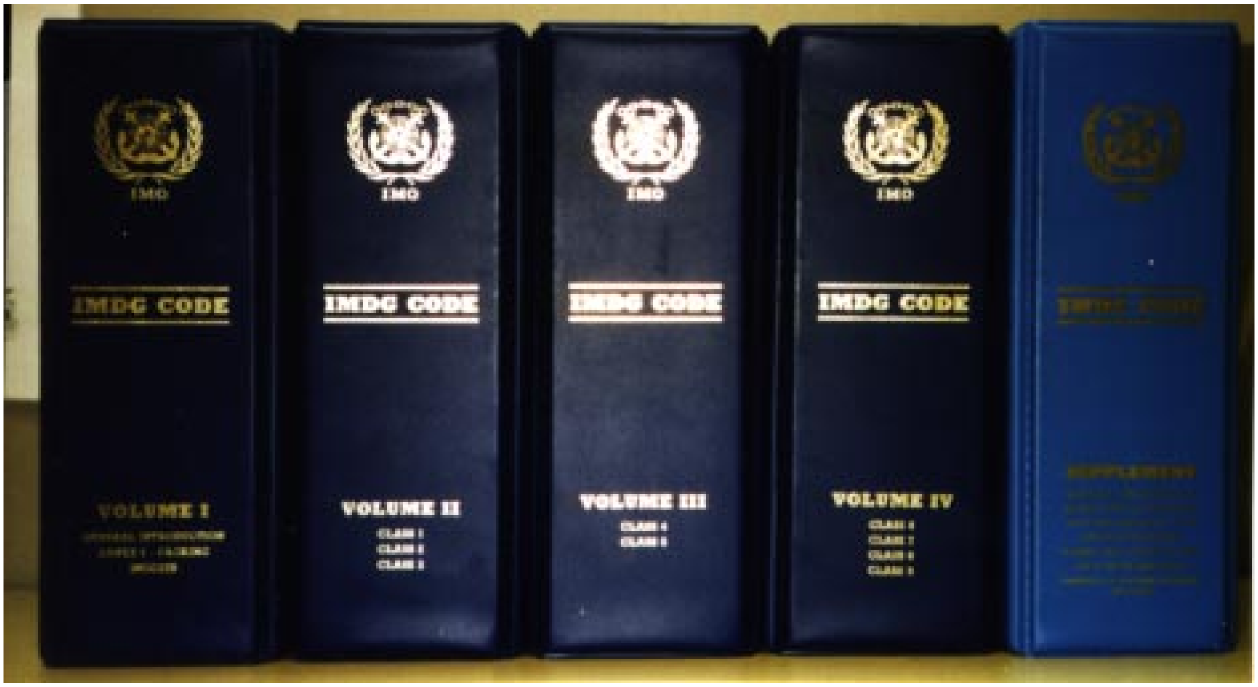
Although ultimately the agreed upon structure of the reformatted Code was decided to closely parallel that of the UN Recommendations Model Rule, alternative formats were initially discussed by DSC. The United Kingdom submitted an information paper to DSC 1 (DSC1/inf.10) that outlined future options regarding the structure of the Code. Three options were discussed:

1. Retain the existing format in spite of pressure from such obligations as agenda 21, chapter 19, initiative from the Rio Declaration.

2. Adopt an A4 bound volume format that is easy to produce, is cheap to buy and update, and would probably enjoy a wider distribution than the existing format

3. Adopt an A4 Blue Book as an IMO/IMDG supplement to the UN Recommendations that would clearly identify marine considerations and be even cheaper and more portable than any other option.

Although the UK supported a slim, single-volume Marine Supplement to the UN Recommendations which contained essential information for the



marine transport of dangerous goods (Option 3 above), DSC decided that, *inter alia* due to the fact that the UN Recommendations currently exist as only a framework and not a complete set of requirements that a stand alone format for the reformatted Code would be adopted.

As the work on the restructuring of the UN Recommendations was progressing quickly and a target completion date of 2000 was established by MSC 65 for the reformatting project, DSC1 decided that the IMDG Code reformatting work should be given high priority by DSC's Editorial and Technical (E&T) Group. As its name implies, the E&T Group, a standing work group of DSC, provides editorial and technical assistance to DSC as needed. Any member government or NGO is permitted to participate in the E&T Group's work.

The Process and Players

Initially the goals of the reformatting process were:

- Reduce the size of the Code from 4 volumes to 1
- Reduce the initial cost and cost (in terms of time and money) of future updates
- Increase the user friendliness of the Code
- Harmonize the format with that of other modal regulations
- Change the content as little as possible
- Do not delete any information valuable to the mariner

As the project progressed, it became apparent that Pandora's Box had been opened. Not only would the existing text need to be rearranged, but also other work would need to be completed, either out of necessity or out of opportunity. The creation of packing instructions for both non-bulk and intermediate bulk containers (IBC's) falls into the former, and the harmonization and rationalization of the portable tank provisions and updating of the Class 7 requirements into the latter. To accomplish these major tasks, working groups were formed in a number of international fora. Time constraints and the nature of the work have necessitated these groups to work both concurrently and consecutively.

The IMDG Code currently has over 130 separate packing instructions. Many instructions have been added based more on immediate industry needs than consistency to the existing instructions of similar materials (same class and packing group with similar physical properties). To make the reformatted IMDG Code more internally consistent, rational, and concise, it became apparent that this number would need to be reduced considerably. Based on IBC and non-bulk packing instructions being developed for inclusion in the 11th Edition of the UN Recommendations[4] and recognizing the rigors associated with the water mode transport of dangerous goods, the E&T group is developing new packing instructions for inclusion in the reformatted IMDG Code. This process has been a balancing act between concern for the safety of the mariner and compromise between the many parties involved, best summed up as "Harmonization first, safety above all".

Work in the area of portable tanks has two fronts – harmonization of the design criteria and rationalization of portable tank assignment criteria. As a number of different regional and modal requirements exist for design and construction of portable tanks (UN Recommendations, IMDG code, RID/ADR, and 49 CFR), vital work has been underway in both the UN Committee of Experts and DSC to develop truly multimodal portable tanks. During informal working group discussions, the majority of delegates agreed that grandfathering provisions of old tanks should be balanced to minimize the impact on all phases of the shipping industry, including tank manufacturers, shippers, carriers, and enforcement agencies. Although old "IMO type" tanks will be allowed to be constructed until 2003, a clear consensus has yet to be reached for their eventual phase out. New UN portable tanks will be allowed in service as early as 2002. Similar to the work that is being done for non-bulk and IBC packing instructions, work is underway to rationalize the assignment of portable tank types according to a substance's class, packing group, and physical properties (toxicity, vapor pressure, physical state, flammability limits, etc.). Each tank type will be assigned a "T Code", which will represent a specific combination of minimum test pressure, type of relief device, bottom openings allowed, and minimum shell thickness. Further, each dangerous good will be assigned a "T Code" and will only be allowed to be transported in tanks with a corresponding T-Code (T-Codes will be arranged in a hierarchy that allows tanks with a "higher" T-Code to be used as well).

With all the great work that is being done to rationalize and harmonize the portable tank requirements, do not be too hasty to toss out those familiar 4 blue binders with the IMO insignia on the spine. Besides probably having great sentimental value to you and your coworkers, they will be the only

source of the existing portable tank design and assignment requirements, as they will not be reprinted in the reformatted IMDG Code.

The existing Class 7 requirements, found primarily in the Introduction to Class 7, are based on the principles of the International Atomic Energy Agency's (IAEA*) Regulations for the Safe Transport of Radioactive Material*, 1985 edition (as amended in 1990). These requirements offer guidance for shipowners and persons in the dangerous goods handling chain without the necessity of directly consulting the IAEA regulations. Details not considered to be of direct interest to water mode personnel are omitted from the IMDG Code. Recognizing that the reformatting process was an excellent opportunity to make changes to the Class 7 requirements in the IMDG Code, a working group was formed by DSC to reformat the existing text into the model rule format, incorporate changes found in the updated IAEA regulations ST-1, develop a suitable format for the dangerous goods list Class 7 entries, and consider consequential amendments to the Emergency Schedules (EmS) arising from the revised UN numbers in ST-1. Related to this effort is the work of the UN Committee of Experts, which is for the first time integrating the ST-1 provisions into the UN Recommendations model rule format. Future objectives of the DSC Class 7 working group will include review of the text concerning radioactive materials in the Code of Safe Practice for Solid Bulk Cargoes (BC Code) and the Medical First Aid Guide (MFAG). In light of the fact that IAEA will again be revising ST-1, the Class 7 working group will be working closely with the UN Committee of Experts to consider how such revisions will be incorporated into the reformatted text.

The E&T group has been charged with physically rearranging the existing text of the IMDG Code, which often has duplicative information in a number of places, into the model rule format. This entailed

Left Hand Page										
1. UN No.	2. PSN	3. Class or Div	4. Subsidiary Risk	5. Packaging Group	6. Special Provisions	7. Limited Quantities	Packaging		IBC	
							8. Instructions	9. Special Requirements	10. Instructions	11. Special Requirements

Right Hand Page					
Tank		14. EmS/MFAG	15. Stowage and Segregation	16. Properties and Observations	17. UN No.
12. Instructions	13. Special Requirements				

condensing approximately 3000 pages into 600 pages without deleting any information valuable to the mariner or changing the intent of the existing requirements. As well as being a member of the orchestra, playing a key role in the development of the reformatted text, DSC's E&T group is also the conductor, ensuring that the many pieces of the puzzle called the IMDG Code reformatting project—reformatting the existing IMDG Code text, harmonizing/rationalizing the portable tanks requirements, updating the Class 7 requirements, and developing packing instructions—fit together in the end. Working untiringly with the E&T group has been the IMO secretariat, who have managed the mind numbing details associated with reformatting a document as complex as the IMDG Code.

Reformatting Highlights

Similar in form to the lists found in the Hazardous Materials Table (49 CFR 172.101) and the UN Recommendations, the Dangerous Goods List will be the heart of the reformatted IMDG Code. In effect, the Dangerous Goods List will replace the individual dangerous goods schedules and the General Index. The table will have 18 columns that will be spread across 2 pages, A3 style. The column headings are as listed at the bottom of the previous page.

Dangerous goods will be listed numerically in the Dangerous Goods List in order to maintain the same sequence of substances in all the working languages of IMO and also to harmonize with the UN Recommendations model rule. The text of the "Stowage and Segregation", and "Observations and Properties" columns will be spelled out in full sentences. Text that is presently included in the "Properties and Observations" that deals with classification will be coded and placed in the "Special Provisions" column. Packaging, IBC, and Tank instructions and special requirements will be coded. Chemical formulae and other non-safety related information will be deleted. The "Subsidiary Risk" column will include the marine pollutant notation, if applicable.

An alphabetical index similar in form to that of the UN Recommendations will be included in the reformatted IMDG Code to permit finding a substance by name. Each entry will include the name of the substance, the corresponding UN number, and the marine pollutant notation (P, PP, or ·) if applicable. Proper shipping names and alternate proper shipping names will appear in all upper case letters, synonyms (all of which will be retained from the existing General Index) will be in lower case letters with a reference UN number. Footnotes currently found in the General Index will appear as footnotes in the Index of the reformatted text.

All of the marine pollutants will be listed in the index, including those that only present a hazard to the environment. Only those pesticides that are marine pollutants will be retained in the index.[5] In addition, each specific self-reactive and organic peroxide formulation and corresponding UN number will be listed in the index. Specific peroxide and self reactive substance information (concentration, diluent type A & B, water, control and emergency temperatures, etc.) will be compiled into 2 tables for inclusion in the reformatted IMDG Code. A reference in the generic organic peroxide and self-reactive entries in the Dangerous Goods List will direct a user to these tables.

There are approximately 40 non-bulk packing instructions, which in all cases allow maximum flexibility to the shipper for packaging selection, planned for inclusion in the reformatted IMDG Code. The philosophy that allows such flexibility is similar to that which was used in developing the packing instructions in 49 CFR Part 173, Subpart E. Gone is the plethora of overly prescriptive, sometimes enigmatic, IMDG Code packing instructions found especially on the existing schedule pages. The reformatted IMDG Code has two very generic, very broad packing instructions, one for liquids of class 3, 6.1 and 8, and one for solids of class 6.1, 8 and Class 4.1,4.2 and 5.1 of packing groups II and III. There is also a very general packing instruction that will cover almost all of the compressed gases. These three instructions will cover over 65% of the dangerous goods currently in the IMDG Code.

Similar in approach to the development of non-bulk packing instructions, portable tank and IBC assignment criteria have been rationalized. The new portable tank assignment criteria will be applied to all newly classified dangerous goods and to existing dangerous goods in new UN portable tanks. The existing or new rationalized criteria, whichever is less stringent, is to be used for an existing substance to be shipped in an existing (IMO type) portable tank.

The use of a tabular Dangerous Goods List coupled with the reduction of packing instructions from over 130 to approximately 40, will allow the reformatted IMDG Code to be condensed to 1 soft bound, A3 format, volume (information currently contained in the existing supplement to the IMDG Code will most likely be included in a companion volume). The Code will be published in its entirety when amended, which will allow users to forgo the time-consuming, error-prone task of inserting and extracting amended pages. The new publication should be cheaper and more readily available to the front line people who need it most.

The 3 divisions within Class 3, which are based solely on flashpoint, have always been points of contention when shipping dangerous goods by water. These divisions, which predate the adoption of packing groups by the IMDG Code and UN Recommendations, have existed in the IMDG Code since it was first published. They were intended primarily to reflect the degree of hazard in terms of flammability and were used in the allocation of stowage category. With the widespread use of packing groups, the information conveyed by the divisions has become redundant and leads to confusion when transporting dangerous goods multimodally. To further align the reformatted code with existing classification schemes (ICAO, UN Recommendations, RID/ADR, 49 CFR, etc), these 3 divisions have been deleted. Packing group assignment criteria remains unchanged.

The terminology used in the reformatted IMDG Code will be standardized with that used in the UN Recommendations and other modal regulations. In particular, the IMDG Code is unique in its use of packaging group (vice packing group) and division (vice class). Although no circumstances are known where this difference has caused other than minor problems over the years, the Code reformatting presented a one time only opportunity to harmonize with other transport regulations in order to increase the credibility of the Code for users involved in multimodal transport.

The final approval process for the project to reformat the Code is in sight. The E&T group will be working on the final draft of the Code until October 1999. DSC 5 will approve the final draft version of the reformatted IMDG Code at its meeting in February 2000 and present it to its parent body, the Maritime Safety Committee, for approval in May 2000. The final version should be available for public consumption prior to January 2001 with entry into force most likely to take place in January 2002.

DSC can step boldly into the 21st century, confident that the Reformatted IMDG Code will meet the needs of the ever more competitive, ever more complex dangerous goods transportation industry. The "New and Improved" IMDG Code, though certain to have some initial growing pains, will serve as an example of international cooperation.

LCDR Plunkett is a 1987 graduate of the Coast Guard Academy. He graduated from the Johns Hopkins University in 1995 with a M. S. in Chemical Engineering and currently serves on the U. S. delegations to both the IMO Subcommittee on Dangerous Goods, Solid Cargoes and Containers and the UN Committee of Experts on the Transport of Dangerous Goods.

Footnotes:

[1]The present DSC is the amalgam of the old CDG and BC subcommittees. DSC1 was held in February 1996.

[2]The UN Economic Commission for Europe (UN/ECE) is a body of the UN with the aim to further harmonize policies, norms, and practices among the countries of Europe and to strengthen their integration and cooperation. The UN/ECE Working Party on the Transport of Dangerous Goods (WP.15) is a subsidiary body of the general assembly of UN/ECE.

[3]The RID Safety Committee and WP.15 administer the European Agreements governing the Regulations Concerning the International Transport of Dangerous Goods by Rail (RID) and Road (ADR), respectively. They meet jointly twice a year in a continuing effort to harmonize the provisions of the two agreements. The objective is to provide the necessary consistency between highway and rail transport and promote international harmonization. RSPA represents the U.S. at these meetings where the U.S. has full voting status.

[4]The most recent packing instructions proposal to the UN Subcommittee of Experts is a joint submission by the US and UK. Based on this document and discussions of a UN working group held in September 1998, the US/UK brought forth a document to the E&T group meeting in September 1998 for final disposition.

[5]Similar to Amdt 29 to the IMDG Code, a complete listing of non-marine pollutant pesticides is not included in the reformatted IMDG Code. Pesticide data can be obtained from the most current edition of the WHO *Recommended Classification of Pesticides by Hazard and Guidelines for Classification.*

Marine Chemists: Over 75 Years of Ensuring Confined Spaces on Vessels are Safe for Entry and Safe for Hotwork

by LT Emile R. Benard, USCG and CDR Kevin S. Cook, USCG

What is a Marine Chemist?

A Marine Chemist is a highly trained professional, certified by the National Fire Protection Association (NFPA), who is responsible for personally determining that confined spaces are safe for entry and hotwork on vessels, prior to the issuance of a Marine Chemist certificate. It is the responsibility of the Marine Chemist to recognize, evaluate and control the hazards associated with these spaces, so that shipyard construction and repair activities can be completed safely.

The U.S. Coast Guard (USCG) and the Occupational Safety and Health Administration (OSHA) both require that a Certificate issued by a Marine Chemist be obtained prior to conducting hotwork in certain spaces aboard marine vessels. The Marine Chemists are also able to perform, by virtue of their training, similar evaluations on landside liquid storage tanks, where an unsafe environment exists that might contain residues of flammable or combustible products. There are currently just fewer than 100 certified Marine Chemists located around the United States. They are listed by geographical area in the "Marine Chemist Directory." The directory is a current listing of all Certified Marine Chemists, published annually by the NFPA.

Origin of the Marine Chemist Profession

The United States began transporting large quantities of flammable materials as cargo during World War I. The increase in flammable cargoes resulted in a corresponding increase in explosions on vessels under repair. This led to the NFPA forming a marine committee in 1916 to draft an initial standard for shipyard fire safety. The committee published Appendix A of the NFPA Marine Regulations in 1922. This was the predecessor of the present NFPA Standard 306, *Standard for the Control of Gas Hazards on Vessels*.

In September 1922, the first 25 Marine Chemists were certified by the American Bureau of Shipping. This initial certification was relatively informal by today's standards. In 1947 the NFPA adopted the Standard for the "*Control of Gas Hazards on Vessels,*" NFPA Standard 306. In 1963 it also became the responsibility of the NFPA to certify and supervise the Marine Chemist.

The Marine Chemist Qualification Board (MCQB)

The NFPA formed the Marine Chemist Qualification Board whose main purpose was to upgrade the requirements for Certification, Recertification, and Training of Marine Chemists. The Board is composed of representatives of the following groups or agencies:

- The Tank Ship Operators
- The Shipyards
- The Marine Chemist Association, Inc.
- The Marine Insurance Industry
- A Practicing Marine Chemist

Membership is also be available to:

- U. S. Coast Guard
- U. S. Navy
- OSHA

Following a 1975 explosion, which claimed four lives, aboard the barge B-924 in Greenville, MS, the Coast Guard joined the MCQB, and began actively participating in certification procedures. Shortly thereafter, the board was granted the authority to investigate potential acts of noncompliance with NFPA 306 provisions, and to suspend or revoke the certification of Marine Chemists based upon findings of formal proceedings.

The Board currently meets three times a year to review incidents that have occurred, conduct interviews of candidate's for certification, review and update training and qualification procedures, and conduct hearings.

Certification of Marine Chemists

The NFPA has managed the certification program for Marine Chemists since 1963. In 1982, the MCQB developed a comprehensive training curriculum for prospective Marine Chemists, known as the *Rules for Certification and Recertification of Marine Chemists* or the "Rules." The Rules require that all Marine Chemists have a bachelor's degree and have completed college level courses in inorganic chemistry, organic chemistry, analytical chemistry, and industrial hygiene sampling. Marine Chemists also must have a minimum of three years experience including time in a laboratory and in the marine industry in shipyards, as licensed mariners or in the Navy or Coast Guard.

Marine Chemists must complete a rigorous training curriculum consisting of 18 training modules including topics such as fire chemistry, shipyard safety, marine vessel design, nomenclature, tank cleaning and gas-freeing techniques, properties of hazardous marine cargoes, field sampling instrumentation and marine industrial hygiene. The modules include practical applications and each module includes a written final exam.

They must also complete a minimum of 300 hours of field inspections under the supervision of at least three certified Marine Chemists. This enables trainees to observe the practices of different Marine Chemists and to gain practical inspection experience on a variety of vessel classes and cargo types.

After completing all of the above requirements the candidate must pass a written certification exam which includes questions from the candidate's technical education as well as questions on NFPA 306, Coast Guard and OSHA regulations, and industrial hygiene practices. The final step in the qualification is an oral interview with the MCQB which may ask any questions relevant to the candidate's training and may pose scenarios for the candidate to walk through, including the writing of Marine Chemist certificates.

Despite the rigors of the training and the very high standards of the Marine Chemist profession, incidents do occur, which can be attributed to lapses in practice and/or judgement. The MCQB is then faced with the difficult jobs of assessing an individual Marine Chemist's culpability and deciding whether or not disciplinary action is necessary. Actions ranging from written admonitions to suspending or revoking a Marine Chemist's certification are possible. Typically, the MCQB receives only a few (three or less) complaints of lapses in Marine Chemists' performance each year. In cases where a hearing bears out that a Marine Chemist has violated the "Rules," the MCQB takes appropriate action. During recent years, serious violations have most often been met with 30-90 day suspensions and mandatory retraining on matters related to the lapse which originally called the Marine Chemist's practice and/or judgement into question.

Marine chemists and shipyard competent persons conduct continuous testing of vessel spaces to eliminate and control potential confined space hazards.

The marine chemists' profession was created by the marine industry to prevent catastrophic fires and explosions and other confined space accidents on marine vessels.

Marine chemists are required to personally inspect spaces they test and certify.

The Marine Chemist Association

The Marine Chemist Association, Inc. is an independent professional organization composed of Marine Chemists certified by the NFPA. It had its origin in May 1938, as the Marine Chemists' subsection of the NFPA Marine Section. Upon termination of the Marine Section in 1948, the present Association was organized for the following purposes:

To promote the science of and improve methods of, evaluating and eliminating health, fire and explosion hazards in marine and associated industries

To obtain and circulate information concerning these hazards and other information regarding the professional and ethical activities of its members

To enhance the general welfare of its members by promoting a closer relationship with all concerned industry and regulatory bodies

Representatives of the Association take an active part in the work of the NFPA Technical Committee on Gas Hazards, the Marine Chemist Qualification Board, and the Marine Field Service Advisory Committee. The Association also provides educational seminars, informational bulletins, and Association newsletters to promote professional advancement.

NFPA's Marine Field service

The NFPA Marine Field service was established in 1963 to provide administrative support and legal assistance to the Technical Committee on Gas Hazards and the MCQB. The field service also maintains all records of activities by both groups. The field service helps the Marine Chemist Association, Inc., to achieve its first basic goal. "to promote the science of, and improve methods of evaluating and eliminating health, fire and explosion hazards in marine and associated industries." It also conducts "competent person" training for shipyard employees, and Coast Guard marine inspection and Navy personnel.

NFPA 306, *Standard for the Control of Gas Hazards on Vessels*

The purpose of NFPA 306 is to provide the minimum requirements and conditions for use in determining whether a space is safe for entry or hotwork. More specifically, it is the standard that provides the minimum requirements for the issuance of Marine Chemist's certificates and the conditions required to maintain the certificates.

Marine chemists and shipyard competent persons conduct continuous testing of vessel spaces to eliminate and control potential confined space hazards.

Updates or changes to NFPA 306 are carried out by the Technical Committee on Gas Hazards with representatives from industry, governmental agencies, the Marine Chemist Association, and other experts who have special expertise in the scope of the standard. The most recent update to NFPA 306 was in 1997; the changes added a new safety designation and expanded the inspection of vessel piping systems. A form for submitting proposals to the standard is included in the back of the document. The standard is updated on a three-year cycle.

Marine Chemists and the U.S. Coast Guard

The interaction between the USCG and Marine Chemists goes well beyond the requirements for obtaining a Marine Chemist certificate prior to conducting hotwork in certain spaces aboard vessels. Coast Guard policy requires a valid Marine Chemist certificate prior to Coast Guard marine inspectors entering spaces that may pose a health risk. The spaces requiring a Marine Chemist's certificate prior to entry by Coast Guard personnel may exceed the normal scope of spaces that would typically be certified by a Marine Chemist for shipyard activities. For instance, the Coast Guard requires a Marine Chemist to certify pump rooms on tank vessels carrying Subchapter "D" or "O" cargoes. This policy stems from OSHA requirements for an "Employer" to recognize, evaluate and control workplace hazards, as well as more specific requirements related to confined space entry.

Marine Chemists provide a way for the Coast Guard to ensure, as an "Employer," that spaces containing potentially hazardous atmospheres are safe for entry by Coast Guard personnel. This is necessary due to the varying workplaces (shipyards, vessels, etc.) that Coast Guard marine inspectors work in on a daily basis and the lack of control the Coast Guard has as an "Employer" over these workplaces. Marine Chemists, therefore, play a significant role in ensuring the safety of Coast Guard personnel.

As mentioned previously the Coast Guard, specifically Commandant G-MSO-3, is a member on the MCQB, and as such plays a significant role in the certification and recertification of Marine Chemists. The Coast Guard representative, as well as other government agencies serve as non-voting members. Commander Robert Corbin presently serves as the primary member of the MCQB. Lieutenant Emile Benard serves as the alternate to the MCQB and also represents the Coast Guard on the NFPA Technical Committee for Gas Hazards.

Forecasting Standard View: A Maritime Industry Risk Analysis Tool and the National/International Maritime Safety Incident Reporting System

by LCDR Scott Ferguson, USCG

A management goal of the U.S. Coast Guard and many members of industry is to develop risk management tools to help allocate scarce resources and reduce risk exposure within the maritime community. Another goal is to capture information on unsafe occurrences, hazardous situations, and non-conformities regarding safety incidents and the corrective actions that were taken to avert marine casualties. This paper will explore two risk management initiatives, and how they may be used individually and in harmony to help measure the effectiveness of the U.S. Coast Guard's and industry's safety/prevention programs and foster a safer more efficient maritime community. The ultimate goal of these initiatives is to provide an interactive instrument to prevent a catastrophic event with a large discharge of oil or major loss of life.

Initiative #1: Forecasting Standard View

The concept of the forecasting standard view involves the building and use of multivariate regression models and the use of hypothesis testing and probabilistic statistical tools to forecast risk within industry and measure the effectiveness of the U.S. Coast Guard's and industry's resources in executing their safety/prevention programs. It will allow the U.S. Coast Guard and industry to leap ahead of causal events allowing data to be used as a weapon to save lives, property, protect the environment, and reduce operational and response costs.

The development and deployment of risk-based tools and technologies would be used to focus Coast Guard and industry resources on high-risk areas within the maritime community. The idea is to use these tools to truly identify the maritime community's safety vulnerabilities and weaknesses, and to measure the effectiveness of its safety/prevention programs by using a combination of mission or operation specific multivariate regression models, hypothesis testing, and actual incident data collected through the national/international maritime safety incident reporting system (subject of Initiative #2). Through these methods proactive steps can be taken to mitigate casual events before they become major problems. The forecasting standard view project is the next generation form of what the Coast Guard calls the standard view (i.e., contains quantitative annualized marine safety activity data). Today, the U.S. Coast Guard uses the standard view as one of its tools to assess mission performance and to do risk identification in combination with other tools such as the Spill Planning, Exercise and Response System (SPEARS). The SPEARS system is used for oil spill and chemical release risk identification. The forecasting standard view is envisioned to be an automated tool/system that all levels of U.S. Coast Guard management and industry can use in conjunction with information collected by the national/international maritime safety incident reporting system to assess not only qualitatively identified risks, but to quantitatively assess mission/operational effectiveness and risk trends. It will allow the maritime community to identify budding safety vulnerabilities before they lead to marine casualties and its subsequent negative impact on fiscal and physical aspects of the industry and the marine environment.

The following steps will turn the forecasting standard view concept into a user-friendly product:

Step 1: Work directly with the Coast Guard's marine safety, operational, and industry's program managers to identify key prevention and safety measures. Use these measures, the strategic goals of the FY1999 U.S. Coast Guard Performance Plan, and the goals of 1998 G-M Performance Plan for Marine Safety and Environmental Protection to start the process.

Step 2: Use the measurement areas discovered in "Step 1" to gather source population information to be used as the basis for denominator data. Denominator data in this sense means the capture of exposure population information that can be used to form the baselines and sample population pools needed to enable random sampling and the employment of statistical tools/models designed specifically for risk assessment. The Coast Guard's current database(s) (e.g., Marine Safety Management System (MSMS), Marine Safety Information System (MSIS), and Spill Planning, Exercise and Response System (SPEARS)), for the most part, provide good numerator data for risk identification purposes (e.g., casualty and pollution incident data) that describes what went wrong in an event. What the U.S. Coast Guard and industry do not have, and what we need to truly measure/improve our safety effectiveness is denominator data based on the identified measurements described in "Step 1." Some possible sources of denominator data may include in combination databases maintained by the U.S. Army Corp of Engineers, Bureau of Labor Statistics, American Bureau of Shipping, Lloyds of London, Det Norske Veritas, and aspects of the Coast Guard's own MSMS relational database system to name a few.

Step 3: Based on the guiding input in "Step 1"and the baselines developed in "Step 2", generate multivariate regression models focused on the variables in the following function equation for each goal described below: S = f(Oi, Ri, Wi, Qi, Fi, Vi, Ei)[1] (see endnotes and references for an explanation of the function equation variables and their relationship). Using this expanding function equation, the corresponding regression model must take into account the mix of industry's operational and prevention activities and the Coast Guard's operational and prevention activities that may contribute to the accomplishment or non-accomplishment of the identified measurement areas and/or the U.S. Coast Guard's performance goals. The models should also include environmental factors such as the economy and its impact on maritime related traffic, the impact of intermodalism, port activities (pricing, depth of water, dock space, traffic and cargo throughput, labor characteristics, etc.) etc. The goals and measurements the expanding function equation and related regression models should at a minimum address the following U.S. Coast Guard performance and G-M performance plan goals:

Goal S1: Save at least 92% of mariners in imminent danger (Baseline: FY93 91.9% (4,689 saved); Measure: Lives saved/(lives saved + lives lost after Coast Guard notification)).

Goal S2: Save at least 75% of property in imminent danger as a result of maritime accidents (Baseline: FY93 74.2% ($908 million saved); Measure: Value of property loss prevented/(property loss prevented + value of property lost).

Goal S3: Reduce the number and severity of injuries due to maritime accidents by 5% (Baseline: FY93 baseline of 245 injuries/100,000 workers; Measure: Number of high-risk injuries/100,000 workers (interim measure, recreational boaters to be included)).

Goal S4/MSS-2: Reduce the risk of major loss of life on passenger vessel by 20% over five years (Baseline: FY93 baseline of 38 casualties/1,000 vessels; Measure: number of high-risk vessel casualties (fire, capsizing, flooding, collision, sinking, grounding) per 1,000 passenger vessels).

Goal S5: Reduce recreational boating fatalities by 10% (Baseline: FY93 baseline of 800 fatalities; Measure: number of fatalities (denominator of hours of exposure needs to be developed).

Goal S6/MSS-1: Reduce worker/crewmember fatalities and injuries on U.S. commercial vessels 20% over five years (Baseline: FY93 baseline of 52 fatalities/100,000 workers; Measure: fatalities per 100,000 workers).

Goal MSS-1a: Reduce crewmember deaths and injuries on U.S. flag inspected vessels (Measure: fatalities per 100,000 workers).

Goal MSS-1b: Reduce crewmember deaths and injuries on U.S. flag uninspected vessels (Primary measure: fatalities per 100,000 workers; Secondary measures: fatalities per 100,000 workers disaggregated by industry (e.g., towing and fishing).

Goal P1/MEP-1: Reduce the amount of oil discharged into U.S. waters from maritime sources by 20% (Baseline: FY93 baseline of 7.76 gals spilled/ million gallons shipped; Primary measure: gallons spilled per million gallons shipped; Secondary measure: number of spills over 10,000 gallons per billion tons of oil shipped).

Goal MEP-2: Reduce the amount of chemicals entering the environment from maritime transportation sources by ensuring a release rate which is below the annual average of the period 1993-97 (Primary measure: pounds of chemicals released from maritime sources per million pounds of chemicals shipped; Secondary measures: national variance from 1993-1997 annual average release rate)

Goal P2/MEP-3: Reduce the discharge of plastics/garbage into the water from maritime sources by 20% over five years (Baseline: FY93 baseline of 101 items/mile of shoreline cleaned; Measure: number of marine debris items recovered per mile of shoreline cleaned).

Goal MEP-4: Reduce the volume of untreated foreign coastal ballast water discharged from vessels into the U.S. exclusive economic zone (Measure: the total volume of foreign ballast water discharged minus the volume of discharged foreign ballast water that has: been treated; been exchanged with open ocean water; or originated in the open –ocean (outside of the EEZ and in depth greater than 500 meters).

Goal P3: Reduce the total number of major and medium oil spills by 50% (Baseline: FY93 baseline of 17 gallons spilled/billion tons shipped; Measure: number of spills (over 10,000 gallons per billion tons shipped).

Goal P4: Increase the removal (volume) of spilled oil by 10% (Baseline: FY93 baseline of 55% removed; Measure: gallons removed as a % of total gallons spilled).

Goal MEP-5: Reduce the consequence of pollution incidents (Measures: under development; Coast Guard unit preparedness ("P rating"); response evaluation scores for spills of greater than or equal to 1,000 gallons).

Goal P5: Improve fish and other living marine resource stocks by increasing compliance with federal regulations from the FY96 baseline of 95% (Measure: observe rate of compliance with federal fisheries regulations).

Goal P6: Reduce the loss of threatened or endangered species from fishing from the FY96 baseline of 0.9% fatality rate (Measure: fatality rate for Kemp-Ridley turtle (interim measure – more species, such as the right whale, to be included).

Goal M1: Reduce identified sources of delay to commercial mariners from FY 96 baseline (Measure: prioritize profile of waterway delay sources identified by commercial mariners).

Goal M2: Reduce identified impediments to recreational boater enjoyment (unmarked obstacles, vessel wakes, excessive vessel speed, etc.) from FY96 baseline (Measure: prioritize profile of waterways issues identified by recreational boaters as impediments to full enjoyment of the water).

Goal C1: Reduce the flow of illegal drugs by denying maritime smuggling routes as part of the interagency effort to impact the national demand level. By FY2002 reduce the smuggler success rate from FY95 baseline of 71% to 38%. By FY2007, further reduce the smuggler success rate to 10% (Measure: Smuggler success rate = amount entering U.S. via noncommercial maritime sources/potential undeterred flow bound via noncommercial maritime sources. Based on data in the FEB 97 "Interagency Assessment of Cocaine Flows," reduction to 38% smuggler success rate begins to impact the supply of cocaine transported by noncommercial maritime routes to a proportional level below the national demand level).

Goal C2: Hold the flow of undocumented migrants entering the U.S. via maritime routes to no more than 13% of entry attempts (Baseline: FY95 25% migrant success rate; Measure: migrant success rate = number of migrants entering U.S. via maritime sources / number bound for U.S. via maritime sources).

Goal C3: Reduce illegal encroachment of the 200 mile U.S. Exclusive Economic Zone by foreign fishing vessels using the FY96 baseline of 213 encroachments (Measure: number of encroachments).

Goal N1: Achieve and sustain a military readiness rate of "C2" for CG units as required by DOD (Baseline: FY96 100% of units at C2; Measure: average SORTS (Status of Readiness and Training System) rating for CG Port Security Units required by DOD(C1 is the highest rating, C5 lowest). Interim measure – more units to be included).

Goal N2: Provide core competencies (Maritime Interception Operations, Deployed Port Operations, and Environmental Defense) as requested or currently planned by CINC or DOS 100% of the time (Baseline: FY95 100% of requests; Measure: number of operations/number of requests).

Goal N3: Achieve and sustain overall capability to respond to Commander in Chief operating plan requirements for major theater war (MTW) and small scale contingencies (SSC) (Baseline: FY97 to be developed; Measure: profile of issues and concerns relating to CG capability requirements).

Goal N4: Protect and support 62% (8 of 13) of Seaports of Debarkation (SPOD) during MTW and SSC by FY2002 (Baseline: FY96 23% (3 of 13) of SPODs; Measure: number of SPODs can CG protect/ number of SPODs CG required to protect).

Goal MMS-3: Eliminate substandard foreign flag commercial vessels from U.S. waters (Measure: number of detentions per 1,000 vessels).

Goal MSS-4: Reduce risk from terrorism to U.S. passengers (at both foreign and domestic ports) and designated waterfront facilities (Primary measure: national variance from Coast Guard unit S rating (Security preparedness) of S-3 (under development); Secondary measure: national mean of risk ratings for designated waterfront facilities and passenger terminals (under development).

Goal WWM-1: Reduce the number of collisions, allisions, and groundings by 10% over 5 years (Primary measure: number of collisions, allisions, and groundings per 10,000 vessel transits (exclude those not preventable/addressable by WWM measures; Secondary measure: number of Vessel Traffic Service (VTS) interventions in which VTS watchstanders brought potentially dangerous developing scenarios to the attention of the appropriate party and no adverse incident occurred).

Goal WWM-2: Reduce the number of tank vessel groundings and collisions resulting from inadequate passage or port transit planning (Measure: number of tank vessel groundings, allisions and collisions per 1,000 transits in which inadequate passage or port transit planning is identified as a causal or contributing factor).

Goal WWM-3: Reduce the number of and/or impact of impediments to ports and waterways accessibility and efficiency (Measure: internal and external customer/stakeholder satisfaction surveys (to be developed)).

Goal WWM-4: Reduce adverse impacts of breaches of security and vulnerability of the ports and waterways system.

Steps 4 and 5: Use the population data described in "Step 2" (living data because it will be updated at the source, e.g., quarterly upload to our own MSMS database, U.S. Army Corp of Engineers database updates) to do random sampling and statistical inferences through hypothesis testing. The focus of this testing should be based on the program measures and the U.S. Coast Guard performance goals identified in "Step 1." Then the national/international maritime safety incident reporting system (envisioned to include a tri-fold database system, i.e., marine casualty data reported per 46 CFR 4.05-10, hazardous conditions reported per 33 CFR 160.203 and 160.215, and near-casualty/hazardous situation data) to help validate the results of the hypothesis testing with known or real-time maritime community safety vulnerabilities and weaknesses. The statistical tool(s), i.e., regression models and hypothesis testing, coupled with the actual occurrence data, i.e., national/international maritime safety incident reporting system, will identify industry danger trends and provide a system to help validate the observations. Plugging actual data and statistically valid (high confidence level) inferences into the multivariate regression models will allow us to see how these trends impact the events the U.S Coast Guard and industry are trying to prevent and how well the said goals are being met. The power of this program is that the maritime community may use it to make educated mid-course corrections to resources, operations, and safety programs fostering attainment of strategic safety goals.

Step 6: Automate the process focusing on the end-user. These tools and their interface must be end-user friendly. They must be easy to use and understand. If they are not, they will not be used and a great safety, cost savings, and risk management opportunity will be lost. This is a very important step in the process. Without end-user buy-in all is lost.

Step 7: Another essential aspect of the process is having a strong communications network or distribution system that gets the word out to the U.S. Coast Guard field units and the particular segment of the industry that is impacted by the trends identified by the regression models, hypothesis tests, and the national/international maritime safety incident reporting system risk management triad.

It is my belief that the development of these tools and their use in unison would revolutionize the way the U.S. Coast Guard and the commercial maritime community do business. It would allow us, for the first time, to truly measure the effects of the Coast Guard's safety/prevention programs and industry's operational and safety policies. By providing the maritime community with the real time capability to identify negative safety trends, we will have an unprecedented opportunity to use information systems to read "danger ahead" signals and proactively intervene to mitigate events that could threaten lives, property, and the environment. This "nip the problem in the bud" approach, keyed to preventing hazards to public and private safety and the environment, fully supports most, if not all, of the U.S. Coast Guard's strategic goals and industry's efforts to meet the International Safety Management Code (ISM) for the Safe Operation of Ships and for Pollution Prevention. Since deployed resources will be more focused on high-risk areas in marine safety and environmental protection, it promotes cost effective industry and Coast Guard operations. The maritime community will have a better understanding where their resources, safety, and training dollars should go. Efforts expended in these "ounce of prevention" measures are much less resource intensive and costly than those employed in "pound of cure" responses to combat major marine safety contingencies and pollution events for both the private and public sectors of the maritime community.

Initiative #2: National/International Maritime Safety Incident Reporting System

From the inception of the marine safety program, the U.S. Coast Guard has investigated casualty events, which resulted in the loss of life, property, and/or damage to the environment. The results of these investigations have been used to improve design, construction, and operations of merchant vessels. While this information has been very useful, there are many more unsafe occurrences that involve near-casualties (near-misses), e.g., near collision situations, near pollution events, etc., and related precursor events (hazardous situations), e.g., equipment maintenance/failures, communication problems, crew fatigue, poor procedures, human factors problems, etc., that, but for some corrective action in the chain of events, did not result in the occurrence of an accident or casualty. These non-accidents and/or unsafe occurrences are an untapped source of data that serve as leading indicators on the level of safety within the maritime community. Such data can provide the real time information needed to prevent accidents before they happen.

This system would receive, analyze, and disseminate information about unsafe occurrences. Participation would be voluntary and reports generated for distribution would be non-attribution based. The intent of this system is to capture, analyze, and distribute causal information and lessons-learned on unsafe occurrences and corrective actions taken at various points in the chain of events that prevented an accident by highlighting lessons-learned rather than culpability.

The Maritime Administration and the U.S. Coast Guard have signed a Memorandum of Agreement to work together with industry to develop and implement an industry led safety incident reporting system. The system is to serve the interests of the U.S. public and maritime stakeholders by identifying safety problems and facilitating appropriate preventive actions. The Coast Guard would be an end-user of the de-identified information that could be available through the system and would use the data to help validate the hypothesis tests described within the forecasting standard view project and direct resources to help industry counter operational system vulnerabilities and weaknesses.

The vision for the system in the broadest sense is to foster a cultural change in the maritime community through implementation of a national/ international maritime lessons-learned system that would be wholeheartedly supported by both the public and private sectors to create a safer and more efficient marine industry.

Our goals are as follows:

- Reduce the annual number of marine casualties, i.e., save more lives, reduce the extent and number of injuries, save more property, and reduce damage to the environment.

- Achieve a reduction in costs, associated with vessel system failures and accidents through the reduction of mariner deaths and injuries, loss of property, and damage to the environment.

- Create a safer and more efficient work environment for the mariner.

The concept is to collaborate with industry to design, development, and implement a national/ international system that can gather, maintain, analyze, edit, and distribute information on safety problems or situations. The gathering and distribution of information will permit the maritime community to take action on potential system vulnerabilities and weaknesses before a system failure and/or marine casualty occurs. Success will depend on industry's leadership in this process, the mechanism for gathering the data, and developing the means for effectively analyzing, using, and disseminating the information gleaned.

This industry-based initiative is intended to help the maritime community prevent marine casualties, e.g., EXXON VALDEZ, TORREY CANYON, etc. If this system can prevent one major incident, e.g., EXXON VALDEZ at an estimated clean-up cost of $3.2 billion, the savings could be astronomical. Also the knowledge gained from a systematic analysis of near-miss and/or related precursor events promises to point the way to those key interventions that should prevent casualties and thus save more lives and property, reduce the number of injuries, mitigate damage to the environment, and reduce operational and response costs for both the private and public segments of the maritime community. A successful system could serve as a source of tax relief for the general public, e.g., reduced pollution fund needs and carrier operational subsidies.

A major tenet of the FY1999 U.S. Coast Guard Performance Plan and the 1998 Performance Plan for Marine Safety and Environmental Protection is to produce effective results through our prevention programs. A national/international maritime lessons-learned system will allow the organization to actually get ahead of events and prevent casualties and their consequential costs in lives and property. The concept for the system is based on standard written and electronic reports of industry anomalies submitted to a non-regulatory third party or a network of parties (public or private) who reviews, confirms, clarifies, scrubs, stores the information in a database, and disseminates findings industry-wide. Output products would include alert reports, monthly/ periodic reports, analysis reports, direct database access to de-identified information, company specific reports as requested by that company, research products, and periodic risk seminars and symposiums. These output products will be made available to members, subscribers, and individuals that include vessel operators, government agencies, insurance companies, mariners, etc., and will protect the identity of the reporting party(s), involved vessel(s) and/or facility(s), and company(s), as applicable. It is also envisioned that the system will be able to provide non-attribution company specific reports, trend analysis, and rapidly produce and distribute safety alert messages. The intent is to have these output products made available on a fee or dues basis, and some products to be offered to the general public free of charge. Operating funds to get the system up and running will be needed until the said sources of income allow the system to be self-sustaining.

The forecasting standard view project and this project are part of the "Prevention Through People 1998 Focus Plan," and they support the Inspector General's recommendation on page 7-4 of Oil Pollution Act of 1990 (OPA 90), Section 4115, "Double-Hull Tanker Legislation," to ensure U.S. Coast Guard oil spill database includes thorough information on event/incident causes and promotes trend analysis. They also support all the program goals described in "Step 3" of the forecasting standard view discussion. Additionally, some industry base groups that consider the fallout from these projects essential for their safety arsenal include the Seattle based Safe Marine Transportation (SMART) Forum of Puget Sound, American Waterways Operators (AWO), Marine Board, and the carrier companies that are striving to comply with the ISM code. The list of parties within the maritime community interested in this aspect of the risk management equation continues to grow. Funding for the national/international maritime safety incident reporting system, in a nominal amount will support the demands of an industry that is striving to improve safety and reduce costs through improved operating and response efficiencies. Funding for the forecasting standard view initiative depends on the level of energy the maritime community wishes to expend on the idea. I estimate that $1 million would go a long way towards moving this idea through the life cycle process from research and development to implementation. In either case, the more funding we have the better the system(s) will be. Industry must resolve whether this ounce of prevention is worth the cure? I believe the answer is obvious, in the affirmative.

There are a number of related systems established in the world that could serve as a potential blueprint for a national/international maritime safety incident reporting system. Examples include the FAA/NASA/Battelle Aviation Safety Reporting System (ASRS), the Canadian Transportation Safety Board "SECURITAS" system. The ASRS Internet web site is http://olias.arc.nasa.gov/asrs, and the Canadian Transportation Safety Board Internet web site is http://bst-tsb.gc.ca. Other systems that are maritime related include The Nautical Institutes Marine Accident Reporting System (MARS), www.nautinst.org/marineac.html, the Human Factors Group Marine Safety Reporting System (MSRS), Det Norske Veritas SYNERGI system, http://www.synergi.no/, George G. Sharp, Inc. Safety Incident Management Information System (SIMIS), http://www.georgesharp.com, American Waterways Operator's Pacific Region Towing Industry Incident Report (TIIR), and the safety incident reporting system developed by the High Speed Commercial Craft Safety Board in New York to name a few.

The development and use of risk management methodologies within the maritime community (public and private) are essential in today's operating environment where full advantage of operating efficiencies and safety programs play key roles. This three part system using regression models, statistical hypothesis testing, and the results from an industry based national/international maritime safety incident reporting system can forever change the way Government and industry does business within the maritime community. The real winners here are the general public who will reap the safety benefits, and the cost benefits in reduced prices and taxes resulting from gains in efficiency within the international transportation/trade community and Government.[2] These initiatives represent a bold strike for marine safety. The time has come for the maritime community to transition their safety efforts from a defensive position to the offensive!

Endnotes and References:

1. Formula

S = f(Oi, Ri, Wi, Qi, Fi, Vi, Ei): These relational function variables have the following meaning:

S = Performance plans and maritime community safety measures mission and/or goal attainment.

Oi = Operating options based on mission program guidance, e.g., port safety and security program, vessel inspection program, marine environmental protection program, law enforcement, waterways management, industry safety programs, etc. Operating options can be further categorized in each mission area to include variables such as speed of movement, frequency of service, reliability of service, susceptibility to loss and damage, accessibility of service. A further explanation can be found in Talley, W.K., Transport Carrier Cost, New York, Gordon and Breach Science Publishers, 1988, pp. 44-46.

Ri = Resources, labor (people), energy or fuel, way (path over which the operate moves; natural path + aids like aids to navigation and roads), facilities or terminals, vehicles (cutters, boats, cars, trucks, etc.). Ibid. pp. pp. 41-43.

Wi = Cost of resources used in function by individual resource.

Qi = Number of mission or activity opportunities.

Fi = Program or goal funding level.

Vi = In a marine transportation setting this refers to the number of transportation miles expended. In the Coast Guard setting it refers to the operating, response or travel miles/time expended.

Ei = Environmental or external to the organization factors.

Function Expanded (read down):

Fi = $Fi(W_1, W_2, \ldots Wi; E_1, E_2, \ldots Ei)$

Ri = $Ri(O_1, O_2, \ldots Oi; Q_1, Q_2, \ldots Qi;$ constrained by Fi)

Vi = $Vi(R_1, R_2, \ldots Ri)$

S = S(Vi constrained by Ri)

Microeconomics regression modeling provides the best examples of the kind of approach I am envisioning for this process. Good maritime references include a number of articles written by Dr. Wayne K. Talley, Old Dominion University, Norfolk, VA. Specific articles include:

- Talley, W.K., *Transport Carrier Costing.* New York: Gordon and Breach Science Publishers, 1988, pp. 39-49, 57-76.

- Talley, W.K. and Frederick W. Beazley, "Performance Evaluation of Mixed-Cargo Ports", Old Dominion University, Norfolk, VA 23529, a paper prepared for the U.S. Army Corp of Engineers (USACOE).

- Talley, W. K., "Performance Indicators and Port Performance Evaluation," *Logistics and Transportation Review,* Volume 30 (1994), pp. 339-352.

- Talley, W.K., "Port Pricing: A Cost Axiomatic Approach," *Maritime Policy and Management,* (1994), Vol. 21, No.1, 61-76.

There is also a port productivity/efficiency model published in an article by Dr. Jose L. Tongzon entitled "The Port of Melbourne Authority's Pricing Policy": Its Efficiency and Distribution Implications," Maritime Policy Management, (1993) Vol. 20, No.3, 197-205.

2. Point of Contact: If you would like to comment on these projects, please forward your ideas, comments, insights, and questions to me as follows: LCDR Scott J. Ferguson, U.S. Coast Guard, Office of Investigations and Analysis, (202) 267-0715/1430, fax: (202) 267-1416, e-mail: sferguson@comdt.uscg.mil, mailing address: Commandant (G-MOA), U.S. Coast Guard Headquarters, 2100 Second Street, SW, Washington, DC 20593-0001.

The views expressed herein are those of the author and are not to be construed as official or reflecting the views of the Commandant or of the U.S. Coast Guard.

HAZMAT Training for the Mariner

Each day, new hazardous materials are being shipped either in bulk or in packaged form. At the same time, substances which were previously unregulated are being reclassified and regulated as hazardous materials. For the mariner, these and other similar problems present dangerous situations, which the mariner may have to deal with, should a shipboard hazmat incident occur.

The Coast Guard's own Container Inspection Program continually indicates the amount of errors occurring in the shipment of containers. Some reports have indicated that upwards of 60% of containers are improperly labeled or have inaccurate shipping papers. The end result is that an improperly documented container will most likely be improperly stowed and may be unsafely handled aboard ship. Once aboard and the vessel is at sea, the crew must now deal with the practical problems associated should a leak, release, or fire occur.

Aboard the vessel, the crew often lacks adequate research materials to identify the substance, characteristics, hazards, and provide cleanup guidance. IMDG (International Maritime Dangerous Goods) Code books, 49 CFR, and possibly a CHRIS (Chemical Hazards Response Information System) manual should be available aboard ship. However, other sources such as Material Safety Data Sheets, industry guides, and current manufacturer's information may not be readily available.

Proper personal protection equipment may also be lacking aboard many vessels. The required fireman's outfits only give limited protection from toxic materials, especially from substances that vaporize or are vapors that can be readily absorbed through the skin or eyes. Realistic vapor detection and gas monitoring capabilities may also be limited to only that of oxygen and explosive limit.

by Captain Lee A. Kincaid, Assistant Director, MEBA Engineering School and Barry VanVechten, HAZMAT Instructor, MEBA Engineering School

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Many companies and vessels often do not have a written Hazardous Communication plan and therefore cannot immediately implement an effective and safe containment and cleanup action. At the same time, crewmembers usually have little or no direct knowledge of the national and international legal implications for their actions taken during a spill containment and cleanup operation.

Lack of consistent and adequate hazardous material training appears to be widespread throughout the industry. Some vessels and companies have excellent training programs in place while others perform little or no training at all.

To achieve a higher level of awareness and knowledge, the Calhoon MEBA Engineering School in Easton, Maryland has been offering a 24-hour HAZMAT Technician course since 1994. The instructor for this course is Mr. Barry VanVechten. Barry has been a marine engineer for 21 years and has been an instructor for the Maryland Fire and Rescue Institute for the past 15 years.

Major topics covered in the course include: recognition of hazardous materials, risk assessment, personal protective equipment, information gathering, medical evaluations and toxicology, monitoring equipment, decontamination, tactical operations, emergency response plan development, and termination procedures. Practical field exercises allow the mariner to utilize command and control to initiate both offensive and defensive operations. Furthermore, from the realistic shipboard side, mariners receive training on effective tactics and procedures to implement while at the same time recognizing the limitations of the resources they may have available at sea.

The goal of this program is to provide the most current information available and give the mariner real solutions for handling hazmat incidents they may encounter while at sea.

Compatibility of Cargoes

by James Prazak
DOW Chemical

Most of us involved in the shipping of bulk marine products are aware of the U.S. Coast Guard Compatibility Chart that is found in 46 CFR Part 150. In fact, if you are shipping product in or out of the United States, you have to be aware of it to insure you meet the U.S. shipping requirements.

The Compatibility Chart is probably the most well known and utilized chart in the industry for the purpose it was designed for, and to that means, it is well designed. Many companies not only require vessels to comply with the chart for shipments involving the U.S., but also use it as a part of their shipping process for shipments on a global basis. There has even been some talk of adopting the U. S. chart as an international standard for the global bulk marine industry.

There are, however, reasons that you should use caution when using the chart, and understanding a little background on the chart will help you see why. Much of the data you will find in the chart was provided to the Coast Guard by industry (i.e. manufacturers, shippers, etc.). Some of this data was also developed by tests conducted by the Coast Guard. Some data was probably developed by "lessons learned" the hard way through unplanned, unwanted events.

As you look at the chart, notice a box with an "X", and realize that this points out that a reaction is possible, and that the cargoes cannot be carried in adjacent tanks. Likewise, you can look at a box with no "X", and that means that the cargoes can be carried in adjacent tanks. Before you finish, you must look at the list of exceptions following the chart to see if there could be an exception for the particular cargoes you are dealing with, which will supersede the listing on the chart. Every time a new product is classified for shipment in the U.S., the Coast Guard has to evaluate the information they have to assign the product to a category and determine whether the new product will or will not react with the products/categories already listed on the chart. It sounds easy from here, but in reality, it's a tough job since in many cases the available data is relatively scarce.

The Coast Guard has a well-defined process for conducting tests to determine if two products should be listed as compatible or not. This process can be found towards the end of Part 150. However, as well written and well defined as this process is, it does not necessarily cover every possible aspect . It is possible that the conditions of carriage of one cargo or of an adjacent cargo will not necessarily agree with the laboratory conditions of the compatibility testing that was done. The temperatures may be slightly higher or slightly lower, inhibitor levels may be slightly different, an inert gas may be present (or absent), etc. The point is that there are many factors that can affect whether two seemingly compatible products will react or not. If the chart has an "X", do not load the products in adjacent tanks in order to prevent a reactive chemical incident should they accidentally mix together. If there is no "X", it is safe to load the cargoes in adjacent tanks and feel confident that a reaction won't take place, provided every aspect of your carriage of the cargoes matches the laboratory conditions where the compatibility testing was performed.

The key points that I hoped to point out through this article are:

The compatibility chart is an excellent tool, not only for marine shipments, but also for general use throughout operations;

The chart was developed with the help of the industry, and will need to be continuously improved with industry's help.

If you see a possible conflict between information you have and what is shown on the chart, that information should be immediately brought to the Coast Guard's attention. That information should be sent to:

Commandant (G-MSO-3)
U.S. Coast Guard
2100 Second Street, S.W.
Washington, DC 20593-0001

Use the chart, but use it wisely. Help us protect our seafarers, the environment, and our industry, by continuously working together to share our knowledge and learning experiences in the carriage of our cargoes.

CARGO COMPATIBILITY

X = Incompatible combination

CARGO GROUPS / REACTIVE GROUPS	1. NON-OXIDIZING MINERAL ACIDS	2. SULFURIC ACID	3. NITRIC ACID	4. ORGANIC ACIDS	5. CAUSTICS	6. AMMONIA	7. ALIPHATIC AMINES	8. ALKANOLAMINES	9. AROMATIC AMINES	10. AMIDES	11. ORGANIC ANHYDRIDES	12. ISOCYANATES	13. VINYL ACETATE	14. ACRYLATES	15. SUBSTITUTED ALLYLS	16. ALKYLENE OXIDES	17. EPICHLOROHYDRIN	18. KETONES	19. ALDEHYDES	20. ALCOHOLS, GLYCOLS	21. PHENOLS, CRESOLS	22. CAPROLACTAM SOLUTION		
1. NON-OXIDIZING MINERAL ACIDS		X			X	X	X	X	X	X	X	X	X			X	X							1
2. SULFURIC ACID	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		2
3. NITRIC ACID		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			3
4. ORGANIC ACIDS		X			X	X	X	X				X				X	X							4
5. CAUSTICS	X	X	X	X							X	X				X	X		X	X	X	X		5
6. AMMONIA	X	X	X	X						X	X	X	X			X	X		X					6
7. ALIPHATIC AMINES	X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X		7
8. ALKANOLAMINES	X	X	X	X							X	X	X	X	X	X	X		X					8
9. AROMATIC AMINES	X	X	X								X	X							X					9
10. AMIDES	X	X	X			X						X									X			10
11. ORGANIC ANHYDRIDES	X	X	X		X	X	X	X	X															11
12. ISOCYANATES	X	X	X	X	X	X	X	X	X	X										X		X		12
13. VINYL ACETATE	X	X	X			X	X	X																13
14. ACRYLATES		X	X				X	X																14
15. SUBSTITUTED ALLYLS		X	X				X	X																15
16. ALKYLENE OXIDES	X	X	X	X	X	X	X	X																16
17. EPICHLOROHYDRIN	X	X	X	X	X	X	X	X																17
18. KETONES		X	X				X																	18
19. ALDEHYDES		X	X		X	X	X	X	X															18
20. ALCOHOLS, GLYCOLS		X	X		X		X					X												20
21. PHENOLS, CRESOLS		X	X		X		X			X														21
22. CAPROLACTAM SOLUTION		X			X		X					X												22
30. OLEFINS		X	X																					30
31. PARAFFINS																								31
32. AROMATIC HYDROCARBONS			X																					32
33. MISCELLANEOUS HYDROCARBON MIXTURES			X																					33
34. ESTERS		X	X																					34
35. VINYL HALIDES			X																			X		35
36. HALOGENATED HYDROCARBONS																								36
37. NITRILES		X																						37
38. CARBON DISULFIDE							X	X																38
39. SULFOLANE																								39
40. GLYCOL ETHERS		X										X												40
41. ETHERS		X	X																					41
42. NITROCOMPOUNDS					X	X	X	X	X															42
43. MISCELLANEOUS WATER SOLUTIONS		X										X												43
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		

Chemical Distribution Institute

by D. V. Bessant

The Chemical Distribution Institute (CDI) is a non-profit independent organization created by the chemical and chemical shipping industries to provide a vessel inspection system. Its key objective is to provide improvement to safety and quality performance for marine transportation of bulk liquid chemicals in an accurate, objective, efficient and cost effective manner.

Unique strengths of the system are its processes for selection, training and accreditation of ship inspectors, for the development and use of a standard format for inspections, and for a database in which reports are logged and accessed for analysis.

Chemical companies have made commitments to adopt safe management practices in their distribution and transport. For chemical shipping the safe practices were developed to meet these commitments by a marine work group comprising of representatives from the chemical industry, shipowners, and shipowner associations. CDI was established in 1994 to implement and operate the systems of work they developed.

CDI is administered in the UK with the support of Electronic Data Systems (EDS) who provide the database management, and The Centre for Advanced Maritime Studies (CAMS) in Edinburgh who provide independent monitoring of inspection reports.

The inspection format provides detailed status of operational and management standards in the following areas for each vessel inspected. Results are measured and reported as compliance with regulations, conformance with industry codes of best practice and quality performance.

- Certification, manning etc.
- Lifesaving appliances
- Management and personnel
- Pollution prevention
- Navigation and bridge organization
- Security
- Mooring
- Hull and superstructure
- Cargo operations
- Accommodation
- Engine department
- Cargo tank physical condition
- Operational safety
- Cargo handling equipment
- Health, safety and personnel protection
- Cargo monitoring equipment
- Fire fighting equipment
- Ballast and other spaces

CDI inspections are conducted by inspectors who have been selected, trained, examined and tested before being accredited to conduct inspections using the CDI format. A charterer who is a participant in the CDI scheme can initiate the inspection or a shipowner who has the vessel entered to the CDI database. The inspection, which is comprehensive, takes approx. 10-12 hours to complete.

Before the completed report is entered into the database the vessel owner has the opportunity to review the report and to add to it any comments he would like to have included. The report and owner's comments remain on the database for access by charterer participants for a maximum period of up to 13 months, after which it is archived.

Release of a report to individual charterer and other interested parties, such as Port State Control, must have prior written approval of the owner of the vessel to which the report refers.

In summary, the CDI scheme is a practical operating example of a voluntary scheme developed to improve the safety and quality performance of chemical shipping. It provides the chemical industry with appropriately trained and qualified inspectors and a consistent uniform approach when assessing standards of chemical and chemical gas ships.

The benefits of the scheme for shipowners are that they reduce the number of inspections required by different charterers and thereby save considerable time. The inspection results also help owners to improve the safety of their vessels.

The benefits for charterers is that the scheme reduces the considerable cost of conducting individual inspections by providing ready access to recent information from which they can judge for themselves the suitability of a vessel they might wish to use.

Current performance statistics for CDI are:

- 27 chemical companies participating in CDI, located world-wide
- 45 accredited inspectors in Europe, N.America, S.E. Asia, Australia, and Middle East
- 268 shipowners registered with CDI
- 1020 ships registered with the scheme
- 1855 inspections since CDI stated operations in 1995
  - 203 in 1995
  - 525 in 1996
  - 668 in 1997
  - 470 in 1998 (to end July)

For further information please contact:

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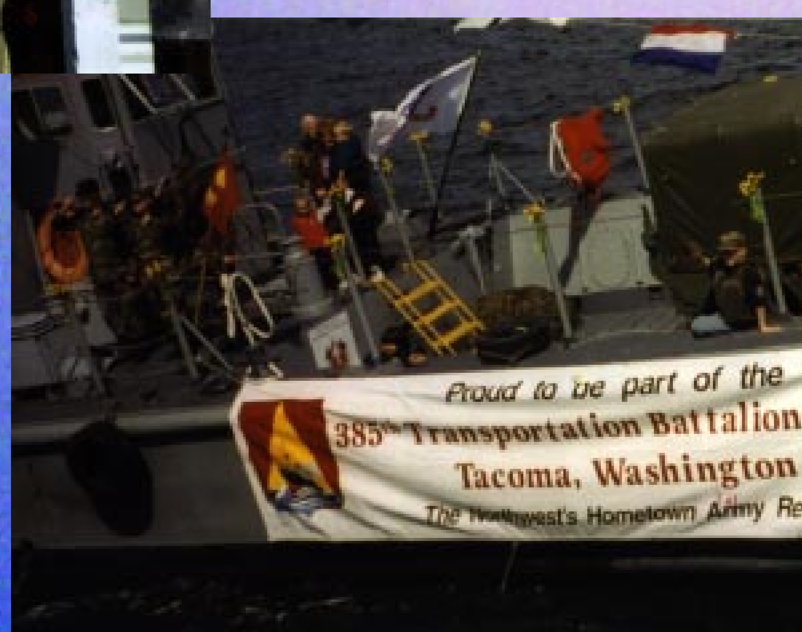
E-mail: chemdist@aol.com

Photo Contest Winners

Honorable Mention: Diesel Marine Moc

"A New Day in Port Jefferson, New



3rd Place: Barbara Sanders

"1998 Daffodil Watercraft Show, Puget Park, Tacoma, Washington"

1st Place: Christiaan Werk
“*Queen Elizabeth II* Entering Outer Harbour, Adelaide”

2nd Place: LT Chris Woodle, USCG
“M/V Kuroshima Aground”

prings, Inc.
York”

Thanks to all who participated!

Liquid Natural Gas Carrier Safety in the U.S.: The Expectation is (and has always been) Excellence

By CDR Robin Crusse, LT Joseph McKechnie, and LT Joseph Fierro, USCG

Waterborne Liquid Natural Gas (LNG) projects in the U.S. have an enviable operational record and have achieved a near perfect safety record. The technology and management practices used by this segment of the maritime industry has been on the "cutting edge" since the barge MASSACHUSETTS started the trade in the late 1950's. Cargo safety and system reliability have always been fundamental considerations in the design of vessels for importing liquid methane. Liquid Natural Gas Carrier (LNGC) safety in the U.S. has continually originated best practices in the shipping world. Industry challenges require innovative approaches to maintain quality at the highest level. LNGCs represent a blend of conventional ship design with specialized materials and high tech systems required for the carriage of cryogenic cargo. Their operations set the standard for excellence.

Three U.S. Led LNG Projects Set the Standard for Excellence

A consortium of U.S. companies combined to start the Algeria I LNG Project in 1969. It was envisioned as the largest LNG transportation project in the world but was prematurely concluded in 1980 with 100 LNGC transits and cargo operations lasting 2+ years. The three ports, Arzew, Algeria; Elba Island, Georgia; and Cove Point, Maryland are located in relatively isolated areas to minimize the risk to population centers.

Forward thinking executives managed the project. Among the leaders, Captain Warren Leback of El Paso Marine Company, and Captain Bill Kime, of the Coast Guard became the Maritime Administrator and Commandant of the Coast Guard respectively. They set a high standard and recognized that there was no tolerance for mistakes if the project was to succeed. They took every possible step to ensure that all employees and subordinates embraced the high standards. Quality processes were instituted from the top.

The LNGCs were designed to be compatible with the specific facilities with which they traded. The facilities were engineered using the highest Federal, State and local construction standards. The facility's details were designed to be compatible with the vessels, down to the mooring systems with emergency breakaway capabilities. The facilities were also designed to minimize maintenance requirements using stainless steel wherever possible.

El Paso Marine instituted comprehensive training for the LNGC crew. They provided simulator training for the bridge crew including the pilots and mates of the tugs that assisted with mooring. The crew also attended marine fire fighting as a team. El Paso employed single nationality crews for all their vessels to ensure fluent communication. Vessel and facility managers partnered with the Coast Guard to develop and exercise all encompassing contingency plans. Coordination between Coast Guard MSOs and districts reduced unnecessary redundancies in inspections.

Energy Transport ETC operates LNGCs that General Dynamics built in their Quincy Massachusetts yards, trading between Japan and Indonesia since 1978. Seven of these LNGCs participate in the Alternate Compliance Program (ACP) where specially trained ABS surveyors conduct statutory inspections for the Coast Guard. The program reduces redundant inspections between classification societies and Flag State and attains an equivalent level of safety.

CG Safety Measures at Active U.S. LNG Facilities

R. E .Crusse, G-MO-1 8/26/98

Port	LAKE CHARLES	KENAI	BOSTON
Coast Guard Escort	Yes (CG Auxiliary from below ICW)	No	Yes
Daylight Transit	Yes	No	Yes
100 % Transfer Monitor	Quarterly	No	Yes
Pre-arrival Inspection (ship)	At Facility	Quarterly	Always
Coast Guard Shipriders	Quarterly (entire route)	No	Always
Tugs for Docking	Yes	No	Yes
Urban Population	No	No	Yes
Partial Transfer Monitor	Yes	Quarterly	Yes
Safety Zone	Yes	No	Yes

Kenai, Alaska LNG Operations commenced in 1969, exporting approximately one million metric tons yearly to Negishi, Japan. The facility is approaching thirty years of sustained incident free operation through the Marathon and Phillips 66 partnership. The 40 employees are well trained and committed to preventive maintenance and plant safety. The plant uses a rigorous performance based management program including regular inspections and an in-depth plant review annually. The Marathon Facility applies a typical quality approach to managing their plant that strives for continuous improvement in LNG safety and efficiency.

Marathon and Phillips 66, the vessel operators replaced two technically sound though aging, LNGCs with new tankers in 1993 and 1994. These were the first ships to use IHI self-supporting prismatic cargo tank design. This design features independent tanks that closely match the shape of the hull to combine the seagoing advantages of a flat decked ship and the cargo carrying flexibility of rigid, self-supporting tanks. This equipment replacement recognized that the weather on the route was extreme. The harsh conditions increase wear on the technically complex LNGC. Marathon installed stress gauges to measure forces on the hull. Recognizing that crew experience on LNGC is paramount they retained the expertly trained, single nationality crew on the new vessels.

LNG Policy Is Explained In Single Document

A team of Coast Guard officers made significant contributions to the International Maritime Organization (IMO) Standards for gas carriers. Admirals Henry Bell, Mike Benkert, Bill Kime and Gene Henn developed portions of the code for use worldwide influenced by the lessons learned at these U.S. projects. They were also involved with approving the Technigas carrier containment system for use in the U.S. Also using this insight Coast Guard policy documents as well as COMDTINST 16616.4 were developed by members of this group.

The best practices from these projects were conveyed to maritime interests world wide through a comprehensive Coast Guard Policy document. In 1976 the Coast Guard summarized the requirements and lessons learned in LNG & LPG, Views and Practices, Policy and Safety, COMDTINST M16616.4. The drafters recognized the integration of vessel design, facility design, operational controls and training requirements in the safety equation. They used the tenets upon which the International Safe Management Code is based. The policy also acknowledged the advantages of local autonomy in defining risk and conducting risk management.

The document presents generic spill scenarios and explains the characteristics of LNG pools, fires and vapor clouds and identifies the significant hazards of the transportation of large quantities of liquid methane

on the water. The extreme flammability and very low temperatures characteristic of LNG require that the cargo remain in its containment. The authors recognized that it is not possible to design a ship to withstand the most serious collision and grounding. Operational controls were recommended such as restricting other vessel traffic and limiting LNGC to daylight operations to prevent a major collision. Many examples are provided to allow the local decision-makers latitude and choices to attain an equivalent level of safety.

LNGC Risk Mitigation Achieved Through Local Regulations

Comparison of CG Safety Measures at Active U.S LNG Facilities (chart) demonstrate the application of the standards from COMDTINST 16616.4 based on risk management exercised by local Captain of the Port. The chart shows the numerous operational measures used to mitigate risk on LNGC. Note that the measures reflect the geographic location of the terminals relative to population centers. With its urban setting, Boston employs the greatest number of safety measures. Lake Charles, Louisiana in its rural setting uses a moderate number while Kenai, Alaska exerts minimum control due to the remote site of the facility.

Local Operations Use Proactive Approaches To Ensure Safety:

The local Coast Guard proactively manages the risk of LNG operations in their area of responsibility.

BOSTON: U.S. Coast Guard Marine Safety Office (MSO) Boston is an internationally recognized leader in LNG safety and provides oversight of the carriage of LNG into the port of Boston for more than two decades. Initially, barges fitted with tank trucks transported LNG from anchored LNGCs to the Dorchester Bay LNG facility. Starting in 1971, LNG arrived at the newly constructed Distrigas facility in Everett, Mass. Cargo volumes ranged from about 60,000 cubic meters to 125,000 cubic meters. As of July 1998, 310 LNG cargoes have been safely offloaded at the Distrigas terminal. Boston is the busiest LNG import terminal in the United States.

To effectively describe the operating requirements and restrictions to vessel owners, operators and the receiving facility, a mechanism was needed. Following the publication of COMDTINST M16616.4 in 1980, MSO Boston developed a comprehensive LNG Vessel Management and Emergency Plan (VMEP) that is still used today. The VMEP details the safety measures including the pre-arrival exam, vessel escort and transit, cool-down, and discharge monitor for all LNGCs in Boston. It is frequently amended to ensure it remains current with the regulatory changes.

The need for all stakeholders to work together is never more apparent than during the arrival, transit and discharging of an LNGC. The urban location of the Distrigas terminal in Everett, combined with the fact that a loaded LNGC must transit through downtown Boston to reach the terminal, compels all stakeholders to remain vigilant to ensure that the necessary level of safety exists. MSO Boston applied the national policy to their circumstances.

As part of continued process improvement, MSO Boston and Distrigas of Massachusetts Corporation committed to collaborate in the development of a milestone program between regulatory agencies and industry. This program is named Port Vision 2000: a Partnership for the Future. It is founded upon goals and objectives common to both regulator and industry and designed to manage the increase in the annual number of LNG cargoes into the port of Boston. It optimizes resource efficiency and minimizes the impact on other vessel traffic with its goal to retain the current level of protection of life, property, and the environment. The fundamental approach is to identify all stakeholder issues, provide prescribed responses where appropriate, and develop guidelines for making critical decisions in response to conditions and incidents that may occur during transport of LNG. The Coast Guard/industry team planned for possible mishaps.

One of the challenges that was brought to light by training base data, and one that faces the Coast Guard and industry today, is the continued turnover of qualified marine inspectors and boarding officers. This shortcoming is magnified when LNG experience is considered. As noted previously, only three ports in the U.S. handle LNG. This means that the number of qualified Marine Inspectors and Boarding Officers exposed to the complexities of LNG carriers or the product is limited. With a projected increase in the number of LNG cargoes arriving annually this caused serious concern in the port of Boston. Over the past five years, with the help of Distrigas and their corporate Safety Committee, MSO Boston has initiated a program inspecting and conducting training on the LNGCs that transport cargo to Boston. The program provides symbiotic benefits to Coast Guard and industry in that the satisfactory condition of the LNGCs is ensured before the vessel reaches the sea buoy. It has taken MSO Boston Inspectors to Spain, France, Portugal, Greece, Japan, United Arab Emirates, and Louisiana to witnesses and share best practices. They travel to the LNGC to mitigate the risk that these vessels bring to the port.

These experiences have allowed MSO Boston to be the recognized "Center of Excellence" on LNGC safety and to partner with other Coast Guard commands while supporting the Commandant's goal of keeping substandard ships from U.S. waters. MSO Boston developed excellent

working relationships with Coast Guard Headquarters, Traveling Inspectors; Marine Safety Detachment Lake Charles; Marine Inspection Office, Europe; and Far East Activities/Marine Inspection Office Asia.

Another venture, this time with CG Activities Baltimore, has begun as the LNGC MATTHEW (ex. GAMMA, EL PASO HOWARD BOYD), owned by Distrigas' parent company Cabot Corporation, completes refurbishment and reactivation for the carriage of LNG from Trinidad to Boston. Whether it involves visiting the dedicated LNGCs while they are in a shipyard repair period or prior to their arrival at Boston in a loaded condition, these trips are most advantageous. The overseas inspection program has increased the number of experienced inspectors and improved effectiveness in oversight of LNG operations and will continue to be a major component in MSO Boston's risk management as well as their training program.

Another tool that has evolved from the partnership between Distrigas and MSO Boston is the joint training sessions. Coast Guard personnel participate in numerous indoctrination programs at the LNG Facility in Everett, MA. These programs ensure that CG personnel have an in-depth understanding of the properties of LNG and are introduced to the industry's precautions and concerns. In-turn, the Distrigas personnel attend Coast Guard training which details the LNGC inspection process as well as CFR, SOLAS, and IMO requirements. The partnership developed by MSO Boston epitomizes "Prevention Through People" and further illustrates the innovative means used to ensure LNG safety.

LAKE CHARLES: Though unlike Boston in customer base and geographic characteristics, Marine Safety Detachment (MSD) Lake Charles uses quality processes to ensure safe LNG operations. MSD is a detachment of MSO Port Arthur, Texas. It is unique because of it's size, (27 personnel, as large as many MSOs) and because it is one of only two ports in the U.S. that import LNG.

Located in Southwest Louisiana, 25 minutes from the Texas State line, Lake Charles and the surrounding communities comprise approximately 80,000 people. The MSD is involved in numerous Commercial Vessel Safety (CVS) and Marine Environmental Protection (MEP) program activities. In addition to their LNG related activity, Lake Charles marine inspectors conduct safety inspections on four casino vessels and provide service to offshore supply vessels in Cameron, Louisiana. They monitor repair work at Halter Marine's Calcasieu yard and new construction at the Leevac Shipyard. Personnel from other groups work with OUTVs, facility safety and casualty investigations.

Coast Guard actions supporting the movement of an LNGC up the Calcasieu River to Lake Charles use every element of the MSD. The Port Operations Department sends a broadcast notice to mariners, prepares the small boat for escort duty and conducts a facility inspection before transfer. The marine inspectors board the LNGC underway to conduct safety examinations of the sophisticated cargo and propulsion systems. Each component is focused on the safe and efficient movement of the LNG cargo. The operations illustrate the one Coast Guard concept and show the synergy of team Coast Guard.

The Trunkline LNG terminal is a modern facility that opened in 1981 and cost $580 million to construct. It is located on a 384-acre site in the Lake Charles Harbor approximately nine miles southwest of the city. The terminal is 25 miles from the junction the Intercoastal Waterway and the Calcasieu River. It has 3 storage tanks with a storage capacity of 1.8 million barrels, equal to 2.3 tanker loads. It is designed to stringent standards and built to withstand wind speeds up to 150 mph, rated for earthquake zone 1 and is above the predicted flood plain and hurricane tidal surge. Its design surpasses the predicted 100-year maximum weather conditions. Five 16 inch articulated arms transfer LNG from the ship to the terminal's tanks. The terminal receives cargoes delivered by dedicated LNGCs from Algeria as well as chartered LNGCs from Australian facilities. It delivers natural gas to Duke Energy Corporation that in turn sells electricity to almost 2 million households and operates pipelines that deliver 12 percent of the natural gas consumed in the United States.

Trunkline LNG and Duke Energy personnel worked with the MSD to develop ship, terminal and operations management plans. Monitors from the MSD attended industrial fire fighting school sponsored by the terminal during start up. Trunkline LNG recognized that it is beneficial to use fully trained Coast Guard inspectors.

Coast Guard Marine Safety personnel attended workshops with LNGC crew and terminal operators to describe the inspection process and understand each other's responsibilities. Indoctrination and orientation seminars are offered by Trunkline LNG to assist new Coast Guard safety monitors to understand each step in the delivery process from the facility dock to the pipeline.

Recently the SS LAKE CHARLES and SS LOUISIANA changed flags from U.S. to Bahamian. Both Coast Guard offices coordinated a standard examination procedure to ensure consistent application of the regulations since the LNGCs were scheduled to deliver cargo to both Boston and Lake Charles. To reduce the potential for misinformed officers, Coast Guard inspectors attended a workshop with the LNGC crew to discuss the LOC examination process and respond to their questions.

In collaboration with MSO Boston and the Traveling Inspectors, the officers new to the program

were instructed in the Coast Guard risk assessment and mitigation process. This helped in their understanding that there may be different requirements from different ports.

The Coast Guard explained to Immigration and Naturalization Service (INS) and Customs that the time away from critical systems by key individuals needed to clear the vessel impacted safe operations. The Federal agencies cooperated with the Coast Guard to clear these key officers quickly after arrival. INS and customs decision helped to control the risk of over pressurizing LNG tanks and avoided venting LNG to the atmosphere.

Future Projects and Innovative Approaches to Safety

Futuristic LNG submarines were proposed by General Dynamics to cruise beneath the Arctic Ice Cap delivering gas to North America and Europe from under Alaska's North Slope Market. Conceivably, these gargantuan structures would be designed to load at submerged terminals, discharge at custom designed facilities and be powered by methane fired boilers. They could be a future generation of LNGC.

The Coast Guard uses an Outline of Cooperation to describe the link between the stakeholder and the Coast Guard. The stakeholder acknowledges their vested interest in safe operations function as an intermediary for their business partner. This type of agreement originated between classification societies and the Coast Guard to expedite control verification exams on cruise ships. It provides a single point of contact for the vessel inspection process and builds upon existing relationships. The Coast Guard is evaluating the use of this mechanism with the stakeholder being the facility operator. They would partner with the Coast Guard to ensure that their trading partners meet the accepted vessel standards.

The LNG market has not expanded significantly in the U.S. due to the cost and availability of product. Presently a new project is under construction in Trinidad to deliver LNG to Boston and Spain. The market is too soft for major capital expenditures for ships using advanced technology. The standard of excellence must be maintained with organizational and training improvements like the International Safe Management Code and STCW.

Coast Guard partnerships with the LNG industry and cooperation between Marine Safety Office's (MSO) maintain the outstanding safety record on LNGCs. Guidance and technical support from headquarters completes the safety equation. The Coast Guard establishes a high level of safety on LNGCs in the public arena. They gain consensus with state and local interests, other Federal regulators and the LNG industries prescribing risk management and other forms of data based decision-making. The local Coast Guard also informs concerned citizens of their regulatory approach so that there is no surprises, especially in emergency situations.

When meeting with the participants, the Marine Safety Officer is the Coast Guard to the group. They aren't observers, can't wire home for instructions, must be technically prepared and know where they want to take the group. They exercise leadership and the responsibilities given to them by the Coast Guard.

Following three minor mishaps on aging LNGC, none related to cargo or safety systems, the U.S. Coast Guard reiterated their expectations in March 1998 for "No show stoppers" prior to port entry. Coast Guard headquarters saw a possible trend and took quick action to reinforce expectations of zero major deficiencies. The Coast Guard decreed that in addition to meeting all U.S. and international standards, the safety management systems (SMS), mandated by IMO must work as designed. The Coast Guard applied quality principles and mandated causal analysis and corrective actions for non-conformities in the SMS. Technological advances may be offset with training and organization advances especially on aged vessels.

The Coast Guard continues to use innovative approaches to marine safety such as pro-active performance based regulation, advanced risk management approaches, team training and integrating design attributes with operational constraints. The comprehensive safety program applied to the carriage of LNG reduces the risk to an acceptable level. Safety is designed into LNGCs to prevent or control all types of potential incidents. The methods used demonstrate best practices in the maritime industry.

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LT Joseph Fierro is the Assistant Supervisor MSD Lake Charles. He was a finalist for Jarvis Award, presented by Coast Guard for leadership excellence and is the coordinator for submission of SW Louisiana Quality Award for excellence in government service.

Differences in Classification of Hazardous Locations

by Laura Hamman
USCG Headquarters, G-ADW

The International Electrotechnical Commission (IEC) and the United States National Fire Protection Association (NFPA 70) National Electrical Code (referred to as the NEC) have different methods of classifying hazardous locations. The IEC uses a method of "Zones" and the NEC uses either a method of "Divisions" or a slightly different method of "Zones" than found in the IEC. Although there are some similarities between the various methods, the differences in the location classifications cannot be ignored. (There are differences in both explosive gases and vapors as well as in dusts. This paper will only address the differences in explosive gases and vapors hazardous location methods.) "Zones" and "Divisions" are very different classification methods, they are not interchangeable, or directly equivalent, as can be seen in the definitions below, and should never be intermixed in a particular hazardous location classified area.

Various authorities and industry standards groups are trying to work together to allow acceptance of a single hazardous area location classification system. However, at this time, Zones and Divisions are still very different methods.

For Class I hazardous classified locations, the IEC specifies three Zones (0, 1, and 2), and the NEC specifies two Divisions (1 and 2) or uses a method similar to the IEC with three Zones (0, 1, and 2). A Class I hazardous classified location, for both methods, is a location in which flammable gases or vapors are, or may be, present in the air in quantities sufficient to produce explosive or ignitable mixtures.

In the IEC, hazardous classified location is defined for *Class I, Zone 0,* as an area in which an explosive gas atmosphere is present continuously or for long periods. For *Class I, Zone 1* it is defined as an area in which an explosive gas atmosphere is likely to occur in normal operation. For *Class I, Zone 2*, it is defined as an area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only.

In section 500 of the NEC, the hazardous classified location for *Class I, Division 1* is defined as an area

(1) in which ignitable concentrations of flammable gases or vapors can exist under normal operating conditions;

(2) in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or

(3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors and might also cause simultaneous failure of electrical equipment that could act as a source of ignition.

The hazardous classified location for *Class I, Division 2* is defined as an area:

(1) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment;

(2) in which ignitable concentrations of gases or vapors are normally prevented by positive

mechanical ventilation and might become hazardous through failure or abnormal operation of the ventilating equipment; or

(3) that is adjacent to a Class I, Division 1 location and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

In section 505 of the NEC, the hazardous classified location *Class 1, Zone 0* is defined as an area

(1) in which ignitable concentrations of flammable gases or vapors are present continuously; or

(2) in which ignitable concentrations of flammable gases or vapors are present for long periods of time. (NEC Section 505-9(a))

The hazardous classified location for *Class I, Zone 1* is defined as an area

(1) in which ignitable concentrations of flammable gases or vapors are likely to exist under normal operating conditions;

(2) in which ignitable concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage;

(3) in which equipment is operated or processes are carried on, of such a nature that equipment breakdown or faulty operations could result in the release of ignitable concentrations of flammable gases or vapors and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition; or

(4) that is adjacent to a Class I, Zone 0 location from which ignitable concentrations of vapors could be communicated, unless communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. (NEC Section 505-9(b))

The hazardous classified location for *Class I, Zone 2* is defined as an area

(1) in which ignitable concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period;

(2) in which volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors normally are confined within closed containers or closed systems from which they can escape only as a result of accidental rupture or breakdown of the containers or system, or as the result of abnormal operation of the equipment with which the liquids or gases are handled, processed, or used;

(3) in which ignitable concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as the result of failure or abnormal operation of the ventilation equipment; or

(4) that is adjacent to a Class I, Zone 1 location, from which ignitable concentrations of flammable gases or vapors could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided. (NEC Section 505-9(c))

Zone hazardous area locations and Division hazardous area locations do not coincide. Class 1, Division 1 hazardous area locations encompass Class 1, Zone 0 and Class 1, Zone 1 hazardous area locations. Although Class 1, Division 2 and Class 1, Zone 2 hazardous area locations are very similar, there are still significant differences between the two.

Beyond the definitions of the locations, the major points of difference are the wiring methods used, ingress protection, the methods of protection, the apparatus groups, the temperature codes, marking, and the allowance of plastic instead of metal in various equipment and locations.

Wiring methods for the IEC and NEC differ mainly around the use of conduit and seals. The NEC allows the use of conduit and requires seals to prevent pressure piling in the conduit, as well as preventing the transfer of gases between locations via the conduit. Since the IEC doesn't allow the use of conduit, the requirement for conduit seals is not addressed.

The differences in the ingress protection methods, between the IEC and NEC, are related to the differences in wiring methods. The use of conduit changes the method of entering and exiting enclosures and equipment. As noted above, conduit is not allowed in IEC hazardous area locations, thus the use of gaskets and seals is significantly different for equipment enclosures designed for Zones versus Divisions.

The methods of protection vary in the types, names and definitions of the methods of protection. Many methods are similar, and can be used in either IEC Zone, or NEC Division or Zone, locations. However, equipment must be labeled for the hazardous area location where it will be installed. If a piece of equipment can be used in either a Zone or a Division hazardous area location, it must be marked accordingly.

The apparatus groups specifically differ in the classification of hydrogen. IEC Group IIC is equal to NEC Class I/Group A; IEC Group IIB is equal to NEC Class I/Group C; IEC Group IIA is equal to NEC Class I/Group D; and IEC Group I is equal to NEC "Mining" areas. However, the difference is in the treatment of hydrogen. Hydrogen is treated as IEC Group IIB + H_2, but the NEC has a separate Class I/ Group B apparatus grouping which includes hydrogen. (There are also differences in dust groupings. However, the differences in the IEC and NEC in the area of dusts are not addressed in this article.)

The temperature differences are more focused on the splitting up of the temperature ranges. The Temperature Identification Number (T Code/Temperature Class) is a system of classification by which temperature identification numbers are allocated to apparatus. The IEC only recognizes 6 different temperature ranges, whereas the NEC has a total of 14 different ranges. The temperature identification number represents the maximum surface temperature of any part of the apparatus that may come in contact with the flammable gas or vapor mixture. Although there are similarities between the IEC and NEC temperature codes, there are significant differences that cannot be overlooked.

The differences in marking are related to all of the previous differences. All differences identified above lead to differences in the marking of the item. Even the use of different names for similar methods of protection causes different markings.

Finally, the IEC allows the use of plastics in many areas where the NEC allows for only metal enclosures and equipment. The differences date back to the 1950's, and are wide spread throughout the different hazardous location classification methods.

For almost 100 years, the NEC has been providing safety guidance for the North American continent in the use of electrical equipment and wiring methods. During this time the NEC has been updated regularly and even now incorporates various aspects of the IEC hazardous location methods. However, this is an evolutionary process, and it is expected that both the IEC and NEC will be working toward compromise in the methods without sacrificing safety. There must be willingness on all sides to accept equivalent, but alternative, hazardous location methods, without trying to force fit exact equivalence where it doesn't exist. Wholesale cross-referencing will not work without consideration of the all of the differences between the IEC and NEC hazardous location methods.

What's In A Name?
(Cargo Name, That Is)

by Dr. Alan Schneider, United States Coast Guard and Mr. Robert K. Snyder, Union Carbide

Everyone has a name, and so does each authorized bulk liquid cargo that moves via inland barges, ocean barges, and tankships. Unfortunately, some cargoes have more than one name, and some have not yet been assigned one (and therefore should not be shipped until the Coast Guard assigns a name). This can lead to trouble!

In order for everyone to "speak the same language," we should all use the same cargo names assigned by the U.S. Coast Guard and listed in the appropriate tables in Title 46, Code of Federal Regulations (CFR). You can find these tables in Title 46, Parts 30, 151, 153, and 154. Be sure not to use a package name for a bulk liquid cargo or vice versa; package and bulk names are very different and cargoes classified under one mode may or may not be authorized for the other. Actually though, it's pretty simple to locate the proper cargo name; all you have to do is look in the appropriate Title 46 cargo tables and you'll find the proper cargo name along with its corresponding shipping requirements. Then you use the same name in all aspects of marine transportation. This is the best (and only) way to make sure everyone knows what you're shipping. If you do not find your cargo in the regulations, please contact the Coast Guard. We will either find it in the tables under a synonym or we will classify the cargo (classifying means evaluating the safety and pollution hazards of a new cargo and developing a set of requirements for safely shipping that new cargo). Unlike Title 49, which permits shippers to self classify package cargoes, the Coast Guard does not authorize shippers to classify bulk cargoes, on either tank barges or tankships. For information or assistance with bulk cargoes please contact the Hazardous Materials Standard Division: Dr. Alan L. Schneider (202-267-1217) or Mr. Curtis G. Payne (202-267-1577).

Why is this important? After all, if a company uses the name "vinegar" rather than "acetic acid," haven't they just saved a little time and effort? Haven't they merely simplified things? Actually, they haven't. Since "vinegar" doesn't exist in the regulations, they are only creating confusion and courting danger. What are the regulations for shipping "vinegar"? You'll have trouble finding them because they don't exist! What vessels and what tanks can you put it into? You'll never know, since the vessel papers do not (and can not) include "vinegar"! By using "vinegar" you are assuming everyone involved in transporting this cargo knows that it really is "acetic acid," including people overseas. Everyone in the marine industry, throughout the world, must use the same names.

Fortunately, the world has gotten together at the International Maritime Organization (IMO) to develop a single set of proper cargo names. Bulk liquid cargoes are listed in the International Bulk Chemical (IBC) Code. The Title 46 cargo lists use the same names as contained in the IBC Code; this results in the entire world using the same name for each classified bulk liquid cargo. Please note that the CFR lists contain some chemicals in addition to those in the IMO Codes; these cargoes can be shipped domestically but not internationally. Now if you can't find the name of your cargo in the lists, you must call the Coast Guard before you ship it. We may be able to tell you the proper cargo name, or, if the cargo has not been classified, we will develop shipping requirements for the cargo.

Most liquid cargoes are carried in inland barges. At least here we avoid complications with other countries. But it is still critical that everyone use the same authorized cargo names, and the names everyone uses must be those in 46 CFR Table 30.25-1, Table 151.05, or authorized in correspondence from Commandant (G-MSO-3) containing transportation and transfer requirements including cargo compatibility assignments.

In order to ship trade name mixtures overseas, IMO has developed a process that has proven to be very successful. IMO compiles lists of trade name products that have been evaluated, together with their shipping requirements, and distributes these lists to member states. Those individuals charged with enforcing shipping requirements only have these lists to refer to. Unfortunately, many companies use two or more trade names to describe each mixture – for example, one trade name may be for customers and another may be for internal company use only. If they use the wrong trade name, there really is no way to tell what the chemical mixture is or what the shipping requirements are. So for that reason you should use only the approved trade names.

What happens if you use other than the proper cargo names? The Coast Guard or the foreign administration can fine you; more likely, the cargo transfer will be delayed until the authorities can find out the true nature of the cargo. Ultimately a foreign administration can refuse to let you off load your cargo and make you take it back to the United States! Those are administrative consequences for not using the proper cargo name.

Perhaps more seriously, you might carry the misnamed cargo in an unsafe way, and end up with a cargo spill or an injury to personnel. And if, for example, by using an improper name you load incompatible cargoes in adjacent tanks which could lead to violently mixing incompatible cargoes in the event of an accident aboard the ship or barge. This violent reaction could lead to the loss of the crew and vessel. And if your misnamed cargo catches fire or is leaking, will the Coast Guard and other responders know what has been released and, more importantly, how to respond immediately? At the minimum an incorrect name will slow the response; at worst, people could be injured or killed from improper spill response action.

Now that you know that you should use the proper cargo name in all marine commerce, you're probably wondering why there isn't one set of names for all modes of transportation—air, road, rail, pipeline, bulk water, and package water (including barge and ship). Unfortunately there is no common set of names, partly because of history—before intermodalism, there was no real need to unify the naming system—and partly because of logic—to a degree the differences between the modes means that some names must be different. Wherever possible, we try to use the same cargo name from one mode to another—this is called "harmonization." Both the Coast Guard and the International Maritime Organization (IMO) consider this aspect during the cargo classification process. Do not expect one set of names for all modes in the foreseeable future; probably the best we can hope for is that all nations use one set of names for the same transportation mode.

The Chemical Transportation Advisory Committee has established a Subcommittee to investigate the cargo name problem for bulk shipment regulated under 46 CFR. Their goal is to find ways to ensure proper cargo name identification during transfer and transportation. This work is at an early stage. If you have an interest in this work please contact the Coast Guard Technical representative, Mr. Curtis Payne at Coast Guard Headquarters, 202-267-1577, or the Subcommittee Chairman, Mr. Robert Snyder of the Union Carbide Corporation at 203-794-7120.

A final note: If you are involved with a vapor control system in the United States, some of the proper cargo names will be inadequate to describe the cargo being transferred. For example, if you are designing a vapor control system or if you want to see if an existing system can safely vapor control additional cargoes, such generic proper shipping names as "Benzene-hydrocarbon mixture (having 10% or more Benzene)" do not describe the cargo sufficiently due to the product manufacturing differences that exist within such a generic name—vapor control system design is very sensitive to physical and chemical properties. In such cases you need to add additional identifiers to ensure that the vapor control system can safely transfer your specific "Benzene-hydrocarbon mixture (having 10% or more Benzene)" cargo. Cargoes authorized for vapor control transfers and transport must be reviewed and approved by the Coast Guard appointed "Certifying Entities" before any vapor control transfer operations take place.

The message here is that the cargo name is very important and that you should always use the proper cargo name as listed in the appropriate section of the Code of Federal Regulations. This problem is much more difficult than it seems, yet it is at the same time more important than it seems. If you ensure that your transfers and shipments are properly represented by the correct cargo names, you will avoid a great deal of confusion, will prevent potential problems, and will be doing your part in making the shipment safe for the ship or barge and its crew and other personnel. Using the right cargo name is the best way to mitigate the risk of unknown dangers through proper identification throughout the shipping phase. Proper cargo names should be used consistently when the cargo is "fixed" or nominated to a tankship owner/operator, and properly stated on shipping papers and other pertinent documentation. Using the same cargo name will ensure consistency and help eliminate any shipments made with wrong cargo names.

Integration of Quality, Environment, and Occupational Health and Safety Management Systems into One Efficient and Effective Management System

by LCDR Julie A. Gahn, USCG

Introduction

The International Organization for Standardization (ISO) 9000 series of standards provides guidance for implementing a quality management system. The ISO 14000 series provides guidance for implementing an environmental management system. The International Maritime Organization's International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) came into effect on July 1, 1998 and requires vessel owners to implement a Safety Management System.

The ISM Code requires that a company have a safety and environmental policy. Beyond this, there is almost no guidance at the international level regarding implementation of an effective Occupational Health and Safety Management System.

Background

In an article published in Quality Assurance (1997), Chris Winder asserts that occupational health and safety systems have been developed in a "reactive and piecemeal fashion." Winder further explains that quality, environment and occupational health and safety activities can be integrated into one system and managed using similar management practices including:

- Organizational commitment
- Senior management support
- Consultative mechanisms
- Organizational systems and responsibilities
- Control (routine)
- Control (nonconformance)
- Training
- Auditing
- Document control
- Records

Management review

Furthermore, Winder states that the tangible outcomes of harmonized management systems include:

- Better reporting to decision-making management
- Better input into analysis of needs
- Consistent input into management review processes
- Improvement in quality
- Improvement in productivity
- Improvement in occupational health and safety (and, indirectly, OHS-related industrial relations issues)
- Evidence of improvement
- More efficient organizational systems through continuous improvement

A study in Great Britain (Doidge, 1997) also links quality management and health and safety management. Doidge stresses that the continuous improvement aspect of Total Quality Management must not be overlooked. Otherwise, attainment of an ISO 9000 certificate becomes an end in itself, and the real purpose, an improvement in performance, is not achieved.

In the United States, the importance of top management involvement and integrating the health and safety program into the existing management system, are seen as critical factors in ensuring safety is accepted as an equal part of business operations. (Woodhull et. al., 1987; Hudson, 1981; Simonds and Shafai-Sahrai, 1977; and Smith et. al. 1978).

A British Standard, "Guide to Occupational Health and Safety Management Systems," (BS8800, 1996) describes how to integrate an occupational health and safety management system within an overall management system. It provides two options. The first model allows integration into a system developed on British Health and Safety Executive guidance contained in HS(G)65[2]. The second model enables integration into an overall management system developed on BS EN ISO 14001, an environmental systems standard.

Finally, the Victorian WorkCover Authority in Melbourne, Australia has developed a health and safety audit tool called The Safety Management System or SafetyMAP. SafetyMAP was developed based on the premise that safety and quality are synonymous. The SafetyMAP audit has 12 elements, each with links to ISO 9000. (Wait, 1998)

Application to shipping industry

The ISM Code established a standardized approach for Safety Management Systems for shipping companies. Many of the elements advocated by Winder are comparable to the elements of the ISM Code. Essentially, the maritime industry is a step ahead of general industry in the effort to integrate quality, environment, and occupational health and safety management systems.

While the ISM Code stages the maritime industry for the development of effective, integrated management systems that address quality, environment and occupational health and safety, there exists relatively little guidance at the international level regarding the elements of effective occupational health and safety management systems. The International Organization for Standardization considered developing an Occupational Health and Safety Management System standard along the vein of the ISO 9000 and 14000 series, but decided to wait until the impact and benefit of those standards could be determined before pursuing a third series.

In recognition of this void and of our responsibility to address mariner health and safety issues, The Office of Operating and Environmental Standards and the Office of Standards Evaluation and Development have been sponsoring an American Society for Testing and Materials task group. The task group is developing a guide titled, "The Basic Elements of a Shipboard Occupational Health and Safety Program" (The Basic Elements).

The Basic Elements are applicable to all vessel types including but not limited to tank vessels, dry bulk carriers, passenger vessels, roll-on roll-off vessels, ore bulk oilers, offshore supply vessels, mobile offshore drilling units, tugboats, towboats and barges. The elements described are fundamental pieces of a systematic occupational health and safety program and may be used by line managers, health and safety personnel or consultants who are implementing, improving or auditing the effectiveness of a shipboard health and safety program. In the table below, The Basic Elements are compared to the functional requirements for a Safety Management System outlined in the ISM Code. A check mark suggests a link between The Basic Element and the corresponding ISM Code Safety Management System functional requirement.

One integrated quality, environment and health and safety management system is the most effective and efficient approach to managing each of these important areas. The Basic Elements will provide assistance to those whom are developing and integrating a

	THE BASIC ELEMENTS							
ISM CODE FUNCTIONAL REQUIREMENT	Management Commitment and Leadership	Employee Participation	Hazard anticipation, ident., evaluation and control	Training	Record Keeping	Contract or third-party personnel	Fatality, injury, illness & incident investigation	Systematic Program Evaluation and Continuing Improvement
.1 Safety & Environmental Protection Policy	✔	✔						
.2 Instructions and procedures to ensure safe operation and protection of environment	✔	✔	✔	✔	✔	✔		
.3 Defined levels of authority and lines of communication	✔	✔				✔		
.4 Procedures for reporting accidents and non-conformities	✔	✔	✔	✔	✔	✔	✔	
.5 Procedures for emergency situations	✔	✔		✔		✔		
.6 Procedures for audits & management reviews	✔	✔		✔	✔			✔

Table 1: Suggested links between The Basic Elements of a Shipboard Occupational Health and Safety Program and the International Safety Management Code Functional Requirements.

health and safety management system with their other management systems.

Questions and requests for a copy of the draft guide may be directed to Lieutenant Emile Benard at 202-267-0082 or ebenard@comdt.uscg.mil. Lieutenant Commander Julie Gahn may be reached for questions or comments at (713) 671-5195.

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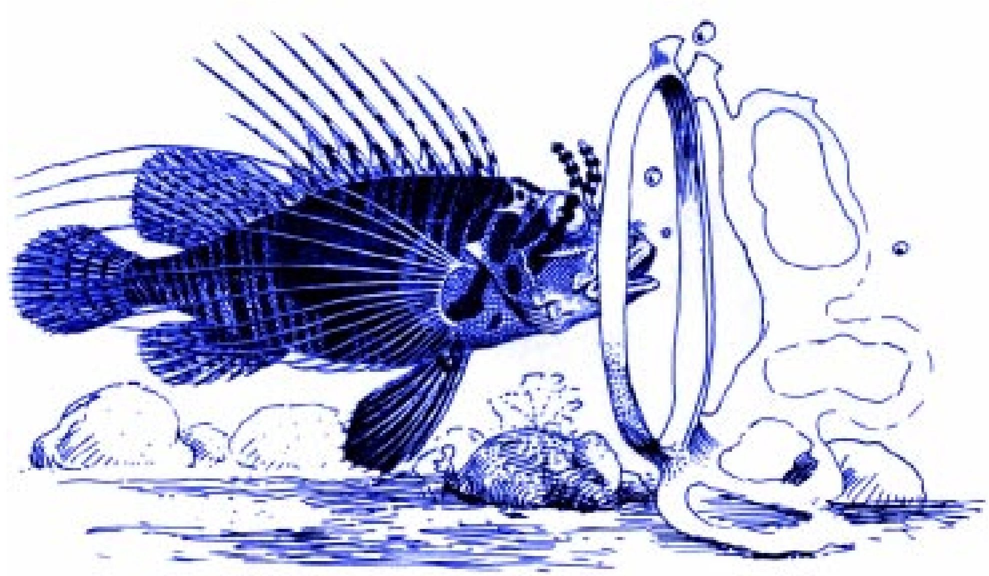


Plastics - Another Hazardous Material

by Dr. Alan L. Schneider

This issue of the Proceedings is dedicated to hazardous materials. So what's an article about plastics doing in it? They don't explode, they are not something you can breathe, and they are generally inert. Still, they can be hazardous to the environment and to sea life. If you release plastics into the water you will hurt the environment—and you will be breaking the law. You might even pose a threat to human life and property. You're almost certain to pollute beaches.

This is a real problem. Plastics are a common name for polymers, and most are artificially made, like that polyethylene cup you might be tempted to throw over the side or a boat. We will see more plastics in everyday use aboard ship in the future.

Let's take a little look at the chemistry of plastics to learn why they are a hazard. There are quite a few plastics out there, and they have one thing in common – they are made of repeating chemical units. Most of the commercial plastics are made from naturally occurring oils or gases; some are made from plants or animals (for example, cellulose). The important thing is that few plastics occur naturally. Now, we're lucky that we have bacteria, insects, and other living things to eat things after they die, such as trees. This rotting process (biological decomposition) is very important; after all, if we didn't have it the land would be covered in fallen trees! Unfortunately, plastics are man-made and bacteria and other living things generally don't eat them. Since most plastics are designed to be strong and resistant to decay from the sun, water, and wind, they will not just go away but rather will remain in the water for years if not forever. This is not the kind of inheritance we want to leave future generations.

So what if plastics don't disappear from rivers and the oceans? If the plastics we discard are heavier than water, they will sink and either coat the sea floor or wash up on land. If they float, the sea will eventually be covered with plastic. And not only does this look disgusting, it will kill many living things in the sea.

There's another danger to sea life, a more direct one—plastics can kill sea life directly. Turtles often see clear plastic bags as highly edible jellyfish; this often kills the turtle by blocking its digestive track or by choking it. Remember those plastic rings that hold a six pack together? There's been more than one fish that has stuck its head through a plastic ring and gotten it stuck behind the gills. Needless to say this usually proves fatal to the fish. Sea birds too stick their heads through these rings, too, twisting them around their necks and strangling themselves.

If you discard old, worn out fishing line or fishing nets, you are making a permanent

contribution to ruining the ocean. Fish and marine mammals can get entangled in the plastic, and if they can't get free they will not swim as fast or as well. And they may not live long as a result. But it's not just living things that are in danger, since a fishing line or net can get wrapped around a ship's propeller and put that propeller out of action. It's not fun when your outboard dies and you're miles from land. The towing fees and repair bills can be expensive!

It's not enough to merely avoid tossing plastics into the ocean. There are other ways for plastics to reach the ocean. If you toss a plastic cup into the street and it falls into a storm sewer it will probably end up in a river, harbor, or the ocean. There's almost always a place to leave that piece of plastic; if not, take it home with you.

We all love going to the beach. Sand, sun, spray – its great! But sand, sun, spray, and plastic garbage? Plastic garbage will ruin the experience for us all. Since most plastics can last for years in the water (and maybe many, many years), they usually end up on a beach.

Plastic garbage isn't just a local problem. Floating plastic can travel very long distances. Plastic dumped in Europe might end up on East Coast beaches. Your six pack plastic ring might kill a fur seal in the Polar Regions. Even if everyone in the United States did the right thing we would still have a problem here if the rest of the world discarded plastics into the sea. Clearly the world needs a concerted international effort to protect the seas from plastics. And there is one.

The International Maritime Organization (IMO) has developed rules against releasing plastics into the environment. Annex V "Regulations for the Prevention of Pollution by Garbage from Ships," of MARPOL 73/78, "International Convention for the Prevention of Pollution From Ships," states that "…disposal into the sea of the following is prohibited: All plastics…." The Coast Guard regulations implementing Annex V (Title 33, Part 151.05) define plastics as being any solid garbage composed in whole or in part of organic high polymers, whether degradable or not. The only polymers not considered plastics under this definition (and therefore allowed to be discharged) are such polymers as crab shells that are naturally occurring in the marine environment. The Coast Guard and other agencies will prosecute plastic polluters—it could cost you if you pollute.

What does this mean? Simply put, YOU CAN'T RELEASE ANY PLASTIC INTO THE SEA! The only exception involves polymers produced by aquatic life and not altered by man. It doesn't matter whether the plastic is biodegradable or soluble in water – you can't toss it overboard.

So, when you have plastic you want to get rid of while at sea – DON'T. Bring it back to land and dispose or recycle it properly.

Prevention Through People is Environmental Protection Too

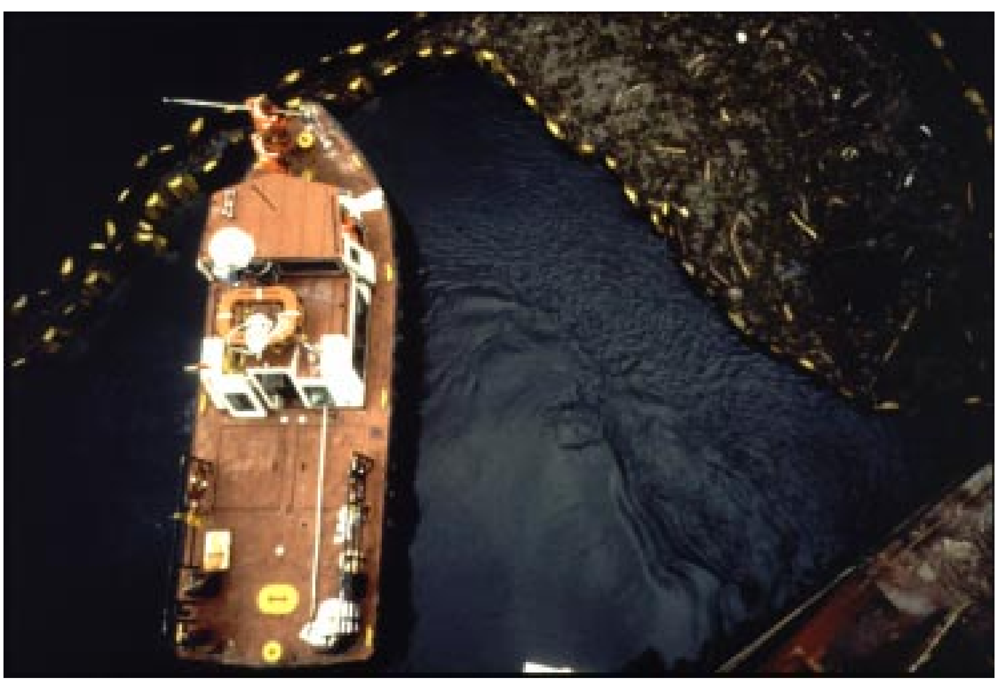
by LT Steven Wischmann, U.S. Coast Guard Office of Response

After several years of focus on the safety of people, ships and facilities, PTP is beginning to directly deal with environmental safety. On February 3, 1998 Rear Admiral Robert North, the Assistant Commandant for Marine Safety and Environmental Protection (G-M), entered into a quality partnership agreement with the Spill Control Association of America (SCAA) in Las Vegas, Nevada. The Association of Petroleum Industry Cooperative Managers (APICOM) was added to the partnership on July 16, 1998 at a meeting held at Coast Guard headquarters. APICOM's involvement significantly broadens the response industry's representation in the partnership. This partnership is intended to strengthen the communication and working relationship between the Coast Guard and the spill response community.

Since 1973, SCAA has grown to over 80 members representing local and state environmental services, pollution response contractors, and equipment manufacturers from around the world. SCAA encourages cooperation among governmental agencies, sponsors conferences, and has played a part in the development of regulations and guidelines that affect environmental policy.

APICOM was founded in 1972 and its global membership is made up of over 30 unaffiliated petroleum industry oil spill cooperative managers. The Association provides for the exchange of information related to the management of spill response cooperatives. APICOM participates in and sponsors governmental and industry workshops, conferences and seminars related to oil spill response. Members of both SCAA and APICOM have direct involvement in spill response operations and frequently work with the Coast Guard.

At the July meeting, the USCG, SCAA, and APICOM formed a Partnership Action Team (PAT) to manage the actual work conducted under the partnership. The PAT agreed to use the quality partnership to improve the effectiveness of spill response and to further spill-related risk management between the private and governmental organizations. This effort builds on the traditional Prevention Through People (PTP) principles of focusing on human factors to prevent accidents, injuries, and pollution in order to maximize the cooperative elements of human interaction in reacting to spill response events.



This partnership recognizes that not all accidents will be prevented, thus requiring that the responses to pollution incidents be performed in the best possible manner. Consistent with the current PTP efforts, the partnership recognizes that the major inhibitors to effective marine safety and environmental protection come from organizational and human error. This partnership will work to make improvements in how spill response efforts are conducted by focusing on the manner in which they are designed, managed, and supported.

Some of the many possible operational topics that will be addressed through the partnership include the financial management of spills, and the viability of establishing a nationwide dispersant delivery agreement between the Coast Guard and industry.

Contracting issues and the Coast Guard's Basic Ordering Agreement (BOA) process are aspects of the financial management of spills that will be examined. The contracting process can be complex and is often time consuming for both the Coast Guard and industry. The PAT has established a work group to examine the BOA process to identify possible ways to improve the way both industry and the Coast Guard satisfy the Federal Acquisition Requirements (FAR). The FAR is the overarching guideline for federal government purchases of goods and services.

Another work group was established to study the viability of a national protocol for the use of Coast Guard aircraft, operations permitting, to deliver dispersants using the response industries' airborne dispersant application equipment and dispersant. Effective use of dispersants is often time critical, requiring that delivery systems be on the scene in very short time frames. The capacity for industry to maintain dispersant stockpiles and delivery equipment is currently difficult to justify due to the historical rarity of their use. However, an increased understanding of dispersants and their effect on the environment has also increased the willingness of governmental response planners to encourage their use under certain circumstances. A national agreement between the Coast Guard and the response industry for the timely deployment of dispersants using Coast Guard aircraft when possible and necessary could improve the response time and effect of dispersant use.

This partnership promises to be very active. Each of the members is committed to finding solutions to common operational problems. Regarding the partnership, Rear Admiral North stated, "This partnership will enable the Coast Guard, SCAA, and APICOM to leverage their respective talents to improve spill response operations and further the nation's environmental protection interests."

Look for more information on this partnership in future issues of *Proceedings* and visit the Coast Guard's PTP web site at www.uscg.mil/hq/g-m/nmc/ptp/ptppart.htm.

Responding Safely: Who Ya Gonna Call?

by LTJG Rob Campbell
Chemical Response Officer
Gulf Strike Team

The list of response objectives for any type of incident begins with the "safety of life and health". In a hazardous material incident, this objective can take on enormous proportions, which seem to overwhelm other priorities. The incident command usually has to address the human health and safety aspect of an incident on two fronts. The first concerns the well being of the general public and the other, the safety of personnel responding to the incident. To protect the general public, an assessment of the risks involved and determinations as to whether nearby residents need to be evacuated or sheltered in place are made as soon as possible. The safety of responders who may have to enter the immediate release area, known as the "hot zone" and, or work in contact with the released substance, is a more complex issue.

Local response agencies such as police and fire HAZMAT teams are typically the first on-scene and in many cases, can resolve the situation within hours using well established and practiced fast response procedures. On larger, more protracted responses, or anytime local, public and commercial response organizations are in need of augmentation, the Coast Guard's National Strike Force (NSF) is able to provide a variety of services when requested by the Federal On Scene Coordinator (FOSC) or Coast Guard Incident Commander (IC). There are three Strike Teams that work under the direction of the National Strike Force Coordination Center in Elizabeth City, NC. The three teams, Gulf (Mobile, AL), Atlantic (Ft. Dix, NJ) and Pacific (Novato, CA), provide personnel and specialized response equipment to the Coast Guard and EPA alike.

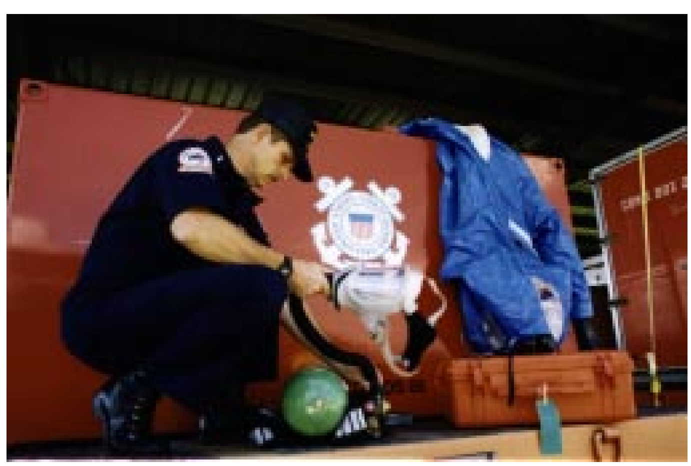
On-Site Services: Each Strike Team can sustain level A, B or C site entries for up to 48 hours and has trained personnel for multimedia sampling. Using air monitoring equipment such as flame and photo ionization detectors, hazard categorization kits, portable gas chromatographs, portable weather stations, automated modeling programs and an extensive collection of colorimetric tubes, Strike Teams often aid in the conduct of hazard and risk assessments. They also provide air monitoring to establish safe perimeters, and identify and quantify airborne levels of contaminants. Site assessments and air monitoring facilitates the set up of an effective decontamination reduction zone and determines appropriate levels of personal protective equipment. Other on-site services available from the Strike Teams include site control and medical monitoring. Often referred to as security, site control is vital to ensuring public safety. Site control is simply a means of establishing an exclusionary zone and controlling access to the contaminated area to prevent and, or reduce exposure. Medical monitoring is important not just because the Occupational Safety and Health Administration (OSHA) requires it, but because the safety of responders depends upon it. Each Strike Team has at least six certified EMT's to evaluate personnel prior to responding, and to

monitor them for exposure to both the released material and prevailing environmental conditions.

Safety Plans: Contingency plans developed by Area Committees and, or, local Emergency Planning Commissions (LEPC's) typically address general priorities, procedures and overall responsibilities for hazmat events. The OSHA requirements for incident specific response procedures contained in Title 29 Code of Federal Regulations, Part 1910.120 are more detailed and direct. Putting general plans in motion, complying with OSHA regulations and above all, responding safely requires the help of specialists. For that reason, of particular interest to FOSCs and ICs may be the NSF's assistance in establishing and monitoring response site safety. Strike Team personnel can assist with oversight and management of safe operations with on-site expertise in the development, review and implementation of Emergency Response Plans for the crisis phase, and site specific Site Safety and Health Plans for post-emergency or "project" phases.

Site Management Aid: Though not directly related to site safety, the NSF offers other services that contribute to safe and effective response by taking additional burdens off local personnel. These services include assistance with media relations, contractor oversight, resource tracking, cost recovery documentation and spill management training in the Incident Command System. The NSF can provide on or off-site support in the form of chemical hazard research and quickly broker the assistance of NOAA and U.S. Navy SUPSALV to provide various modeling techniques that offer real time simulations of spill characteristics and vessel strength/stability information to aid in time critical decision making.

HAZMAT incidents are trying and potentially intimidating events. "Best Response" for these events means effectively bringing to bear all available and appropriate assets. The NSF works hard to be a valued "plug and play" asset for the FOSC or IC. Next time HAZMAT response requirements exceed local capabilities or you need response support to continue routine operations, we hope you will give us a call; it's what we do!



Nautical

Deck Questions

1. A device fitted over the discharge opening on a relief valve consisting of one or two woven wire fabrics is called a

   A. flame stopper.
   B. flame screen.
   C. flame filter.
   D. flame restrictor.

2. The last 1.0 meter (3.3 feet) of vapor piping before the vessel vapor connection must be painted

   A. red/yellow/red.
   B. yellow/red/yellow.
   C. international orange.
   D. hi-visibilty yellow.

3. When using GPS, how many position lines are required for a 3D (dimensional) fix that takes into account altitude?

   A. 1
   B. 2
   C. 3
   D. 4

4. Due to “GPS roll over” of the clock cycle, GPS receivers may give the wrong time and position or may lock up permanently on

   A. August 21, 1999.
   B. September 21, 1999.
   C. October 31, 1999.
   D. December 31, 1999.

5. Which statement concerning GPS is TRUE?

   A. It cannot be used in all parts of the world.
   B. There are 12 functioning GPS satellites at present.
   C. It may be suspended without warning.
   D. Two position lines are used to give a 2D fix

6. The modified civilian system that approaches military precision in global positioning is called

   A. DGPS.
   B. CGPS.
   C. PGPS.
   D. GPS.

7. Operators of Uninspected Passenger Vessels are required to keep their Coast Guard License aboard

   A. only when operating more than one mile from shore.
   B. only when operating at night.
   C. only when carrying passengers for hire.
   D. At all times.

8. Under the federal regulations, what minimum level of Blood Alcohol Content (BAC) constitutes a violation of the laws prohibiting Boating Under the Influence of Alcohol(BUI) on commercial vessels?

   A. .18% BAC
   B. .10% BAC
   C. .06% BAC
   D. .04% BAC

9. If within 500 yards (460m) of a right whale you are lawfully obligated to

   A. turn away from the whale and leave at full speed.
   B. turn away from the whale and leave at slow speed.
   C. slow to bare steerageway until the whale swims away.
   D. stop the vessel and sound repeated blasts on the ship’s whistle to scare the whale away.

10. A vessel sighting a northern right whale dead ahead should

   A. maintain course and speed.
   B. alter course to give a wide clearance.
   C. report the whale’s position to the Canadian Coast Guard.
   D. All of the above.

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

Queries

Engineering Questions

1. An accidental path of low resistance, allowing passage of abnormal amount of current is known as a/an___________.

   A. open circuit
   B. short circuit
   C. polarized ground
   D. ground reference point

2. When a megommeter is being used to test insulation resistance, current leakage along the surface of the insulation is indicated by the megommeter's pointer____________.

   A. dipping toward zero then rising slowly
   B. continually rising as test voltage is applied
   C. kicking down scale as voltage is applied
   D. fluctuating around a constant resistance reading

3. The main purpose of an electric space heater installed in a large AC generator is to _____________.

   A. keep lube oil warm for quick starting
   B. prevent moisture from condensing in the windings when the machine is shut down
   C. prevent the windings from becoming brittle
   D. prevent acidic pitting of the slip rings

4. You are attempting to parallel two AC generators, and the syschroscope pointer is revolving in the fast direction. This indicates that the frequency of the incoming machine is ____________.

   A. higher than the bus frequency
   B. lower than the bus frequency
   C. the same as the bus frequency but out of phase with it
   D. the same as the bus frequency and the circuit breaker may be closed at the pointer position

5. When the operating handle of a molded-case circuit breaker is in mid-position, the circuit breaker is indicated as being __________.

   A. in the "closed" position
   B. in the "opened" position
   C. tripped
   D. reset

6. Ambient temperature is the ______________.

   A. amount of temperature rise with no load
   B. amount of temperature developed by an operating motor
   C. temperature of the compartment where the motor is located
   D. normal operating temperature, less the room temperature

7. Magnetic controller contacts may become welded together during operation due to ___________.

   A. an open coil
   B. low contact resistance
   C. excessive ambient temperature
   D. excessive magnet gap

8. If many turns of an alternating current coil for a contactor become short-circuited, the coil _________.

   A. temperature will drop
   B. will probably burn out immediately
   C. will continue to operate
   D. will operate on reduced current

9. The frequency of an alternator is controlled from the main switchboard by adjusting the __________.

   A. frequency meter
   B. voltage regulator
   C. governor control
   D. sychroscope switch

10. Since fuse elements are made of zinc or any alloy of tin and lead, the melting point of the fuse element must be __________.

    A. higher than that of copper
    B. lower than that of copper
    C. equal to that of copper
    D. reached when the conductor it is protecting becomes "white hot"

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

A Tale of Two Responses

by LTJG Wilborne Watson

New International and Coast Guard regulations applied mandatory cargo stowage requirements to ships. However, these regulations do not apply to ocean-going deck barges. The challenges of preventing casualties aboard containerized deck barges are highlighted by recent hazardous materials incidents aboard the deck barges PONCE TRADER and CHESAPEAKE TRADER. In both incidents, improperly secured cargo shifted resulting in several containers being lost overboard and extensive hazardous materials cleanup operations onboard the barges upon their arrivals in port.

History: M/V SANTA CLARA I

On January 3, 1992, the containerized freight vessel SANTA CLARA I departed Port Elizabeth, New Jersey fully loaded with containers of hazardous materials and general cargoes en route to Baltimore, Maryland with forecast dangerous storm warnings. As the ship headed south off the New Jersey Coastline, weather conditions deteriorated with winds gusting to over 50 knots and seas up to 28 feet. The vessel's cargo lashing and rigging on deck failed resulting in twenty-one containers lost at sea including four containers of toxic Arsenic Trioxide and ten palletized drums of poisonous Magnesium Phosphide. Extensive cargo damage and additional Magnesium Phosphide releases occurred in the number one (#1) cargo hold.

The Coast Guard Board of Inquiry attributed the casualty to inadequately secured containers and machinery on deck in addition to several other operational deficiencies including the lack of a Cargo Securing Manual.

The Container Inspection Program

As a result of the Coast Guard Board of Inquiry's findings, Cargo Securing Manual requirements were introduced into regulation in the U. S. for ships traveling on foreign as well as on domestic voyages. A formal Coast Guard Container Inspection Program was established requiring the inspection of at least 1 % of all hazardous materials containers either imported or exported by water from U.S. ports. The Container Inspection Training and Assist Team (CITAT) was developed as a center of excellence in assisting Coast Guard Marine Safety Offices throughout the country in accomplishing this goal while providing relevant technical knowledge of general industry practices and developments. CITAT also provides training to these units on proper enforcement of the regulations.

These preventive measures, regulations and compliance programs have been extremely successful. Regulatory compliance with container stowage and cargo securing regulations has been strictly enforced and there has been a significant reduction in the occurrence of incidents such as the SANTA CLARA I in U.S. ports. However, none of these efforts has been effectively directed towards containerized deck barges.

PONCE TRADER Incident

At approximately 0700 on November 8, 1996, MSO New Orleans received a report from Columbia Coastal, the operator of the deck barge PONCE TRADER, that the barge, while in tow of the tug ALICE MORAN, had lost six containers at sea. Vessel personnel reported that the most probable cause of the casualty was weather conditions, which were fairly moderate. A dockside survey conducted by Coast Guard personnel and contractors, hired by the responsible party, later revealed that, in fact, the barge had lost 27 containers and that the available cargo rigging and lashing had been inadequately installed.

Sealand and Columbia Coastal surveyors documented extensive damage to the containers in the number five hatch. No other hatch was affected. [The usage of the term "hatch" merely connotes the location of fore and aft cargo storage areas on deck. As a freight barge, the PONCE TRADER was not equipped with cargo hatches and below deck storage.] Approximately 50% of the cargo deck fittings were in the open and unlocked position and many had been broken and lay loose on deck. The deck fittings (cloverleaves and D-rings) and the secure rigging on the unaffected hatches had experienced extensive corrosion. Surveyors noted evidence of a yellow liquid that had spilled on the deck and over the port side as well as evidence of an oil spill that had flown over the starboard side. They further noted a clear liquid leaking from the damaged Toluene Diisocyanate tank onto the deck and immediately exited the vessel.

The New Orleans Fire Department's Hazmat team and an independent cleanup contractor were notified. MSO New Orleans and Louisiana State Police arrived and established a unified command on scene to supervise the response.

The damaged and dislodged containers were a combination of regular boxes and bulk liquid containers of hazardous materials including Toluene Diisocyanate, Dichloromethane, Xylene, Polyethylene, Polyamine and Acetic Acid, several of which were extremely toxic if inhaled or ingested. The unified command responded effectively and efficiently in resolving the highly dangerous cleanup and salvage operation.

CHESAPEAKE TRADER Incident

At approximately 1400 on April 26, 1998, the tug CAPTAIN BILL, owned by McAllister Towing, reported to MSO New Orleans that its tow, the 300 ft. deck barge CHESAPEAKE TRADER, had lost 32 of 279 containers into the Gulf of Mexico. The vessel, while enroute to New Orleans from the Port of Houston, reported seas of 6-8 ft that reportedly caused on deck container lashings and rigging to fail. MSO New Orleans investigators later determined that the deck fittings on hatch 2, from which 4 containers were lost, had failed. Additionally, 28 containers were lost from hatch 1, where it was discovered that the deck cones and clover leaves had been sheared and that cargo rigging on the damaged containers on deck had been broken. Seven containers of hazardous materials, including Polyvinyl Chloride, Polyethylene, Synthetic Resin and Pepsico Extract (containing Phosphoric Acid), along with twenty-five non-hazardous materials containers were among those washed overboard. Twenty-five damaged containers remained on deck in a toppled state with several containers carrying hazardous materials including Acetone, Battery Acid, Ethylene Glycol and Monoether Acetate. At 0700 on April 27,1998, less than 24 hours after notification of the incident, a unified command was formed consisting of the MSO, Sealand, Louisiana State Police, Louisiana Department of Environmental Quality (LADEQ), the New Orleans Fire Department's Hazmat Team (NOFD), and other federal state and local agencies and experts representing the barge operator.

MSO New Orleans personnel arrive on scene to monitor the stability of the dangerous cargo aboard the deck barge PONCE TRADER.

CHESAPEAKE TRADER

A thorough analysis of the hazards involved was undertaken. Several Coast Guard and private overflights were conducted. Level A Hazmat exposure entries and several air monitoring operations were carried out by MSO and Gulf Strike Team personnel and visible assessments of the tug and tow were performed at sea before the vessel was ever allowed in port. After it was determined that there was no apparent leakage and that the toppled containers appeared stable and safe for transit, the Captain of the Port secured all deep draft vessel traffic on the Mississippi River Gulf Outlet and allowed the CHESAPEAKE TRADER to proceed to Sealand's container terminal at approximately 2200 that night.

At 0534, representatives from MSO New Orleans, Louisiana State Police, NOFD, LADEQ, NOAA, Sealand and McAllister Towing met at Sealand Container Terminal to commence cleanup and salvage operations aboard the CHESAPEAKE TRADER. By 1454 on April 29, 1998, the entire operation was completed. All damaged containers were salvaged and those carrying hazardous materials were properly disposed of and documented. The operation was flawlessly coordinated and implemented providing a textbook example of how a Hazmat incident could be successfully managed when accurate prior notification is given.

Nevertheless, the fact remains that if proper cargo securing policies had been observed by the stevedores conducting initial cargo loading operations, this and the aforementioned incidents would likely not have occurred.

Conclusion: Cargo Securing Manuals and Procedures should apply to deck barges

These major hazardous materials incidents are evidence that the scope of current Cargo Securing Regulations needs to be broadened to include deck barges that carry hazardous materials. Crewmen and Stevedores should be trained and have written instructions on loading, unloading, and securing of containerized dangerous cargoes on deck. The Cargo Securing Manual must include provisions for management oversight to ensure that cargo-securing operations take place properly and completely. The manual and instructions should meet an international, national, or industry consensus standard and should be approved by a recognized Class Society, the National Cargo Bureau or the USCG. However, the scope and detail of the manual and instructions may be limited by the size of the vessel. Also, each deck barge carrying hazardous materials should be required to employ a Qualified Individual (QI). This would ensure that in the event of a spill - just as is proposed for ships carrying hazardous materials in bulk - cleanup procedures are properly implemented and funded.

MSO Boston Partners With Mediterranean Shipping Company and Improves Hazmat Transportation Safety

by LTJG Peter Heron and DC1 Dan Reynolds of MSO Boston and Mr. Dirk Vande Velde of Mediterranean Shipping Company

During a routine boarding of a Mediterranean Shipping Company (MSC) container ship in September of 1996, personnel from Marine Safety Office Boston encountered 30 placarded (dangerous when wet) containers of an unknown substance stowed below deck. A review of the ship's documents revealed an incomplete and ambiguous dangerous cargo manifest (DCM) and shipping papers printed in a foreign language. This appeared to be a simple stowage discrepancy as a result of routine "clerical errors" in the documentation accompanying the transportation of hazardous material from Europe to the Port of Boston. However, what if a fire had broken out in one of these containers while the ship was at the pier? What if a container stowed adjacent to these containers caught fire or started leaking hazardous material? Remember, Coast Guard personnel as well as the ship's crew were onboard. This stowage problem, a result of "clerical errors," could have led to loss of life had tragedy struck.

Ferrosilicon

The substance in these containers was Ferrosilicon. Ferrosilicon is labeled as a hazardous class 4.3 (dangerous when wet) substance with a subsidiary hazard of 6.1 (poison) and special stowage provisions according to the Code of Federal Regulations 1 Title 49 (49 CFR). According to the Material Safety Data Sheet, it is an odorless, crystalline solid metal. It is flammable and can react explosively with oxidizing materials. In the presence of moisture or water it may emit toxic and explosive fumes. With incomplete documentation of this material, it is easy to imagine the deadly scenarios involving an unsuspecting crewman with a charged fire hose, or a member of the Coast Guard breathing vapor or dust during a deck walk. While this hazardous situation was resolved through the cooperative effort of MSC and the Coast Guard, it still points to the issue: frequent problems with shipping papers and DCM's can pose a serious danger.

Partnership

Upon notification by MSO Boston, Mr. Dirk Vande Velde, head of the MSC Dangerous Cargo Department, recognized the dangers for all involved and offered to meet with MSO Boston personnel to attempt to resolve these documentation problems. He flew from Belgium and spent days with Coast Guard personnel discussing documentation discrepancies and potential solutions. He later stated "Logistical performance is dependent on information between partners, where excellence is only possible in mutually satisfactory working relationships." He recognized that the above deck/below deck loading discrepancy was due to altered stowage categories and the poisonous by inhalation stowage criteria. The untranslated Spanish and German packing certificates had added to this complication. Prior to his departure, he devised a tentative plan for drastic changes within MSC's system of documenting the transportation of hazardous materials. Mr. Vande Velde suggested an improved safety and emergency response system to improve both ship and port safety. The implementation of an updated computer-tracking program would completely revamp MSC's hazardous materials transportation system. It would meet and exceed the requirements of the CFR and drastically improve the safety of the MSC crew and Coast Guard boarding teams.

Computerized Tracking System

The results were impressive. Shipping papers were received from the shipper and the information entered into the computer. Completely new, legible, English language, user-friendly shipping papers were produced. These documents not only listed the required emergency response phone numbers, but also included the addresses and phone numbers of the shippers and the phone numbers of the original packers. All information was organized according to the requirements of 49 CFR 172.202. DCM's were also automatically created from these new shipping papers to ensure accuracy and avoid any discrepancies between the two documents. The stowage position, calculated from the DCM, was then transferred back to the shipping papers for even greater consistency. Information for every United Nations (UN) number and transported chemical was entered into the MSC database. Mandatory data entry fields in the new program, combined with an automatic checking/matching capability, further reduced potential discrepancies. The final result was accurate hazmat documentation that could be relied on to provide correct information in the event of an emergency.

In addition, MSC created emergency data cards including fire, toxicity, explosion and reactivity hazards, as well as emergency response information, toxicology, chemical properties, threshold limit values, protective clothing requirements and first aid measures for each chemical. This document was then stapled to the shipping paper and included with the DCM. In the event of an emergency, crew members, based solely on the information onboard, now had the ability to respond effectively. This ability could prove to be very useful should an incident occur in the middle of the North Atlantic. During the initial implementation of this system, any documentation problems encountered at the first U. S. port of call (Boston) were faxed to MSC and corrected before the ship left port. Since MSC's ships operate worldwide, the main office in Antwerp implemented new hours of operation, from 8:30am to 1:30am local time, in order to handle requests from around the globe. In addition, MSC implemented a stowage advice checklist and a shipboard quick reference guide to container stowage listing hazards by destination and container position on the ship. MSC has created a modern system of documenting the transportation of hazardous material. They have shown that the quality of hazmat transportation information flow is as important as the physical movement of the product. By agreeing to partner with the Coast Guard, they met and exceeded all requirements of the CFR and reduced the number of Coast Guard work-hours required for boardings. This cooperation between organizations had a much more beneficial impact on the process than initially believed.

Mr. Dirk Vande Velde said later, "Good communication is directly proportional to good data management. Potential partners in the right environment, having these opportunities to receive information, will create a win-win situation for all parties involved." The improvements to this computerized system continue to evolve as new situations are met. Most importantly, MSC has provided a new standard for safety in the transportation of hazardous materials in the port of Boston and beyond.

Mariners' Seabag

Two Tonnage Systems for U.S. Flag Vessels

by Peter Eareckson and Anthony Murray

Tonnage is a parameter used in the shipping laws to regulate a vessel according to its size. By nature, when the eye sees the word “tonnage”, the mind is thinking of a measurement in “weight”. Not so when speaking of gross tonnage assignments for vessels. In the 15th century, wine casks with a measure of 252 gallons were known as “tuns” of wine. These weighed approximately 2240 pounds (our current “long ton”) and occupied a cargo stowage space of about 42 cubic feet. “Tunnage” came to be used for indicating the carrying capacity of a vessel’s hold.

In the United States, the traditional measurement system used to assign tonnages is the Regulatory Measurement System. It is based on a 19th century British measurement system developed by naval architect Mr. George Moorsom, which was adopted in various forms by the world’s leading maritime nations. As with earlier systems for measuring carrying capacity, weight does not apply; volume of spaces does.

Gross tonnage assigned under these so-called Moorsom systems is a cubic capacity measurement representing 100 cubic feet (2.83 cubic meters) of a vessel’s internal space, exclusive of certain exempted spaces. Net tonnage is based on the vessel’s earning space, which is the gross tonnage less certain deducted spaces. Tonnages determined in this fashion are sometimes referred to as Gross Registered Tonnage (GRT) and Net Registered Tonnage (NRT), respectively.

Moorsom systems are subject to manipulation, and can result in tonnage assignments that do not accurately reflect vessel size or earning capacity. This, coupled with various national interpretations and methods of measurement, led to wide differences in assigned tonnages between similarly sized vessels. To address these concerns, the International Convention on Tonnage Measurement of Ships (1969) was established, and has become an international standard. In 1986, the United States adopted this measurement system as it’s primary measurement system, calling it the Convention Measurement System. It applies only to vessels of 24 meters (79 feet) and over in length

The Convention Measurement System is based on molded volume, numbers of passengers, and other specific vessel parameters. It is reasonably straightforward and not susceptible to manipulation. Under this system, there is no direct relationship between tonnage and cubic feet, since logarithmic formulas are applied to volumes and other parameters to arrive at tonnage. The formulas were selected to yield tonnages comparable to those that would have been assigned under existing Moorsom-type systems for typical vessels. Nonetheless, gross tonnage under the Convention Measurement System is still a measure of volume, not weight.

For many U.S. flag vessels, especially those employing tonnage reduction techniques, Convention Measurement System tonnages are greater than those assigned under the Regulatory Measurement System. Recognizing this, Congress provided that owners of U.S. flag vessels may continue to apply existing tonnage-based U.S. laws and regulations using assigned Regulatory Measurement System tonnages. These include vessel inspection, manning, and mariner licensing laws.

Older vessels engaged on foreign voyages have similar "grandfathering" relief from certain international requirements such as the International Convention for the Safety of Life at Sea (SOLAS). However, all U.S. flag vessels of 24 meters (79 feet) and over in length engaged on foreign voyages must now be assigned Convention Measurement System tonnages, and carry an International Tonnage Certificate (1969) on board.

The result is that many U.S. flag vessels have two sets of gross and net tonnages assigned. This can cause confusion as to what tonnages are to be used under what circumstances. In general, a vessel assigned tonnages under the Regulatory Measurement System, will use those tonnages to apply all U.S. laws and regulations that are tonnage-based. Refer to U.S. Coast Guard Navigation and Vessel Inspection Circular 11-93 (NVIC 11-93) for details on tonnage measurement system applicability. This NVIC is accessible on the Coast Guard Internet web site at: http://www.uscg.mil/hq/msc/.

A vessel's U.S. Tonnage Certificate and/or International Tonnage Certificate (1969) (as applicable) provide information on tonnage measurement systems that apply to that particular vessel. Currently, three classification societies are authorized to issue these documents to qualifying U.S. flag vessels: the American Bureau of Shipping, Det Norske Veritas, and Lloyd's Register of Shipping. When a vessel is initially measured or remeasured, the vessel owner informs the classification society which measurement system he/she has elected to have the vessel measured and regulated under.

By law, many U.S. flag vessels will continue to be measured under both the Regulatory and Convention Measurement Systems. Therefore, in talking about gross tonnage, it is important to recall that a vessel may be assigned tonnages under more than one measurement system. One should also recall that there are governing requirements concerning the purposes for which those tonnages may be used.

From the *Marine Safety Newsletter:*

USCG 1997-3198
Alternate Convention Tonnage

The Coast Guard is considering developing alternate tonnage thresholds for certain vessels based on the measurement system established under the International Convention on Tonnage Measurement of Ships, 1969. Existing tonnage thresholds in domestic laws and regulations are based on the U.S. regulatory measurement system. Establishing the international convention tonnage as an option for applying domestic regulations may result in the building of safer, more efficient vessels and may enable designers and operators of U.S. vessels to be more competitive in the international market. The Coast Guard asks for comments on related issues and questions.

Status: Notice, request for comments published on February 4, 1998 (63 FR 5767). Comment period closed on October 15, 1998. Reviewing comments.

Contact: LT John G. White, Tel.: (202) 267-6885.

Annual Index

READER'S SURVEY

1999

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READER'S SURVEY

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