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OF THE MARINE SAFETY COUNCIL

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PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

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Season's Greetings

At this time of celebration and new beginnings I offer to each of our readers, at sea or ashore, my best wishes for a joyous holiday season and a happy New Year. May the spirit of this season bring to all joy, hope, and peace.

J.B. Hayes

J.B. HAYES,
Admiral, U.S. Coast Guard, Commandant.

DIST. (SDL No. 108)
A: acde(2); fghklmntuv(1)
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THIS COPY FOR NOT LESS THAN 20 READERS— PLEASE PASS IT ALONG

maritime sidelights

READER RESPONSE

The following letter, written by the president of the National Fire Protection Association, was received by LCDR J. E. Lindak. It addresses and comments on LCDR Lindak's article, "Upgrading the Marine Chemist Program," which appeared in the October 1978 issue of the Proceedings. We feel that Mr. Morgan makes some valid points and therefore present his letter for your consideration.

Dear Commander Lindak:

I have just had the opportunity to read your thoughtful memorandum entitled "Receut Progress in Upgrading the Marine Chemist Program." I understand that this was prompted by the NTSB (National Transportation Safety Board) recommendation that the Coast Guard take over the certification of Marine Chemists. In this light, I wanr to express our thanks for your constructive comments supporting the present form of Marine Chemist certification by NFPA (National Fire Protection Association).

As you have asked for our comments, I trust that you won't mind if I add a few of my own to those already offered by my associates. These are thoughts that cross my mind as I consider what you have written.

You will not be surprised, I'm sure, if I express the wish that a few words might be said in direct response to the NTSB recommendation. The implications of your factual account may be too subtle for your audieuce to grasp. There are those, we both know, to whom the cure for every headache known to man is aspirin manufactured only in Washingtou.

Because your memorandum addresses only "Recent Progress" I am concerned lest the NTSB draw the inference that prior to the Greenville explosion the certification of Marine Chemists and the administration thereof was a rudimentary or oversimplistic routine procedure. Nothing could be farther from the truth. Major tightening of administrative controls and of qualifications dates from 1962 when NFPA took over the operation from the American Bureau of Shipping. And even then the program of certification of Marine Chemists had been carried on with very few accidents for forty years. With the growing complexity of the situations encountered by Marine Chemists in the daily performance of their profession, the need for technical support, educational opportunity, and closer observation of field practices was apparent to NFPA, and steps were taken without delay to sharpeu the administration of the program. There was no perpetuation of the "status quo"; there was continuous progress and the events of the last few years are but evolutionary steps in a long sequence of events dedicated to the same purpose. I am a bit concerned lest NTSB fail to realize just how far advanced in development the certification procedures actually were long before the Greenville accident.

It seems to me important to make the point that there is no system known to mankind that cannot be compromised or set at naught by the mistake of one man and that no system devised within the private or governmental sector is ever likely to preclude the possibility of an accident resulting from human failure. The record of safety achieved by rhe Marine Chemist profession in the exercise of their judgement and skills is one that the USA cau point to with great pride and will withstand comparison with the records achieved in foreign shipyards. Indeed I believe the USA record will be shown to be superior to all others. When one has a substantially winning combination it rarely makes good seuse to discard it in the face of one loss.

We appreciate very much your response to the NTSB recommendation, which in our opinion is quite unwarranted and unlikely to produce any greater safety to personnel or vessels than the highly developed non-governmental system which now prevails. Thanks also for the privilege of registering these comments with you.

With kindest regards,

Charles S. Morgan
President

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Reader response to any information appearing in the Proceedings is encouraged and appreciated. Comments may be addressed to:

Editor, Proceedings of the
Marine Safety Council
c/o Commandant (G-CMC/81)
U.S. Coast Guard
400 7th Street SW
Washington, DC 20590

PUMPROOM "ENCLOSED SPACE" HAZARDS

In the spring of this year four Coast Guard marine safety inspectors were exposed to Isopropylbenzene and Trichloroethane during the course of an examination of a tankship. The vessel was also carrying caustic soda. The Coast Guard personnel boarded the tankship at the request of the vessel's owners to conduct a special examination prior to offloading of the cargo. During the course of the inspection all four inspectors, in company with the chief mate, entered the forward and aft pumprooms. in each of these pumprooms isopropylbenzene had leaked into the bilges due to impropar seating of in-line blank flanges. The inspectors were exposed to rhis material's vapors for approximately 10 minutes. One of the inspectors and the chief mate also entered the pumproom located port side on deck and both were briefly exposed to trichloroethane vapors (for approximately one minute) due to a previously leaking packing gland on a cargo pump.

(continued on next page)

Isopropylbenzene (cumene) is a potent narcotic, but its vapor hazard is minimized by virtue of its relatively high boiling point (low vapor pressure). It is also considered as a skin, eye, and upper respiratory tract (nose and throat) irritant.

1,1,1, - Trichloroethane (methyl chloroform) is a high vapor pressure chlorinated hydrocarbon (like the insecticide DDT), which, if inhaled, can irritate the air passages, and produce moderate anesthetic side effects leading to dizziness, headaches, nausea and drowsiness. Upon prolonged exposure, harmful effects may be seen in the liver and lungs. Additionally, the National Institute for Occupational Safety and Health (NIOSH) warned in Current Intelligence Bulletin No. 27 (August 21, 1978) methyl chloroform should be handled with caution, citing its relationship to four other chloroethanes shown to be carcinogenic in animals in National Cancer Institute Research. (This bulletin, which includes some recommendation on work practices, is available from NIOSH, Publications Disseminations - DTS, 4676 Columbia Parkway, Cincinnati, Ohio 45226).

This incident points out the possible human health hazards inherent in entry into enclosed spaces. These hazards include flammable/explosive atmospheres, oxygen deficiency, and toxic vapors. Pumprooms must be recognized as "enclosed spaces" possibly containing the above hazards. In this case faulty pump seals led to leakage and accumulation of certain toxic vapors. In another recent case the failure of a ventilation system led to a deficiency of oxygen.

If you are in doubt of the safety of an enclosed space have it checked by a marine chemist or industrial hygienist before entering!

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The Coast Guard Cargo and Hazardous Materials Division has prepared a booklet on tank safety entitled "When You Enter That Cargo Tank," number CG-474. If you do not already have a copy of this publication, it is free upon request from: Commandant (G-MHM/3), U.S. Coast Guard, 400 Seventh Street, SW, Washington, DC 20590; phone (202)426-1577.

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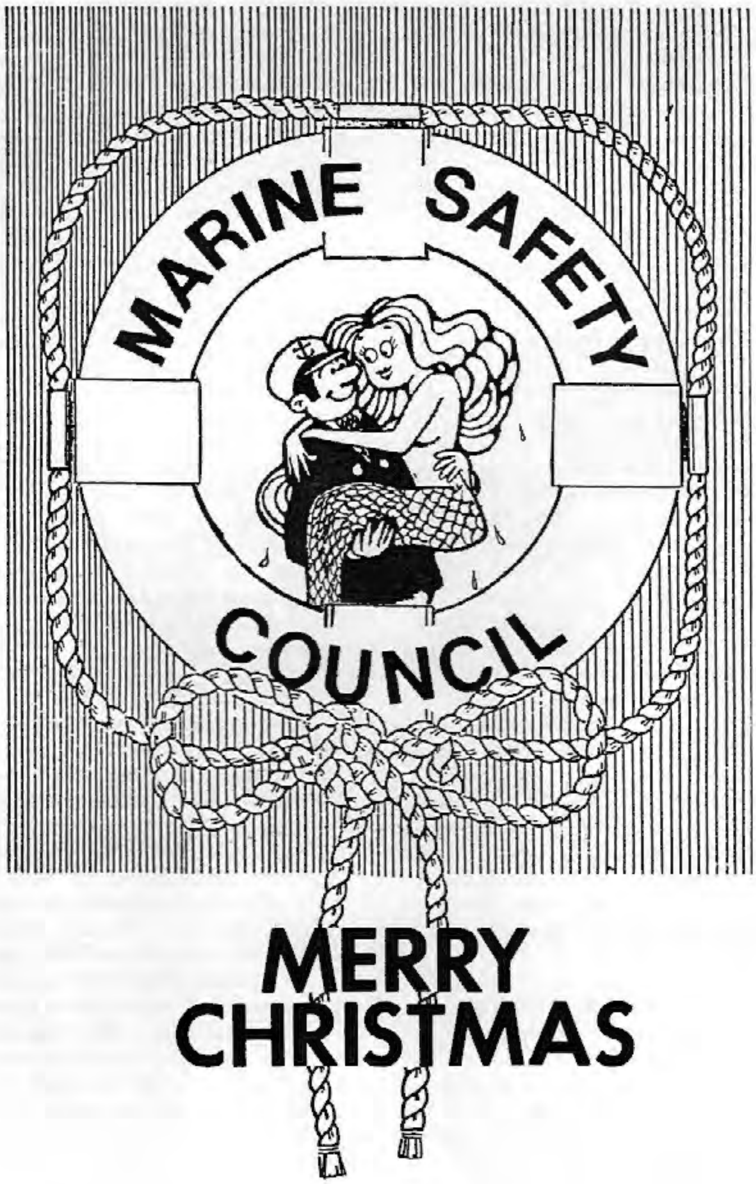

First Annual

1979 Marine Photography Contest

EXECUTIVE COMMITTEE, MARINE SECTION

GOLDEN SAFETY PHOTOGRAPHY AWARD will be awarded to the person who submits the winning 35 mm color slide. The award will be presented at the 1979 National Safety Congress in Chicago, Illinois.

SPONSOR'S GOLDEN SAFETY AWARD will be presented to employer of the winner in the color category, in appreciation for their cooperation and interest in furthering marine safety.

SILVER SAFETY PHOTOGRAPHY AWARD will be awarded to the person who submits the winning black and white photograph. The award will be presented at the 1979 National Safety Council Congress, in Chicago, Ill.

SPONSOR'S SILVER SAFETY AWARD will be presented to a representative of the employer of the winning black and white photography entry, in appreciation for their cooperation and interest in furthering marine safety training.

RULES

1. The photography contest is open to any and all employees in the maritime industry, who are photography buffs, either amateur or professional. All photography entries must be on a Marine Safety subject. The content should show a positive or negative safety topic. Give your picture a safety title, safety slogan or state the safety topic briefly and sign your entry. Any maritime operation or situation afloat or ashore may be used.

2. Color Category: Only 35mm slides will be acceptable. Your entry will be judged for content, composition, originality, safety applicability and pertinence.

3. Black and White Category: Glossy or matt prints 8" by 10" or larger will be acceptable. Your entry will be judged for contrast, content, composition, origiuality, safety applicability and pertinence.

4. Sign your entry. Photographs and slides will not be returned. Submission automatically gives copyrights to Executive Committee, Marine Section, National Safety Council and entrant and sponsor release all rights thereto.

5. Employer's name and address, as well as entrant's name, address and position, must be PRINTED and submitted with each entry.

6. All entries must be postmarked on or before midnight, June 30, 1979. As many entries in either the color or black and white category may be submitted as desired.

7. Winners will be notified via employer as soon as possible after closing date. The winner's names and companies will be published in the NSC, Marine Section Newsletter.

8. Carefully read and comply with all the above rnles, and mail your entries to:
Chairman, Audio/Visual Aids and Posters Committee
c/o Ships' Operational Safety, Inc.
284 Main Street
Port Washington Harbor, NY 11050

OFFICIAL JUDGES

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Vice President
Ships' Operational Safety, Inc.

John Fanlk, Vice Chairman
Safety Director
Strachan Shipping Co.

Allan Litty
President
Flying Camera, Inc.

Bob Ahrens
President
Bob Ahrens Productions, Inc.

By Dr. Alan L. Schneider and
Mr. Robert C. Lambert

Presented at the 21st Annual American Institute of Chemical Engineers Meeting, Miami Beach, Florida, November 12-16, 1978

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The views and opinions expressed in this paper are those of the authors, who are solely responsible for the accuracy of facts and data presented. This does not necessarily represent policy or official views of the U.S. Coast Guard.

The United States Coast Guard is the primary U.S. maritime transportation regulatory agency with the responsibility for safety of all commercial vessels in the navigable waters of the United States and of U.S. commercial vessels worldwide. The Coast Guard is also responsible for safety and environmental protection of U.S. ports and waterways. The Coast Guard's responsibility in these areas originates from several sources, including the Ports and Waterways Safety Act of 1972. This act addresses pollution prevention from marine spills and includes the shoreside aspects of marine safety, such as vessel traffic services and facility safety--as well as the design, equipment, and manning of vessels. It also requires that the Coast Guard establish a comprehensive approach to the prevention of pollution from marine operations and casualties. The Deepwater Ports Act of 1974 requires comprehensive control of navigation and traffic in the vicinity of the port, as well as control of transfer operations at such ports to prevent or minimize spills. The Federal Water Pollution Control Act gives the Coast Guard additional authority in the abatement of marine pollution.

U·S· COAST GUARD RISK ANALYSIS

Together, these acts require a comprehensive systems approach to regulation and enforcement to prevent operational or accidental spills of oil or other harmful substances due to marine operations.

The Coast Guard is meeting these requirements with a family of risk analysis tools. These tools include the Chemical Hazards Response Information System (CHRIS), the Hazard Assessment Computer System (HACS), the Population Vulnerability Model (PVM), the Equivalent Safety Model (ESC), and the Marine Safety Management Methodology Synthesis (MSMMS). Each tool complements the others; the last will tie the others together in a total system while filling any gaps.

CHRIS and HACS

The Coast Guard's Chemical Hazards Response Information System (CHRIS) forms the basis for much of the Coast Guard's risk analysis development. In this system, only the damage assessment portion of risk analysis is addressed; since CHRIS is deterministic, no probability assessment is possible. The Hazard Assessment Computer System (HACS) is a computerized version of CHRIS, developed in tandem with the non-computerized CHRIS. Both systems were developed by Arthur D. Little, Inc. under contract to the U.S. Coast Guard. In CHRIS, the analysis is performed using tables, plots, nomographs and, occasionally, very simple calculations. HACS is completely computerized. The heart of both systems is made up of 12 models; Table 1 is a listing of the 12. Along with the models is a data base, consisting of physical property data and other information needed in executing problems. For CHRIS, the data are printed in tabular and graphic form, while the data are converted to equation form and modified for direct use by the computer in HACS. A spill may be broken down into a sequence of steps and a particular spill can follow one or more sequences, depending on the actual spill scenario. Figure 1 graphically illustrates the possible pathways that can be taken by a cargo release. The ovals in Figure 1 symbolize an inherent characteristic of the cargo such as volatility or density, and the triangles symbolize an event peculiar to the spill scenario such as ignition or a lack of ignition. The rectangles are the modules used in CHRIS and HACS, the place where the calculations are made, and the circles are the damage modes. Each module is made up of one or more models and often the same module is used in two or more locations in Figure 1.

Use of the CHRIS-HACS systems is straightforward. For CHRIS, a detailed manual leads the user through a series of tables, plots, and nomographs to the answer. The system is designed for very rapid use in emergency situations, with only limited user inputs required. For HACS, the user specifies the module sequence and provides certain user specified inputs; the computer draws values from the internal data base and provides default values for those inputs not provided by the user or found in the data base. The user can override any of the data base values.

The two systems are designed so as to permit the user to directly input known quantities, bypassing the superfluous modules. This saves time and prevents errors from creeping in from the modules. For example, for an LNG spill, if the actual release rate is known or can be estimated accurately, there is no need to execute the Venting Rate module; the release rate is directly inputted to the Spreading Rate and Movement module.

There are two areas of study in progress, development of additional models and validation of models. Not all of the modules in Figure 1 and the models that make them up have been developed to date. Eventually, all modules will be developed as specified in Figure 1 and all modules will be validated. Some problems may be encountered in preparing models for each chemical that is self-reactive or reactive with water.

Both CHRIS and HACS are operational and are in use by the Coast Guard. Future work will expand the scope of the systems and increase their accuracy.

TABLE 1

The Twelve CHRIS-HACS Models

1. Venting Rate
2. Spreading of a Liquid on Water
3. Mixing and Dilution
4. Vapor Dispersion
5. Flame Size
6. Thermal Radiation from Flames
7. Spreading of a Low-Viscosity Liquid on a High-Viscosity Liquid
8. Simultaneous Spreading and Evaporation of a Cryogen on Water
9. Simultaneous Spreading and Cooling of a High Vapor Pressure Chemical
10. Mixing and Dilution of a High-Vapor-Pressure, Highly Water-Soluble Chemical
11. Boiling Rate Model for Heavy Liquids with Boiling Temperatures Less than Ambient
12. Radiation View Factor Between an Inclined Flame to an Arbitrarily Oriented Surface in Space

PVM

The damage assessment provided by CHRIS and HACS is an incomplete one in that these systems can give the user only the distribution of the spilled cargo and, in case of fire, the thermal radiation. In the future, they will be able to deal with a cargo that self-reacts or reacts with water, but they cannot calculate the actual damage done. When the CHRIS and HACS systems were well along in their development, the Coast Guard began to prepare the Population Vulnerability Model (PVM). Developed by Environmental Control, Inc. (ECI), the computerized PVM calculates the effect on people and property for a given spill situation. This is a deterministic tool without consideration of probability; furthermore, it is not intended as an emergency tool but as a planning aid. Given an incident in a specific area, the PVM can estimate the number of people harmed and the value of property lost. At this time, there are no plans to integrate probability considerations into the PVM.

The PVM begins where HACS ends, that is, the HACS models are integrated into a larger, two-part scheme. In Phase I of the PVM, the location of released cargo and its products (if a chemical reaction occurs) are calculated for a series of time intervals. Also, the locatiou and level of thermal radiation and/or overpressures, if any, are calculated. Currently, the geographic data are taken from the U.S. Census, and the area is divided into census tracts. Values of thermal radiation or chemical concentration are, therefore, calculated for each census tract and the computer prints a table of thermal radiatiou or gas concentration as a function of time for each census tract. The Phase I models include the HACS models, in some cases modified by ECI, plus a group of new models. After Phase I is complete, Phase II is begun. In this phase, the effects of the toxic gas, thermal flux, and/or overpressure on people and property are calculated in a time step fashion. The modes of harm to individuals include toxic gases (poisoning), vapor cloud deflagrations (thermal radiation), vapor cloud detonations (overpressures, impact, and fragmentation), and pool deflagrations (thermal radiation). Except for toxic gases, property is damaged through the same modes.

The final output is a table giving the number of fatalities, the number of injuries (permaneut), and the number of irritated individuals (no permanent harm) along with an estimate of the dollar value of the buildings lost. Due to the fact that the response of sheltered individuals to the various damage modes is generally so different from those in the open, separate calculations are performed for both groups.

Although the PVM appears very complex, it is not much more difficult to use than HACS, once the geographical data have been entered into the system and ouce the relevant probits have been developed. It is available for use by non-Coast Guard users and has been used as a part of the technical evaluation of a California Liquefied Natural Gas importation terminal. The system can be used in determining the relative hazards presented by different cargoes and can be helpful in determining the relative effects of a new safety measure or of a new waterfront facility.

Some current Coast Guard efforts in improving the PVM include adding two additional port areas to the data bank and running many test simulations. Several more sets of toxicity probits are in preparation and, for certain types of scenarios, closed form integration is being substituted for time step integration, providing a more realistic simulation and, hopefully, a more accurate damage estimate.

In this way the Population Vulnerability Model is the logical step forward from CHRIS and HACS in the development of a complete risk analysis. The PVM is completely deterministic but can provide a complete damage assessment.

Due to the approximations inherent in such a complex system and at the system's stage of development, the calculations are only esrimates; in the future, the results should be more accurate. The best evaluation of the PVM would be to study an actual release and then simulate it using the PVM. Fortunately, there have been very few cargo releases in the water mode involving hazardous materials, even fewer that have caused serious harm to people. This, however, makes verification of the model difficult. Current plans are to improve the PVM and channel all CHRIS and HACS improvements into the PVM.

ESC

The Coast Guard's formal mathematical risk analysis effort is represented by the Chemical Hazards Response Information System, the Hazard Assessment Computer System, and the Population Vulnerability Model. These have two major drawbacks: first, they require a significant amount of training, and in case of the last two, a computer. Second, they represent only the damage assessment portion of a complete risk analysis, leaving out a probability assessment. To provide an easy to use, complete risk analysis system, Danahy and Gathy of the Coast Guard prepared an entirely differeut system, the Equivalent Safety Concept (ESC).

The ESC is a semiquantitative method of determining whether a loaded ship may transit a harbor. Note that CHRIS, HACS, and the PVM can be used to answer questions about the other modes or even about land facilities; the ESC is strictly limited to a yes/no answer to whether the local Coast Guard Captain of the Port (COTP) should permit a certain harbor transit. In the ESC, three indices are prepared for a given cargo, vessel, and port; the Cargo Index (CI), the Vessel Index (VI), and the Port Safety Index (PSI). These indices are then compared; if the comparison is favorable, the COTP can permit the transit but if not, he must take action that will change one or more of the indices or forbid the transit.

The Cargo Index (CI) is a numerical evaluation of the hazard presented by a specific cargo given a releese. The higher the index, the greater the hazard. For toxic cargoes the index is based on the Threshold Limit Value, the boiling temperature, the ambient temperature, the vapor density, and the Reid vapor pressure. For flammable cargoes, the index is hased on the flammable limits, the autoignition temperature, the boiling temperature, the ambient temperature, the vapor density, and the Reid vapor pressure. For those cargoes that are both toxic and flammable, the higher index is used.

The Vessel Index (VI) is a measure of the ability of the ship to undergo an incident and not have a cargo release or, at the least, to minimize the harm from such a release. The VI is the product of three groups of factors, the first measuring the ability of a ship to resist the loss of cargo. The second group measures the potential for damage if the cargo is lost. The third group of factors represents variables that increase the probability of an accident. The higher the VI the safer the vessel. Values for some of the factors are somewhat arbitrarily assigned, while some of

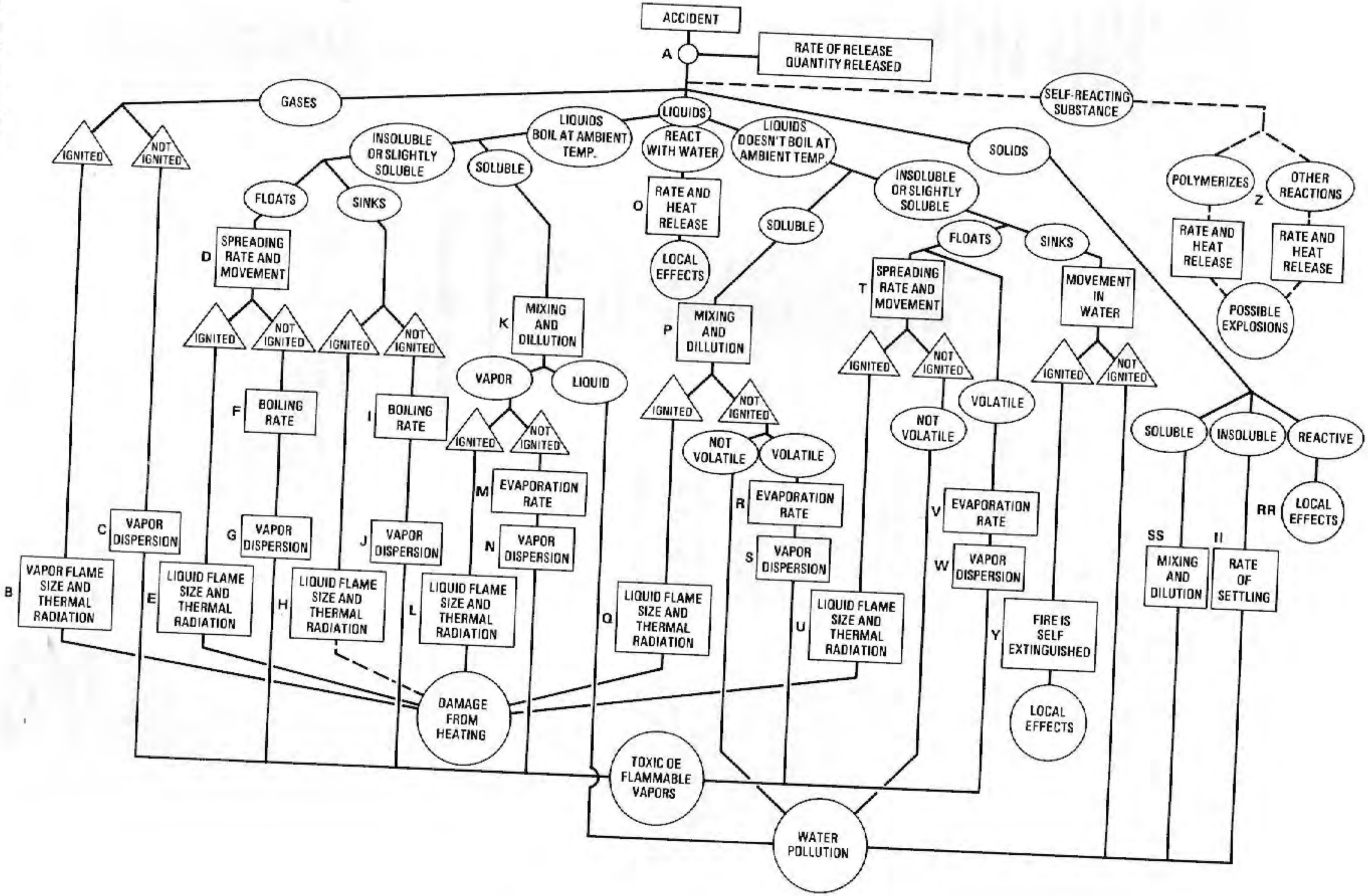

FIGURE 1 HAZARD ASSESSMENT TREE: (Events Chart)

the other variables are determined mathematically. For example, in the first group of factors, a vessel with a double bottom is arbitrarily assigned a "2," while the "tow size factor" in the third group (assuming the "vessel" is a barge tow) is the square root of the number of barges.

The Port Safety Index (PSI) is based on the product of two factors. The first factor represents the characteristics of a port and the associated waterway that tend to favor an accident. Such characteristics include the channel width, maximum water current, and unobstructed line of sight. The second factor represents the shoreside resources that are vulnerable in case of a cargo release, such as the population densities as measured at various distances from the waterway. The higher the PSI, the less favorable the port is for vessel transit.

Note that each index is completely independent of the other. A set of CI's must be prepared only once (and updated whenever a Threshold Limit Value changes). The COTP must prepare a set of PSI's for each port under his control and update it as needed. A set of PSI's for each port is required to reflect the variation of water current with tides and other factors. Separate VI's must be prepared for each vessel.

The CI, VI, and PSI have been scaled so that their values are roughly comparable. A new index, the Transportation Index (TI) is set equal to the VI divided by the CI. All that remains for the COTP to do is to compare the TI with the PSI. If the TI is more than the PSI, the COTP can consider the port transit relatively safe, but if the PSI is greater than the TI, the port transit should be considered unfavorably. The COTP can experiment with certain changes to either decrease the PSI or increase the TI. He could require one or more tugs to escort the vessel or he could establish a safety zone around the ship.

The Equivaleut Safety Concept is still in the development stage. It shows promise of being a useful tool in risk analysis in that it could be implemented long before the more formalized risk analysis techniques growing from logical progression of CHRIS, HACS, and the PVM. The ESC requires more refinement, but it could provide the Coast Guard with many of the benefits of a rigorous risk analysis system at a great savings in both time and money.

MSMMS

The first four tools complement each other but do leave gaps. In order to fill these gaps and to develop a total systems approach to marine safety, the Coast Guard has entered iuto a contract with Planning Research Corporation (PRC) entitled "Analyzing Marine Safety Systems." The Marine Safety Management Methodology Synthesis (MSMMS) is being developed as part of this contract. It will link together the existing Coast Guard risk analysis tools and develop new methodologies where needed. Four areas will be developed during the course of the contract. They are:

*Commercial Vessel Safety Program
*Port Safety and Security Program
*Deepwater Ports Safety Program
*Systems Synthesis Task.

Each of these functional areas has unique needs and objectives; some will use common data inputs and common methodologies. The studies being conducted by PRC during the contract will develop systems analysis support in each of the four program areas to better assess spill potentials, spill prevention goals, program cost-effectiveness, and operating procedures. The overall goal of this effort is to describe and document a compreheusive systems approach to marine safety and spill prevention.

This contract is presently in progress with work being conducted in all program areas. The MSMMS will be developed toward the end of the contract with completion scheduled for 1983.

The Coast Guard's mission in assuming the safe operation of marine transportation requires risk analysis techniques. The CHRIS, HACS, and PVM are in use today, but are being improved, with the ESC and the MSMMS under development. when these systems are fully developed, the level of safety of the marine transportation mode will be greatly increased.

About the Authors

Dr. Alan L. Schneider earned his Doctorate in chemical engineering in 1973 from the Massachusetts Institute of Technology. He has been working as a chemical engineer since 1974 with the Cargo and Hazardous Materials Division, Technical Support Section of the Hazard Evaluation Branch at Coast Guard Headquarters. In this field, Dr. Schneider is concerned with liquefied natural gas, fire and explosion phenomena, and computer stimulation of cargo releases.

Mr. Robert C. Lambert, an Operations Research Analyst, is also a member of the Cargo and Hazardous Materials Division, Technical Advisory Staff at Coast Cuard Headquarters. He was graduated from the University of Pittsburgh with a mathematics degree in 1968, and received his Master's in numerical science from Johns Hopkins University in 1970. At present, Mr. Lambert is serving on the SUPERFUND/OCSLA Task Force at Coast Guard Headquarters.

Annual Index

Volume 35

Lessons from Casualties

The total loss of a towboat resulted from a combination of housekeeping practice, vessel arrangement and underestimating the effect of moving, hot particles produced by welding.

While repairing the push knees of a towboat, the welder and fire watch did not notice that the hot metallic and slag particles from the welding were crossing three feet of open deck into the galley. A small gap between the bulkhead and the deck allowed the particles to fall into the oily bilges, where a fire was ignited. Despite efforts to use the available CO_2 portable extinguisher, the fire went out of control and the vessel was lost.

This casualty demonstrates the importance of anticipating hazards on board a vessel and taking preventive measures. Doors to adjacent spaces, ventilation systems, and structural conditions should be evaluated in order to eliminate hot work as a source of ignition to nearby combustible materials. A fire watch is not enough.

Unexpected hazards may exist when handling containers of cryogenic materials. These materials can be dangerous under working conditions that are normal for most products. This is illustrated by the following example.

A 160-foot supply boat was offloading cargo to an offshore drilling rig in 6- to 8-foot seas. The vessel pitched down as a tank of liquid nitrogen was being lifted from its cradle, displacing the tank and skid from the at rest alinement. When the vessel rose again on the next swell, the tank and deck collided with sufficient force to break the valve attached to the tank bottom. Liquid nitrogen began to pour from the tank to the deck of the vessel—then the main deck plate cracked, allowing the nitrogen to rush into the engine room. The tank was quickly swung out over the water and allowed to drain; damage to the engine room was minor. However, the damage to the main deck was severe and required extensive repair.

On September 26, 1974 the SS TRANSHURON was lost after a sequence of events that started when the failure of a nipple in a salt water system allowed water to spray up and into the main propulsion switchboard. The selection of material and inspection of the condition of the equipment contributed to the casualty.

A similar incident occurred recently when another vessel of the same age experienced a piping failure in the discharge of the butterworth pump. A spray of water covered the ship's lighting and navigational service transformers, causing their failure and loss of service. The vessel was not lost, but the possibility of tragedy should be evident. These incidents demonstrate the need to protect electrical equipment from potential failures of piping systems.

(LESSONS cont'd on next page)

LESSONS FROM CASUALTIES.........

Routine maintenance on lifeboat equipment requires inspection to insure sound and usable equipment. Recently, such maintenance was being conducted on a lifeboat. After the falls were slushed, the boat was heaved back into position. The forward falls parted, transferring the weight of the boat to the after falls; they parted, and the boat was dropped into the sea. Both areas where the wire broke were constantly exposed to the weather and had shown signs of broken strands. Such warning signs should be heeded so that inspection scope is increased and necessary repairs or replacements are made.

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In July of this year a tankship experienced a steering failure in Long Beach Harbor, California. A coupling failed on the rod that connected the follow-up unit with the control mechanism of the steerage motion unit. The coupling consisted of a sleeve overlapping the rod and the short shaft of the control mechauism. The sleeve was secured to the shaft by two Allen screws which backed out, probably due to vibration. As a result, the rod was turned by the follow-up unit, but this motion was not transmitted to the storage motion unit. Fortunately, collision or grounding did not result from this failure.

This casualty is reminiscent of the Sea Witch-Esso Brussels catastrophe in that the sleeve was not supposed to be secured to the control mechanism shaft with Allen screws. The vessel's plans show the coupling secured to the shaft by a tapered pin. The hole for the pin was observed through the diameter of the shaft but the pin was missing.

In the Sea Witch, a similar sleeve-type coupling between a rotating rod and critical component in the steering system was modified by replacing the woodruff key with a square key and an Allen set screw 90 degrees from the keyway. The square key wore and slipped out of the keyway, the set screw loosened and the steering was lost. The Sea Witch then collided with the Esso Brussels. Both vessels were totally ravaged by fire and 16 persons were killed.

In both of these casualties, critical steering machinery was modified in ways that defeated design features specified in the vessel's plans. The "fixes" may have looked serviceable in a static condition, but in use and particularly when subjected to the vibrations of the vessel underway, neither of them was reliable.

key notes

OFFSHORE OIL POLLUTION LIABILITY

The December 4, 1978 Federal Register contained a notice of proposed rulemaking intended to implement Title III of the Outer Continental Shelf Lands Act Amendments of 1978. This act was signed into law on September 18, 1978. Title III of the act imposes liability for Outer Continental Shelf oil spills upon the person or group responsible for the source of the spill. Title III also establishes an Offshore Oil Pollution Compensation Fund which is to be administered jointly by the Secretary of Transportation and the Secretary of the Treasury. The principal purpose of this fund is to ensure that money is available to pay for prompt removal of any oil spilled as a result of Outer Continental Shelf activities, and any ensuing damages--in the event that payment is not made immediately by the responsible spill source.

The intended effect of the proposed rulemaking is to establish requirements for financial responsibility, settlement and adjudication of claims, notification of incidents, designation of sources of oil pollution, and advertisement of claims procedures. The Coast Guard will hold public hearings on the proposals on January 4, 1979 beginning at 9:30 a.m. in the Prince of Wales Room, second floor, Hilton Hotel, Poydres at the Mississippi River at New Orleans, Louisiana and on January 8, 1979 beginning at 9:00 a.m. in room 2230, Department of Transportation, Nassif Building, 400 Seventh St. SW, Washington, DC. Interested persons are invited to attend the scheduled public hearings.

The Coast Guard invites the public to participate in this rulemaking by submitting written data, views or arguments. Comments must be received on or before January 18, 1979. Each person submitting comments should include his or her name and address, identify this notice (CGD 77-055), the specific item or items being commented upon, and give detailed reasons for any suggestions, arguments, objections or recommendations submitted. All comments received will be considered as fully as possible before final action is taken on the proposals; however, the statutory authority under which these rules are being issued requires final action by March 17, 1979. To facilitate the comment evaluation stage of this rulemaking and assure a full and careful consideration of all comments received, commenters are asked to key each comment to the particular section of the proposed rule to which it applies.

REQUIREMENTS FOR OFFSHORE DRILLING UNITS CGD 73-251

As we go to press, it is expected that a final rule will be published in the Federal Register later this month. These regulations will govern the inspection, certification, design, equipment and operation of mobile offshore drilling units. Mobile offshore drilling units have previously been subject to various regulations depending on whether they float while engaged in drilling operations or whether they drill while bearing on the seabed. These regulations will bring all mobile offshore drilling units under one set of uniform, comprehensive regulations. They will also provide that all units will be inspected and certified by the Coast Guard.

These rules were published as a proposal in the May 2, 1977 Federal Register.

Nautical Queries

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

DECK

1. The principal purpose of compass adjustment of the magnetic compass is to eliminate as far as possible which factor?

A. Deviation
B. Compass error
C. Variation
D. Earth's magnetic force

2. Which statement(s) is (are) correct concerning the plotting of radio bearings as received by RDF?

I. A correction must be applied, except where the distance is very short, if the bearings are plotted on a mercator chart.
II. They are great circle bearings and cannot therefore be plotted as rhumb lines.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

3. When using a Loran navigation chart in an area where there is a choice of Loran stations (rates), which of the following represents the most important factor in the choice of station pairs?

A. That the Loran lines of position cross at angles as near 90° as possible
B. Stations located physically nearest the DR position
C. Stations so located as to avoid using skywaves
D. Stations located so that the signals travel a minimum distance over a land area

4. The speed error of a Gyro compass, caused by motion of a vessel along its track, is greater when steaming at a constant speed on which of the following courses?

I. North or South
II. East or West

A. I only
B. II only
C. Both I and II
D. Neither I nor II

5. The amount and sign of the Gyro compass error is determined most accurately at sea by which of the following methods?

A. By comparing the gyro azimuth of a celestial body with the computed azimuth of the body
B. By comparing the Gyro heading with the magnetic compass heading
C. By determining from the chart the course made good between celestial fixes
D. Cannot be determined accurately at sea due to drift of unknown currents

ENGINEER

1. Fluctuating pressures and temperatures in any evaporator will

A. eliminate most scale formation in the first effect.
B. increase the heat level in all effects.
C. increase priming in all effects.
D. automatically cold shock the evaporator.

2. If a motor driven air compressor repeatedly blows fuses upon starting, the cause may be

A. a defective pressure switch
B. a leaking suction unloader
C. compressor starting against full load
D. compressor starting without any load.

3. A groaning sound from a drill tip as the drill is being fed into a metal workpiece indicates

A. overloading of the drill tip
B. the drill is too large
C. the drill speed is too low
D. underfeeding of the drill tip.

4. The functions of lubricating oil include

A. total elimination of friction between moving surfaces
B. distributing bearing wear evenly
C. removing heat from the bearing
D. providing a medium to carry away metal particles.

5. All portable electric tools should have a ground connection to prevent

A. electric shock if the internal wiring becomes shorted
B. burning out the motor if there is an overload
C. overloading the drill motor if there is a short
D. grounding the power circuit if there is a short.

ANSWERS

Deck
1. A, 2. C, 3. A, 4. A, 5. A

Engineer
1. C, 2. C, 3. A, 4. C, 5. A

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications may be obtained from the nearest marine safety office or marine inspection office of U.S. Coast Guard. Because changes to the rules and regulations are made from time to time, these publications can be kept current between revisions only by referring to the Federal Register. (Official changes to all federal regulations are published in the Federal Register, printed daily except Saturday, Sunday, and holidays.) Following the title of each publication in the table below are the date of the most recent edition and the dates of the Federal Registers affecting each.

The Federal Register may be obtained by subscription ($5 per month or $50 per year) or by individual copy (75 cents each) from SupDocs, U.S. Government Printing Office, Washington D.C. 20402.

CG No.	TITLE OF PUBLICATION
101-1	Specimen Examinations for Merchant Marine Deck Officers (2d and 3d Mate) (4-1-77).
101-2	Specimen Examinations for Merchant Marine Deck Officers (Master and Chief Mate) (4-1-76).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (4-1-72). F.R. 7-21-72, 12-1-72, 6-18-75.
115	Marine Engineering Regulations (8-1-77). F.R. 9-26-77.
123	Rules and Regulations for Tank Vessels (8-1-77). Ch-1, 4-28-78). F.R. 8-17-77, 9-12-77, 10-25-77, 12-19-77.
169	Navigation Rules - International - Inland (5-1-77). F.R. 7-11-77, 7-14-77, 9-26-77, 10-12-77, 11-3-77, 12-6-77, 12-15-77, 3-16-78.
*172	Rules of the Road - Great Lakes (7-1-72). F.R. 10-6-72, 11-4-72, 1-16-73, 1-29-73, 5-8-73, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 1-13-77, 11-3-77, 12-6-77.
174	A Manual for the Safe Handling of Flammable and Combustible Liquids and Other Hazardous Products (9-1-76).
176	Load Line Regulations (2-1-71). F.R. 10-1-71, 5-10-73, 7-10-74, 10-14-75, 12-8-75, 1-8-76.
182-1	Specimen Examinations for Merchant Marine Engineer Licenses (2d and 3d Assistant) (2-1-78).
182-2	Specimen Examinations for Merchant Marine Engineer Licenses (First Assistant) (3-1-78).
182-3	Specimen Examinations for Merchant Marine Engineer Licenses (Chief Engineer) (3-1-78).
184	Rules of the Road - Western Rivers (8-1-72). F.R. 9-12-72, 12-28-72, 3-8-74, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 3-1-76, 6-10-76, 7-11-77, 12-6-77, 12-15-77.
*190	Equipment Lists (5-1-75). F.R. 5-7-75, 6-2-75, 6-25-75, 7-22-75, 7-24-75, 8-1-75, 8-20-75, 9-23-75, 10-8-75, 11-21-75, 12-11-75, 12-15-75, 2-5-76, 2-23-76, 3-18-76, 4-5-76, 5-6-76, 6-10-76, 6-21-76, 6-24-76, 9-2-76, 9-13-76, 9-16-76, 10-12-76, 11-1-76, 11-4-76, 11-11-76, 12-2-76, 12-23-77, 4-4-77, 4-11-77, 4-21-77, 5-19-77, 5-26-77, 6-9-77.
191	Rules and Regulations for Licensing and Certification of Merchant Marine Personnel (11-1-76). F.R. 3-3-77, 8-8-77.
227	Laws Governing Marine Inspection (7-1-75).
239	Security of Vessels and Waterfront Facilities (5-1-74). F.R. 5-15-74, 5-24-74, 8-15-74, 9-5-74, 9-9-74, 12-3-74, 1-6-75, 1-29-75, 4-22-75, 7-2-75, 7-7-75, 7-24-75, 10-1-75, 10-8-75, 6-3-76, 9-27-76, 2-3-77, 3-31-77, 7-14-77, 7-28-77, 9-22-77, 9-26-77, 12-19-77, 1-6-78, 1-16-78, 3-2-78, 11-16-78.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (9-1-77). F.R. 9-26-77, 9-29-77, 12-19-77.
258	Rules and Regulations for Uninspected Vessels (4-1-77); Ch-1, 3-17-78). F.R. 9-26-77.
259	Electrical Engineering Regulations (7-1-77). F.R. 9-26-77.
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293	Miscellaneous Electrical Equipment List (7-2-73).
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (7-1-77). Ch-1, 3-17-78). F.R. 9-26-77, 12-15-77, 12-19-77, 7-17-78.
329	Fire Fighting Manual for Tank Vessels (1-1-74).
439	Bridge-to-Bridge Radiotelephone Communications (12-1-72). F.R. 12-28-72, 3-8-74, 5-5-75, 7-11-77.
467	Specimen Examinations for Uninspected Towing Vessel Operators (10-1-74).
497	Rules and Regulations for Recreational Boating (7-1-77). F.R. 7-14-77, 8-18-77, 3-9-78.

*Temporarily out of stock.

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