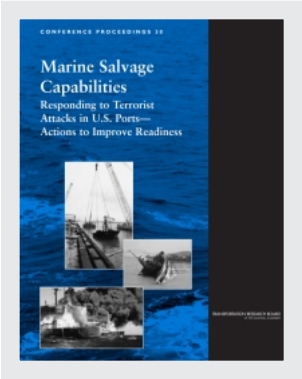

Marine Salvage Capabilities: Responding to Terrorist Attacks in U.S. Ports--Actions to Improve Readiness Responding to Terrorist Attacks in U.S. Ports — Actions to Improve Readiness

DETAILS

38 pages | | PAPERBACK

ISBN 978-0-309-09459-7 | DOI 10.17226/11044

AUTHORS

CONFERENCE PROCEEDINGS 30

Marine Salvage Capabilities

Responding to Terrorist Attacks in U.S. Ports—Actions to Improve Readiness

Report of the Committee for Marine Salvage Response Capability: A Workshop

August 5–6, 2003
Washington, D.C.

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

TRANSPORTATION
RESEARCH BOARD
WASHINGTON, D.C.
2004
www.TRB.org

Transportation Research Board Conference Proceedings 30
ISSN 1073-1652
ISBN 0-309-09459-3

Subscriber Categories
IV operations and safety
IX marine transportation

Transportation Research Board publications are available by ordering individual publications directly from the TRB Business Office, through the Internet at national-academies.org/trb, or by annual subscription through organizational or individual affiliation with TRB. Affiliates and library subscribers are eligible for substantial discounts. For further information, contact the Transportation Research Board Business Office, 500 Fifth Street, NW, Washington, DC 20001 (telephone 202-334-3213; fax 202-334-2519; or e-mail TRBsales@nas.edu).

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competencies and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

This study was sponsored by the Maritime Administration, U.S. Coast Guard, U.S. Army Corps of Engineers, U.S. Navy Supervisor of Salvage and Diving, Office of Naval Research, U.S. Department of Energy, National Oceanic and Atmospheric Administration, and the National Science Foundation.

Cover inset photographs courtesy of (clockwise, from top) Donjon Marine Co., Inc., Hillside, New Jersey; Titan Maritime, LLC, Dania, Florida; and Smit Salvage, Annapolis, Maryland.

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. On the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce M. Alberts is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. William A. Wulf is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, on its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Bruce M. Alberts and Dr. William A. Wulf are chair and vice chair, respectively, of the National Research Council.

The **Transportation Research Board** is a division of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation through research. In an objective and interdisciplinary setting, the Board facilitates the sharing of information on transportation practice and policy by researchers and practitioners; stimulates research and offers research management services that promote technical excellence; provides expert advice on transportation policy and programs; and disseminates research results broadly and encourages their implementation. The Board's varied activities annually engage more than 5,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. **www.TRB.org**

www.national-academies.org

Preface

Malcolm MacKinnon III, *Chair, Committee for Marine Salvage Response Capability: A Workshop*

The U.S. Navy (USN) Office of the Supervisor of Salvage and Diving (SupSalv) maintains a capability to respond to maritime accidents and provide ship salvage services in emergencies. Although the office was established primarily to meet military needs for search and salvage, it also provides services to meet certain commercial emergency salvage needs. The Navy has overall responsibility for ensuring that the nation has salvage capabilities on all coasts to respond to disasters and to protect the public interest. Within this context, SupSalv is responsible for emergency marine salvage preparedness in the event of a terrorist incident in U.S. ports and waterways, and the U.S. Coast Guard (USCG) has a broad responsibility for homeland security, including the nation's seaports.

The United States is a world trade leader with an economy increasingly dependent on ocean transportation and the vitality of ports and waterways. If a terrorist-related or other incident results in the blockage of a harbor or waterway, emergency towing vessels, salvage vessels, experienced divers, and other professionals must be available to respond. In recognition of this need, it was decided to evaluate the status of U.S. marine salvage response capabilities, particularly with respect to potential terrorist-related incidents that could affect commercial and military operations in U.S. harbors and waterways. The National Academies' Marine Board within the Transportation Research Board was asked by SupSalv to assist in the evaluation by conducting a workshop involving salvage experts in both industry and government to consider the status of preparedness and suggest steps for improvement if needed.

An ad hoc committee was appointed to plan and conduct the workshop addressing national salvage response capabilities, with particular attention to the consequences of potential terrorist incidents affecting operations in U.S. ports and waterways. Issues that were considered include organizational and interagency coordination as well as response capabilities. The workshop addressed economic, legal, forensic, environmental, and human casualty issues related to salvage. The principal goals of the workshop were (*a*) to share information among relevant agencies, organizations, and other interested parties concerning current salvage response capabilities and (*b*) to determine if there are any major gaps or concerns with respect to current capabilities and agency roles.

The committee membership included experts in marine salvage, port and waterways management, port and harbor safety, ship operations and management, marine and transportation engineering systems, risk assessment and management, and environmental issues. Members had backgrounds in marine salvage response and capability as well as in legal, economic, and environmental issues; and they understood agency missions and interagency coordination and communications efforts required for effective, efficient salvage response.

The committee met before the workshop to develop the workshop agenda and prepare a list of invitees. In meetings following the workshop, the committee reviewed information presented at the workshop and

developed resulting conclusions and recommendations for future action. These proceedings contain a summary of workshop discussions and committee recommendations highlighting important topics and issues that warrant further, more detailed inquiry by the responsible federal agencies.

ACKNOWLEDGMENTS

The work of this committee has been greatly helped by the thoughtful advice and background information provided by all of the participants in the workshop (who are listed in Appendix B) as well as by other government and industry officials who were consulted during the study. The committee gratefully acknowledges the contributions of time and information provided by the sponsor liaisons and the many individuals within and outside government who are interested or involved in port security and salvage issues. The committee would particularly like to thank the liaison representatives Capt. James R. Wilkins, USN, and Richard Buckingham, Naval Sea Systems Command, who responded promptly and with a generous spirit to the committee's requests for information.

The committee is especially indebted to the salvage industry representatives, researchers, and scientists who provided input to the committee. In particular, the committee thanks Capt. Richard P. Fiske of the MacKinnon-Searle Consortium, LLC, and Richard Fredericks, Director of the American Salvage Association, for their helpful advice. Special thanks are also extended to RADM Thomas Gilmour, USCG; Michael Kidby, U.S. Army Corps of Engineers; Mark Johnson, Department of Homeland Security; Steve Krueger and Mark Whitworth, Federal Bureau of Investigation; and Capt. James R. Wilkins, USN, who participated in the federal agency panel at the workshop, and to Cappy Bisso, Roger Elliott, Mauricio Garrido, James Shirley, Jr., Robert Umbdenstock, and J. Arnold Witte, who participated in the industry panel at the workshop.

The project was conducted under the overall supervision of Joedy Cambridge, Marine Board Staff Director. Beverly Huey and Pete Johnson managed the project and drafted the report under the guidance of the committee. The committee gratefully acknowledges the work and support of Suzanne Schneider, Associate Executive Director of TRB, who managed the review process; of Naomi Kassabian, Editor; of Jennifer J. Weeks, Senior Editorial Assistant; and of Javy Awan, Director of Publications.

The report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making the published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

The committee thanks the following individuals for their review of this report: Stephen E. Flynn, Council on Foreign Relations, New York; Jacqueline Michel, Research Planning, Inc., Columbia, South Carolina; RADM John Brad Mooney, Jr., J. Brad Mooney Associates, Austin, Texas; and Malcolm Spaulding, University of Rhode Island. Although these reviewers provided many constructive comments and suggestions, they were not asked to endorse the findings and conclusions, nor did they see the final draft before its release.

The review of this report was overseen by C. Michael Walton, University of Texas, Austin. Appointed by the National Research Council, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Contents

Executive Summary

Federal officials and industry leaders have recently focused national attention on the security of U.S. seaports and posed serious questions about how best to prevent future terrorist incidents in and around these facilities. Equally important, however, are questions about U.S. capabilities to respond adequately to a terrorist incident should one occur. Ports and waterways are vital to the nation's economic well-being, and the closure of major harbors would have an enormous impact on both commercial and military operations. The response to such incidents would involve many government agencies and organizations at the federal, state, and local levels. With this in mind, the U.S. Navy Office of the Supervisor of Salvage and Diving (SupSalv) asked the National Academies' Marine Board within the Transportation Research Board to convene a workshop of marine transportation and salvage professionals as well as organizational stakeholders in government and industry. The workshop was designed to explore and evaluate current capabilities to respond to terrorist incidents in major U.S. seaports and to report on the current readiness posture and strategies to improve deficiencies.

Given the current elevated threat level, the restructuring of parts of the federal government with the establishment of the Department of Homeland Security (DHS), and variations in response missions of different federal agencies,[1] it is timely to consider whether U.S. marine salvage capabilities are adequate for responding to terrorist-related incidents. It is critical that ports and waterways be kept open to provide services with minimal interruption. If a terrorist-related or other incident results in the blockage of a harbor or waterway, clearance of the channel, waterway, or harbor, or all three, will be a major focus of the response efforts. In addition, many other issues, such as organizational and interagency coordination, must be addressed, especially if there are human casualties and public health impacts. The principal goals of the workshop were to share information among participants concerning current marine salvage response capabilities and to determine if there are major gaps or concerns regarding the current capabilities and agency roles.

Since September 11, 2001, the U.S. Coast Guard (USCG) has given increased emphasis to maritime homeland security to reflect its leadership role in that mission area while continuing to have responsibility for maritime safety, protection of natural resources, maritime mobility, and national defense (e.g., ports and waterways security). Thus, for maritime incidents such as collisions, groundings, and shipboard fires, USCG usually takes the federal lead responsibility for response. If salvage response is needed, USCG typically relies on the responsible party to provide commercial salvage capability. In the absence of adequate action by the responsible party, as well as in any case

[1] The U.S. Coast Guard (USCG) and other agencies within DHS, the Navy, the U.S. Army Corps of Engineers (USACE), the Federal Bureau of Investigation (FBI), the National Oceanic and Atmospheric Administration (NOAA), the Maritime Administration (MARAD), the U.S. Department of Transportation (DOT), and the National Transportation Safety Board (NTSB).

requiring salvage expertise, USCG calls upon the Navy for salvage assistance.

Traditionally, the Navy has been the federal agency that maintains the ability to respond to maritime accidents requiring professional marine salvage services. SupSalv was established to meet military needs for maritime salvage and underwater search operations, and that remains its primary mission. To meet its responsibilities, SupSalv augments the Navy's internal resources through competitive long-term contracts with commercial salvors to provide additional assets, personnel, and cutting-edge technology as needed. Because of its unique capabilities and recognized expertise in the field, SupSalv also has the discretionary authority, under the Salvage Facilities Act (P.L. 80-513, 10 U.S.C. Sections 7361-–7367), to provide and promote domestic marine salvage facilities and capabilities for private-sector as well as public-sector vessels. The Navy's ability to exercise that authority with respect to the private sector has been, and continues to be, constrained by budgetary considerations and shrinking internal salvage resources.

In 1982, the Marine Board conducted a comprehensive study of U.S. salvage needs and capabilities and published *Marine Salvage in the United States*. This report was followed by a 1994 Marine Board report, *A Reassessment of the Marine Salvage Posture of the United States*, which describes the Navy's salvage resources and its contribution to the nation's salvage capabilities. The overall organization of the Navy's salvage mission has remained much the same since 1994, but there has been a continuing decline in the number of vessels and other resources. In addition, the 1994 report found that there is not enough marine salvage business to support a commercial salvage industry solely dedicated to traditional salvage work, and that reality continues today. Since the 1994 study, substantial changes have occurred in public and private salvage capabilities as well as in public expectations for the nation's ability to respond to major incidents at sea. The major U.S. salvage companies recently formed the American Salvage Association (ASA) with the intent of agreeing to and defining joint interests of salvors for representation before federal agencies and the general public.

In summary, there has been no significant increase in the number of domestic salvage vessels or their capabilities in recent years. Although marine casualties in U.S. waters are at a historically low rate, recent events—notably the terrorist attacks on the World Trade Center and the Pentagon in the United States and the attack on the USS *Cole* in the Port of Yemen—suggest that issues relating to national salvage capability have importance not only in terms of transportation, economic, and environmental concerns but also for homeland security.

THE WORKSHOP

The Workshop on Marine Salvage Response Capability, held at the National Academies on August 5–6, 2003, brought together experts in salvage response, government officials responsible for incident response, and representatives of stakeholder organizations. During the workshop, the role of salvage and the response to potential terrorist incidents affecting U.S. ports and waterways were discussed, including the issue of organizational and interagency coordination. Specifically addressed were physical salvage and harbor clearance issues; financial, economic, and political issues; legal, forensic, and human casualty issues; and environmental issues.

Before the workshop, the Committee for Marine Salvage Response Capability developed two scenarios involving terrorist incidents through a process of interviews with experts and industry officials familiar with these ports and their vulnerabilities. At the beginning of the workshop, the committee introduced the participants to the results of the hypothetical maritime terrorist scenarios, which were developed for the purpose of exploring and testing salvage response capabilities—one in the Port of Houston, Texas, and the other in the Port of New Orleans, Louisiana. The committee made assumptions concerning what determined terrorists with sufficient assets could accomplish. The two ports selected are major, world-class commercial shipping complexes—both along the U.S. Gulf Coast—handling significant international and domestic waterborne commerce. The Port of Houston is the second largest in the United States by tonnage carried and conducts a major trade in petroleum, chemicals, and other hazardous cargoes with large refineries and petrochemical plants along the waterway. The Port of New Orleans and other ports along the Mississippi River from Baton Rouge south handle more combined tonnage than any other U.S. port and accommodate a huge variety of large ocean-going ships, barges, tugs, and other vessels.

The hypothetical scenario for Houston concerned a terrorist attack causing a collision between a cruise ship and a chemical tanker. Both vessels were sunk and were blocking the Houston ship channel. The chemical tanker exploded and the result was mass conflagration with a spill of an unknown mix and quantity of hazardous chemicals. The passenger ship was carrying 2,100 passengers plus crew. It became engulfed in fire, was flooded, and suffered an unknown number of human casualties. The prevailing winds carried a cloud of toxic chemical vapors and smoke from the collision site toward the city of Houston.

The hypothetical incident for New Orleans resulted from a terrorist-caused explosion aboard a product tanker and sinking of the vessel in the Mississippi River, the disabling of the Algiers locks in the Gulf

Intracoastal Waterway (GICW), and the destruction of a state highway bridge across the Mississippi River. The product tanker was sunk across the river blocking the channel at Southwest Pass, and the GICW and Mississippi River were blocked at New Orleans because of the disabled locks and destruction of the bridge. There was a mass conflagration on the product tanker.

After discussing these incidents, designated workshop participants divided into two panels—one government and one industry. These panels assessed likely salvage responses. The first panel included representatives of key federal agencies with authority and responsibility to respond to these types of incidents and specifically their marine salvage component. These panel members discussed their anticipated overall salvage response and identified their respective agency's role in such an incident. They also described existing procedures for managing and implementing a coordinated response and providing the needed resources. The salvage industry panel first commented on the salvage problem presented and then discussed the expected salvage response drawing on their knowledge and experience.

At the end of the panel presentations, a general discussion was held with questions or comments from the entire workshop. The results of these panel discussions set the stage for more detailed discussions with four breakout groups: (*a*) physical salvage and harbor clearance issues; (*b*) financial, economic, and political issues; (*c*) legal, forensic, and human casualty issues; and (*d*) environmental issues.

Each of the four breakout groups used the information presented in plenary sessions to discuss the scenario results, responses, and likely impacts from their perspective. A moderator in each group summarized the results of the group discussions and presented it to the full workshop. Each group prepared a final summary of discussions including the participants' views as to what the most useful next steps might be. A final plenary session gave all participants an opportunity to comment on each group's results and offer other observations. The committee used these workshop results to prepare these proceedings, which include summaries of each group's discussion, overall observations about the key issues, and committee recommendations for actions that the responsible agencies should take to improve future marine salvage readiness to respond to seaport terrorist incidents.

Workshop participants considered the adequacy of salvage assets to respond to the hypothetical scenarios. Although many participants from the salvage industry believed that past performance on marine salvage problems of similar magnitude shows that the industry has the needed capabilities, the question could only be addressed in a very general way given the time and limited information available for the workshop. Perhaps a more pressing question was whether necessary capabilities will be maintained into the future given the nature of the industry and the overall business climate. Workshop participants, including experienced members of the marine salvage community, were not able to identify specifically the existing physical capabilities that would be available to government responders and planners for the hypothetical scenarios. Consequently, they were not able to provide an anticipated time frame for response, which is a critical component of readiness posture. It is clear that physical salvage capabilities in the United States have not been documented and evaluated in sufficient detail to define whether the nation has an adequate readiness posture for responding to terrorist incidents in major seaports.

The status of organizational capabilities[2] for adequate salvage response was also addressed at the workshop. Many participants believed that readiness in this area is improving but needs sustained attention in the future. A number of areas were discussed in which salvage input to the planning process could be enhanced for the purpose of improving readiness and the ability to deploy and utilize salvage assets when needed to respond to terrorist incidents. Several specific suggestions were offered for modifying ongoing planning efforts with homeland security initiatives.

The workshop participants considered whether further tests and evaluations would help address remaining questions about the U.S. readiness posture. Whether the nation has adequate salvage resources, capabilities, and organizational structures to respond to a major terrorist incident in U.S. seaports remains an open question, particularly considering the magnitude of economic and social impacts that might occur. The participants discussed the value of conducting drills and exercises as a method of more specifically evaluating capabilities and identifying needs. These exercises were considered a useful step to evaluate more completely where improvements in salvage readiness would bring concrete results. Both tabletop and field exercises have been used in similar fashions and could be designed specifically to answer questions about salvage assets as well as organizational issues.

Also addressed at the workshop were a number of other issues of concern to the marine salvage community and those responsible for planning and managing salvage response. Participants identified unresolved regulatory and policy issues that could affect the ability of government and industry to maintain an acceptable readiness posture. These issues included questions

[2] Organizational capabilities are defined as the makeup and capabilities of intra- and interagency planning groups, the adequacy of response plans, the expertise of the planners and responders, and the methods of implementing response actions when needed.

about funding, liability, planning processes, and protocols for addressing impacts not directly a part of salvage but having an effect on salvage operations. All of these issues could not be covered during the time given for the workshop. Therefore, these issues remain an important aspect of future work to improve capabilities within the government and private sector.

Conclusions and Recommendations

The workshop discussions and the results of each breakout group's consideration of the questions posed focused on two general areas of concern regarding capabilities—physical capabilities and organizational capabilities. Although discussions about responses to hypothetical scenarios were not detailed enough to highlight the need to obtain or maintain specific physical assets, they did provide an overall sense that, although U.S. commercial salvage capabilities are significant, more work is required to define the physical assets and organizational competency necessary to meet a terrorist threat. In reviewing the workshop results, the committee concludes that further work in four areas is necessary to improve the nation's readiness posture regarding marine salvage capabilities: (*a*) maintaining an inventory and evaluation of available physical salvage assets, (*b*) conducting tabletop exercises to test physical and organizational readiness posture, (*c*) improving salvage expertise and input to the planning and response networks, and (*d*) conducting further study of related legal, regulatory, and policy issues. The committee's recommended next steps in these four areas are described in more detail in the following sections.

Inventory of Marine Salvage Assets

Because the workshop did not have the time or resources to conduct a comprehensive review of physical assets in the marine salvage industry and the relevant government agencies, definitive conclusions about readiness were not possible. In addition, many workshop participants believed that specific answers to questions about the adequacy of response or readiness are very dependent on the specifics of the incident and are difficult to generalize. Nevertheless, the committee believes that response planners need to have access to an inventory of salvage assets maintained by responsible government agencies and the salvage industry and that a gap analysis—an assessment of salvage needs compared with available assets—should be conducted, taking into account the need for timely response.

Therefore, the committee makes the following recommendations:

- SupSalv, in consultation with USCG and the commercial salvage industry, should maintain an inventory of available marine salvage and firefighting assets. The inventory should be updated at regular intervals with sufficient frequency to maintain current information.
- SupSalv should conduct a series of gap analyses by comparing available assets with those required to respond effectively to a range of potential marine terrorist activities as well as other major marine salvage incidents. The analyses should consider all critical salvage response measures including rescue towing, harbor and channel clearing, dredging, search and recovery, patching and refloating of vessels, and marine firefighting. The adequacy of anticipated response times on a regional basis should be included in the gap analyses.
- The USCG should promulgate final rules for vessel response plans as soon as is practical to provide necessary guidance on effective response times for salvage operations.
- If the gap analyses show that current marine salvage assets are insufficient to respond to plausible terrorist threats in U.S. seaports and waterways, responsible federal agencies should consider revising the existing national salvage policy to provide for the necessary salvage capability in the future.

Marine Salvage Response Exercises

The committee believes that a logical next step in evaluating marine salvage readiness is to conduct detailed exercises using plausible terrorist incidents, the realistic complements of response systems and equipment, and the complete response organizational structure. Such an exercise would be designed to assess the U.S. readiness posture in the event of a terrorist act affecting U.S. harbors and waterways with a particular focus on the marine salvage component. Specifically, the committee recommends the following:

The responsible federal agencies should plan and conduct a high-level tabletop salvage response exercise. Participants in the exercise should be senior members from the relevant agencies and private organizations who are capable of making the decisions necessary to ensure proper responses. The exercise could follow scenarios similar to those used in the workshop. The exercise should be carefully planned and led by an experienced facilitator. Additional exercises should follow the first for the purpose of testing different scenarios in different locations.

Responsible agencies should conduct a supplemental exercise utilizing the same scenarios as those for the high-

level tabletop exercise to test the interactions necessary to identify and mobilize the salvage assets necessary to clear harbors and channels so that the ports can be reopened in the most efficient fashion. This exercise should include representatives from the Navy, the salvage industry, and other related stakeholders.

In addition, individual agencies should conduct their own exercises, designed to test the responses necessary to support the opening of the port or ports in the most efficient manner. An example would be an exercise conducted by the FBI to determine the most efficient handling of the crime scene, thereby allowing clearance operations to proceed in a timely fashion. Other agencies might include USACE, USCG, NSTB, and local fire and police departments, among others.

Public affairs specialists from the various federal entities participating in the exercises should also be involved. Such a procedure would acquaint public affairs specialists with salvage efforts and should prepare them to handle the myriad public affairs challenges in an actual salvage operation.

Salvage Response Organizational Structures

The committee considered the results of workshop discussions and concerns about how existing organizational structures are implemented within the responsible federal agencies and how these organizations receive and utilize expertise and advice about marine salvage operations and capabilities. The committee concluded that response readiness could be significantly enhanced by improved interagency coordination. Organizational structures need to be revised at several levels in order to include salvage expertise in both planning and response operations. Specifically, the committee has the following recommendations:

- The membership of the Secretary of Homeland Security's National Maritime Security Advisory Committee should be modified to include a marine salvage expert.
- The Coast Guard Director of Homeland Security should develop a liaison position with SupSalv.
- The structure of the National Response Plan should provide for the inclusion of salvage expertise in the National Incident Management System (NIMS).

Legislative, Regulatory, and Policy Issues

The workshop participants identified a number of unresolved legislative, regulatory, and policy issues associated with marine salvage operations resulting from terrorist acts. The committee noted that marine salvage companies are not guaranteed immunity during response operations and thus there is the potential for civil or criminal liability if pollution incidents occur during salvage operations. Industry participants believed that this potential is a serious disincentive for salvors to undertake some salvage operations. Other participants were concerned that there are inadequate funding methods in place to cover effective salvage response resulting from terrorist attacks. A number of funding options could be explored, including expansion of existing systems or development of new ones patterned after successful funding mechanisms that are now in place. Workshop participants, noting the use of "standby" salvage in other parts of the world, discussed the potential for increased use of standby salvage capability as a mechanism to fill the gap in salvage capacity in the United States and to ensure timely response in emergency situations.

Another issue identified by workshop participants was the absence of a process for designating places of refuge or safe havens when a vessel has experienced serious damage. Past experience has shown that this deficiency can present a critical obstacle to effective salvage operations. Some issues were also identified in the workshop that relate to topics other than salvage but affect the conduct of salvage operations. For example, environmental impacts and public health considerations need to be an integral part of any crisis management decision-making process. Participants noted that a protocol for addressing public health impacts of a terrorist event or consequent salvage operations is not clearly defined and that this lack contributes to the potential vulnerability of the public during a terrorist event. In addition, the absence of a protocol for addressing human casualties in maritime incidents could result in potential confusion over jurisdiction and logistics for effectively addressing decedent affairs.

Because these policy issues need to be resolved before salvage response readiness can be ensured, the committee recommends that a study of outstanding legal, regulatory, and policy issues be conducted to determine how best to address the following concerns:

- The development of an appropriate process within the emergency response organizations to fund adequately salvage operations resulting from a terrorist event;
- The development of a process to designate places of refuge or safe havens for the conduct of salvage operations;
- A perceived need for responder immunity and consequent civil liability for nonnegligent salvage operations that result in pollution or other unintended or unavoidable damages;
- The establishment of a protocol for addressing public health impacts of a terrorist event or consequent salvage operations;

- The establishment of a protocol for addressing human casualties and decedent affairs for maritime casualties; and
- The establishment of standby salvage capability in some particularly vulnerable and busy port and harbor.

Introduction

The United States is a world trade leader with an economy increasingly dependent on ocean transportation and the vitality of the nation's ports and waterways. U.S. ports and waterways, however, are remarkably diverse in terms of the vessel traffic served, the types of services provided, geography, and environmental conditions. Because ports must be able to provide efficient, rapid turnaround capabilities to accommodate not only expanding trade but also the increasing size and speed of ocean-going ships, it is critical that ports and waterways be kept open to provide these services on a continuous, uninterrupted basis. If a terrorist-related or other incident results in the blockage of a harbor or waterway, emergency towing vessels, salvage vessels, dredging equipment, and salvage personnel must be available to respond.

Traditionally, the U.S. Navy has been the federal agency that maintains the ability to respond to maritime incidents requiring professional marine salvage services. Within the Navy, the Supervisor of Salvage and Diving (SupSalv) was established to meet military needs for maritime salvage and underwater search operations, and that remains its primary mission. To meet its responsibilities, SupSalv augments the Navy's internal resources through competitive, long-term support contracts with commercial salvors to provide additional assets, personnel, and cutting-edge technology as needed. Because of its unique capabilities and recognized expertise in the field, SupSalv also has the discretionary authority, under the Salvage Facilities Act (P.L. 80-513, 10 U.S.C. Sections 7361–7364), to provide and promote domestic marine salvage facilities and capabilities for private-sector as well as public-sector vessels. The Navy's ability to exercise that authority with respect to the private sector has been, and continues to be, constrained by budgetary considerations and shrinking internal salvage resources.

Although the U.S. Coast Guard (USCG) has increased its emphasis in maritime homeland security to reflect its leadership role in that mission area, it also has responsibility for maritime safety, protection of natural resources, maritime mobility, and national defense. For maritime incidents such as collisions, groundings, and shipboard fires, USCG usually takes the federal lead responsibility for response. However, if salvage response is needed, USCG typically relies on the responsible party to provide commercial salvage capability. For example, USCG maintains requirements for marine salvage and firefighting resources in vessel response plans for tank vessels carrying oil. The existing requirements are currently being revised to clarify what services must be identified in vessel response plans. In some instances, USCG calls upon the Navy for salvage expertise and capability.

In recent years, there has been no significant increase in the number of domestic salvage vessels and no significant enhanced capability or availability of existing vessels (Volpe 2001). Although marine casualties in U.S. waters are at a historically low rate (NRC 2003), recent events—notably the September 11, 2001, terrorist attacks in the United States and the attack on the USS *Cole* in the Port of Yemen—suggest that issues relating to national marine salvage capability have importance not only for transportation, the

economy, and the environment but also for homeland security.

Given the current variations in salvage missions of the different agencies, the restructuring of some parts of the federal government with the establishment of the Department of Homeland Security, and resulting changes in agency missions, it is timely to discuss and consider whether there is a need to reexamine U.S. marine salvage response capability, particularly with respect to potential terrorist-related incidents that could affect commercial and military operations in U.S. harbors and waterways.

Background

In 1982, the Marine Board conducted a comprehensive study of salvage needs and capabilities, the findings of which appear in the report *Marine Salvage in the United States* (NRC 1982). This report was followed by *A Reassessment of the Marine Salvage Posture of the United States* (NRC 1994), which contains a description of the Navy's salvage resources and contribution to the nation's salvage capabilities. The overall organization of the Navy's capabilities has remained much the same since that report, but there has been a continuing decline in the number of vessels and other available resources (Volpe 2001). In addition, the 1994 report found that there was insufficient marine salvage business to support a commercial salvage industry solely dedicated to traditional salvage work. This lack of support continues to be a concern today. Since the 1994 study, substantial changes have occurred in public and private salvage capabilities as well as in public expectations for the nation's ability to respond to major casualties at sea. In 2000, the major U.S. salvage companies formed the American Salvage Association (ASA) with the intent of agreeing to and defining joint interests of salvors for representation before federal agencies and the general public. The plans and policies of this group will be important to consider in any assessment of future salvage capabilities.

Significant changes have also occurred in maritime traffic and shipping in general in major U.S. ports and waterways. The state of Washington now requires escort tugs for certain tankers operating in Puget Sound and standby tugs for areas in which emergency towing services might be needed. USCG also conducted a formal risk assessment as well as a regulatory assessment on the use of tugs to protect against oil spills, which included an analysis of the costs and benefits for various prevention and mitigation measures (Volpe 2001). The Puget Sound situation is illustrative of the issues in salvage and rescue tug operations that can arise when the perceived risk of accidents and oil spill pollution is high. The additional complexities associated with terrorist-related incidents make the need to examine these issues even more apparent.

In addition, many other maritime nations have expressed an interest in emergency response to tanker accidents that might cause pollution. (A recent example is the *Prestige* incident off the European coast.) One scheme has been to station salvage vessels or tow vessels in strategic locations to reduce response time and provide needed emergency capabilities. In Europe, the United Kingdom and France have adopted this stand-by approach as a way of protecting against future tanker spills; they have stationed emergency towing vessels at strategic locations in the English Channel and elsewhere.

SupSalv has recognized the changing nature of maritime traffic, the need for increased port security in light of the threat of terrorist activity, the importance of keeping ports and channels open, and the continuing decline in U.S. salvage assets. These factors led SupSalv to seek the assistance of the Marine Board to evaluate current salvage capabilities and to investigate the U.S. salvage readiness posture including organizational issues within the responsible federal agencies. The Board agreed to convene a workshop with participation from both the commercial salvage industry and the federal agencies.

Approach

The workshop brought together professionals with expertise in U.S. marine salvage response capabilities, particularly with respect to potential terrorist incidents in U.S. ports or waterways that could disrupt or halt commercial shipping operations and affect the environment or other transportation operations, as well as representatives of various stakeholder organizations. During the workshop, the role of salvage and U.S. response capabilities to the consequences of potential terrorist incidents affecting operations in U.S. ports and waterways was discussed. This discussion included organizational and interagency coordination as well as response capabilities. The workshop addressed (*a*) physical salvage and harbor clearance issues; (*b*) financial, economic, and political issues; (*c*) legal, forensic, and human casualty issues; and (*d*) environmental issues related to salvage. The principal goals of the workshop were (*a*) to share information among relevant agencies, organizations, and other interested parties concerning current salvage response capabilities, and (*b*) to determine if there are any major gaps or concerns with respect to current capabilities and agency roles.

The committee met before the workshop to discuss hypothetical terrorist scenarios and decided to use the scenario strategy to focus and direct the workshop. The initial conditions that resulted from the scenarios were presented to workshop participants for their

response and reaction. The committee also developed the workshop agenda and identified panelists who could address likely responses to the scenarios. At meetings following the workshop, the committee reviewed the information presented at the workshop and developed key findings and recommendations. These proceedings contain a summary of workshop discussions, the approach used to identify marine salvage capabilities and possible problems, and committee recommendations highlighting important topics and issues that warrant further, more detailed inquiry by the Navy, USCG, and others.

The workshop began with a brief description of the results of hypothetical terrorist scenarios in two U.S. ports. Following this description two panels were convened. The first comprised federal agency representatives from USCG, the U.S. Army Corps of Engineers, the Office of Maritime and Land Security, Transportation Security Administration, the Federal Bureau of Investigation (FBI), and SupSalv. The second panel consisted of marine salvage industry representatives. (See Appendix A, page 32, for the workshop agenda; panel participants are listed in Appendix B, page 34.)

Following the panel sessions, four topical breakout sessions were held concurrently. Each group discussed the scenario results, responses, and likely impacts from the topical perspective of their respective breakout session.

Hypothetical Terrorist Scenarios

At the beginning of the workshop the committee presented the results of two hypothetical maritime terrorist scenarios that were developed for the purpose of exploring and testing salvage response capabilities—one in the Port of Houston, Texas, and the other in the Port of New Orleans, Louisiana. The committee developed these scenarios through a process of interviewing experts familiar with these ports and the members of the local commercial maritime industry and considering the possible vulnerabilities that exist. Assumptions were then made concerning what a terrorist group with sufficient assets could accomplish. The two ports selected are major, world-class commercial shipping complexes—both along the U.S. Gulf Coast—handling significant international and domestic waterborne commerce. The Port of Houston is the second largest in the United States by tonnage carried (about 185 million tons per year), accommodates 6,600 major ships each year, and conducts a major trade in petroleum, chemicals, and other hazardous materials cargoes with major refineries and petrochemical plants along the waterway. The Port of New Orleans and other ports along the southern Mississippi River handle more tonnage than any other U.S. port at about 359 million tons per year and accommodate a huge variety of large ocean-going ships, barges, tugs, and other vessels.

The hypothetical scenario presented for Houston concerned a terrorist-caused collision between a cruise ship and a chemical tanker. Both vessels were sunk and blocking the Houston ship channel. The chemical tanker, loaded with 17,000 tons of mixed but unknown chemicals, exploded, resulting in mass conflagration and a spill of unknown hazardous chemicals. The passenger ship was carrying 2,100 passengers plus crew. It suffered fires and flooding and an unknown number of human casualties. The prevailing winds were from the collision site toward the city of Houston.

In the incident for New Orleans, terrorist activity resulted in a product tanker explosion and sinking in the Mississippi River, the disabling of the Algiers locks in the Gulf Intracoastal Waterway (GICW), and the destruction of the State Highway 90 bridge across the Mississippi River. The product tanker was sunk across the river blocking the channel at Southwest Pass, and the Mississippi River access was blocked at New Orleans because of the disabled locks and destruction of the bridge. There was a mass conflagration on the product tanker.

After presenting and discussing the major factors of these incidents, the workshop participants, organized into one government and one industry panel, addressed their assessment of key elements of a likely response—especially related to how the salvage activities would be carried out and how they would relate to the other activities anticipated during such an event.

Panel Discussion Topics

The first panel included representatives of key federal agencies with authority and responsibility to respond to salvage incidents in U.S. ports and waterways. Panel members were asked to discuss the anticipated overall salvage response to the incidents presented and to identify their agency's respective role or roles in such incidents. They were also asked to describe the existing procedures for managing and implementing a coordinated response and providing the needed resources. In particular, to the extent possible, they were asked to address the following questions:

- What are the specific roles and responsibilities of your agency in responding to an incident such as those presented to the workshop? Are these roles and responsibilities formally established and have they been updated recently?
- Has your agency developed a comprehensive plan for such a salvage response and clearly defined its relationship to that of other responsible agencies as well as to the private sector? Has this plan been tested?

- How will the National Response Plan, currently under development, affect your roles, responsibilities, and agency relationships?
- Would you anticipate any problems or shortfalls in capabilities to respond to the incidents presented based on your knowledge of both government and private equipment and resources available?
- What organizational or procedural problems would you anticipate in responding to the incidents presented and how might these be addressed?
- What steps would you suggest be considered in order to improve the overall readiness posture of the nation for responding to incidents such as those presented or similar threats?

The second panel included representatives of the marine salvage industry. These panelists were asked to first comment on the salvage problems presented and then discuss the expected salvage response drawing on their knowledge and experience with the required type of salvage actions and any local knowledge they may have had of the Houston-Galveston and Lower Mississippi port complexes. In particular, they were asked to address the following issues:

- What equipment and personnel are likely to be immediately available to respond to the scenarios presented?
- What are the key steps and the major types of resources that would be required for an adequate response effort?
- What would be the best estimated times for initial mobilization, first emergency response, and final channel clearing?
- What shortfalls of either equipment or personnel might be expected and how might these be addressed?
- What organizational or procedural problems might be expected and how might these be addressed?
- What steps might be useful to consider in order to improve overall readiness posture before incidents such as these?

Organization of the Report

The Summary of Workshop Discussions, page 1, offers a brief description of the workshop discussions and a distillation of the key issues. The next chapter, Committee Assessment of Response Capabilities Based on Workshop Discussions, page 19, presents the committee's assessment of existing response capabilities, as well as of the nation's organizational capabilities (within both government and private entities) and physical capabilities (equipment and personnel). The chapter concludes with comments about whether further steps such as drills or exercises or additional study might help to evaluate more completely and accurately the status of capabilities. On the basis of the knowledge gained from the workshop, Committee Recommendations to Improve Salvage Readiness, page 28, presents the committee's suggestions regarding steps that might be taken to improve the nation's readiness posture regarding marine salvage capabilities and identifies a sample of key action items.

References

NRC **National Research Council**
Volpe **John A. Volpe National Transportation Systems Center**

NRC. 1982. *Marine Salvage in the United States*. National Academy Press, Washington, D.C.

NRC. 1994. *A Reassessment of the Marine Salvage Posture of the United States*. National Academy Press, Washington, D.C.

NRC. 2003. *Oil in the Sea III: Inputs, Fates, and Effects*. National Academy Press, Washington, D.C.

Volpe. 2001. *Regulatory Assessment: Salvage and Marine Firefighting Requirements* (Draft). John A. Volpe National Transportation Systems Center, Cambridge, Mass.

Summary of Workshop Discussions

The Marine Salvage Response Capability Committee of the Marine Board within the Transportation Research Board held this workshop on August 5–6, 2003, in Washington, D.C. The workshop agenda is shown in Appendix A, page 32. The workshop included three plenary sessions interspersed with two breakout sessions to allow a full and open discussion of the issues by all attendees as well as to focus attention of both federal agency and industry representatives on the readiness to respond to terrorist attacks on U.S. maritime facilities and how to improve the nation's response capabilities. In the opening plenary session, the purpose and goals of the workshop were presented and two hypothetical terrorist attack scenarios were described. Next, two panels (one of federal agency representatives and one of marine salvage industry representatives) responded to prepared questions about response capabilities.

During the federal agency panel discussion, panel members described their respective agency's roles and responsibilities. During the industry panel discussion, panelists described the industry's probable salvage response actions following the scenarios presented to the group. Each panel member was then asked to respond to several questions regarding how their agency or industry would probably respond and whether adequate capabilities are available. The questions that were posed to each set of panelists can be found in the Introduction, on page 7. At the end of the panel presentations, a general question-and-answer period was held. The plenary sessions were intended to inform participants about federal agency and industry roles, responsibilities, and resources and to set the stage for more detailed discussions in the four breakout groups.

Workshop attendees participated in one of four breakout groups:

- Physical Salvage and Harbor Clearance Issues;
- Financial, Economic, and Political Issues;
- Legal, Forensic, and Human Casualty Issues; and
- Environmental Issues.

Using the information presented in plenary sessions, each group discussed the scenario results, responses, and likely impacts from the perspective of each group theme. The moderator of each group summarized the results of the group discussions and presented them to the full workshop during the second plenary session. Using feedback from the full session, each group then prepared a final summary of discussions, including useful next steps. The breakout group summaries, which are presented in the following sections, represent the key results of the workshop and the observations by the workshop participants about how federal agencies and the salvage industry would likely respond to terrorist attacks of the nature presented in the two scenarios as well as the response capabilities that are available and the response capabilities that are needed to attain an adequate readiness posture.

Physical Salvage and Harbor Clearance Issues

The physical salvage and harbor clearance group reviewed and discussed the most critical such issues facing the salvage industry, including the physical resources available, the time frames most likely for a response (e.g., would it be within months or years in the situation presented?), questions about where the salvage community fits in the Department of Homeland Security of the Transportation Security Administration (DHS-TSA) structure in responding to terrorist events, and the level of resource capabilities that might be available if the nation were faced with multiple events.

In considering a proper marine salvage response, decision makers must assess the situation, including the circumstances surrounding it. For example, in the event of a fire, extinguishing it immediately may be inappropriate because salvors may not have all the needed data about the burning materials and how they might react with water or other agents used to fight the fire. Salvors must also give adequate consideration to an evolving situation that may have multiple needs and requirements. Because salvage is a dynamic situation, the salvage plan may change a number of times, perhaps abruptly, during the course of a typical operation.

One key factor to consider is that there will be pressure after a serious event to reopen the waterway quickly if it is closed by the incident. For instance, participants estimated that about one week's crude oil supply is usually available to the refineries above the Houston incident site, and pressure to resume crude oil deliveries to these refineries will be great. One method that might be used to expedite reopening a waterway is open-water dredging of a new channel (without concern for disposal).[1] This operation might be possible in some waterways and may be the fastest means for opening a channel to shipping. Clearing a channel by salvaging a wreck might take much longer.

The group then discussed the physical salvage resources that would be needed and their availability given the scenarios presented. Most of the commercial salvors at the workshop believed that they currently have sufficient salvage equipment to effectively carry out the needed salvage response even though they did not have specific details about all components and their locations. However, concern was expressed about the future because current needs for salvage do not justify training of new people or acquisition of additional assets, and thus salvage capabilities may diminish with time. For example, today there are few young salvage masters, and for most salvage companies, salvage is now a small part of their overall business (industry participants estimated 10 to 25 percent). In addition, there is an issue regarding provision of salvage services by international salvors within U.S. waters (in the 3-mile and 12-mile limits) without specific waivers in certain U.S. laws that prohibit foreign flag operations here. There are costs involved in maintaining U.S. equipment and infrastructure, but customs can waive the U.S. flag requirement. There is concern, however, that arbitrary waiving of this requirement will diminish U.S. salvage capability.

Time to mobilize assets was another issue that was raised. Even if there is no capability problem, there is concern about whether equipment can be mobilized quickly enough to respond to multiple incidents in several locations. Permission and ability to get the assets that are needed are crucial. In most cases, if an incident results in a national crisis, the question is mostly one of money and details.

Oil companies own heavy lifting equipment and other assets that they ordinarily will not lease for salvage because of liability concerns and prior commitments. Although it was believed that such equipment would be made available in case of a national emergency, it was suggested that including a liability release in the National Response Plan would facilitate procurement of equipment. However, although salvors regularly cooperate with each other, procuring equipment previously committed to other projects could be a concern. Many thought that cooperation is the key, and some issues can be resolved by the terms of a contract, most of which contain a deviation clause in the event of terrorism, war, or government requisition. The participants suggested that there is a need to investigate possible standardized contract language that might be put into place before an event occurs. Existing U.S. Navy Office of the Supervisor of Salvage and Diving (SupSalv) contracts with commercial salvors were given as an example of a system that works well.

In discussing a time line for salvage and wreck removal operations, the group estimated that dredging to open another channel in Houston, where barge channels are already available outside the main channel, may take only 24 hours once equipment is ready. Furthermore, if a broadside collision results in vessels remaining upright in relatively shallow water and without extensive damage, patch-and-float operations can typically be carried out in two or three weeks. When vessels cannot be patched and floated, cutting and removal may take two to three months, possibly longer.

Much information from prior salvage events is available on which to base these time estimates. One key factor affecting time lines in a terrorist event is the extent

[1] Although disposal of dredged material is always a significant environmental concern during normal operations, for this situation the workshop participants assumed that environmental impact issues could be set aside for the duration of the emergency.

of human casualties. For example, immediate issues relating to loss of human life and the rescue of survivors, concerns over toxic chemicals, and treating the area as a crime scene could significantly affect salvage operations and thus extend the time required.

The group also addressed organizational concerns related to salvage response. First, there is a concern that the proposed Initial National Response Plan (DHS 2003) should balance prevention and response. In addition, there is a critical need to incorporate institutional salvage knowledge into the federal government side of the Unified Command System (UCS). Within any major salvage operation, communication is a key factor and is critical given the large number of parties involved.[2] The mechanism used for transmitting information is important, and not just for informal communication, and there are special considerations relative to a terrorist incident. Commercial salvors believe that they would need to communicate and coordinate with someone who understands the industry. One approach might be for the National Response Plan to include a directive that the salvor be involved early in the process.

A concern was also raised about the high turnover rate of key government personnel [e.g., the U.S. Coast Guard (USCG) and SupSalv], and it was noted that salvage requires experienced people. It was also noted that the Supervisor of Salvage is typically quite experienced, but many other agencies may not be aware of SupSalv resources both in house and under contract.

With regard to conducting an exercise to evaluate salvage capabilities, most participants believed that it should focus on the interaction of a terrorist attack and the salvage operation and should identify where there are interferences. If DHS sponsored an exercise, it could raise awareness of problems relating to communications and decision making among DHS and other key agencies. For example, many thought that it would be useful to involve the Federal Bureau of Investigation (FBI) in an exercise scenario and include a realistic portrayal of how the communication and interplay occurs between that agency and its counterparts. It should also involve the major salvage companies with different levels of capabilities and the key government agencies that would need to work together.

An exercise will be most valuable if it replicates all of the actions (e.g., reaching the location of the incident, arriving at the Unified Command Center, contending with roadblocks) that will be required if a terrorist incident occurs. The process is what is important. There could be 140 to 160 persons at the Unified Command Center during an event, with only a few being salvors. Salvors' position on the list of key decision makers should reflect the extent to which salvage is important to the response. It is necessary to have experienced people on the spot to make the critical decisions.

One important outcome of an exercise would be to increase awareness to other responders of the role of salvage. The exercise could highlight issues relating to salvage—teaching others what this part of the operation involves and its importance. The fact that maritime commerce might be severely affected could elevate interest in this exercise among industry members involved. In many past incidents, pollution concerns have overshadowed concerns about salvage operations, but in the case of the terrorist scenarios presented, channel clearance because of its potential impact on the nation's economy seems to be paramount. Inclusion of this issue in an exercise would allow it to be evaluated.

When an exercise is proposed, industry participants believe that the American Salvage Association (ASA) should be involved in planning the exercise scenario to ensure that practical issues are addressed. For example, ASA could prepare a particular component of the exercise with a very complex salvage challenge. The exercise could also be of value for training personnel by highlighting problems related to the interruption of commerce. A two- to three-day exercise with adequate resources to support the effort appears appropriate. Questions to be addressed would include the following: What do we know? What don't we know? What do we need to know? How do we get the needed information? What decisions can't wait for all the information to be available?

One other useful facet of an exercise would be to prepare a comprehensive inventory of what is available in the salvage industry and what type of assets would be needed for this type of event. ASA, through its members, could develop a list of what each member has available (pumps, compressors, equipment, etc.). SupSalv has some of this information, but a fully documented and verified inventory prepared by the industry could be more comprehensive and up to date. Existing capabilities are extensive, but it would be helpful to know more detail about what capabilities the commercial salvage sector has, the types of ships and equipment that could be brought to bear, and what would be required to mobilize and move them.

There are two components to a proper salvage response—equipment and the people to actually run the operation. To date, an adequate gap analysis—an assessment of salvage needs versus available capabilities for both these components—has not been done. A number of questions need to be answered: Are there any obvious gaps that can be identified today? What requires addi-

[2] This same issue was discussed and similar conclusions were reached in the context of marine salvage response to air crashes at sea such as the TWA Flight 800 accident in 1996 and reported in a Marine Board Roundtable that included many of the same participants (NRC 1997).

tional analysis? Are there adequate marine firefighting skills? For example, only a handful of people in this country can extinguish fires on ships, and marine firefighting capability in major port cities varies considerably. There is a similar situation in retainers and contracts with respect to firefighting. A survey of various port cities to determine if there is a need to upgrade skills in marine firefighting might be useful. The issue of who has control also arises in this situation. In many cases, the local firefighting unit has control; however, control varies among jurisdictions. There needs to be more communication among jurisdictions. Many municipal firefighting units are not prepared or allowed to go aboard a vessel. The workshop participants suggested that marine firefighting issues need more careful analysis to determine what might be available for response in the event of a terrorist incident.

The pool of people to perform specialized salvage work is small and may be shrinking—the lack of qualified people could be the most critical gap between needs and capabilities. This group travels a great deal and thus is not always readily available. If an exercise or drill is conducted, issues related to the availability and qualifications of salvage personnel could be investigated in more detail. Any subsequent gap analysis must look at both people and equipment. For example, some gaps may be geographical—assets needed and whether they are readily available in a particular area—and should be part of the gap analysis.

The U.S. Army Corps of Engineers (USACE) relies heavily on the commercial sector and has an extensive inventory of salvage assets including dredging equipment. For this reason, USACE should be a part of any gap analysis. The workshop participants noted that dredging may be the quickest means to get channels reopened to commercial traffic, and an evaluation of how to do this in an emergency situation would be of significant value.

In any exercise, it is important to get the salvage community at the table with high-level officials so that they can provide information on available assets. It was noted that the list of people to be called for response to an incident should include the salvage community as well as the salvage leadership (including SupSalv) and must be identified within any protocol for incident response. Since SupSalv is a U.S. Navy agency and, in many cases, is involved in domestic salvage events only by invitation, the agency's role tends to be omitted in planning documents. Therefore, their role must be explicit and well-defined. In addition, by law, USACE is responsible for safety, maintenance, and clearing of channels. However, the Corps no longer has the in-house technical expertise to carry out these operations and generally contracts for these services. USACE is often left out even though it is the Corps' function to restore navigation. Because interagency coordination issues are often complex, it is important to bring these agencies together in planning exercises to resolve problems before an event occurs.

Financial, Economic, and Political Issues

The group discussing financial, economic, and political issues began by defining the terms "financial" (the actual cost of response efforts), "economic" (the impacts of the incident on local and national economies), and "political" (management of public fear, quest for information, and restoring trust and confidence). The scenarios as presented in the plenary session appeared to stretch existing capabilities in all of these areas.

Financial Issues

Several mechanisms exist to fund responses to such emergencies as natural disasters, oil and hazardous materials spills, accidents, and other maritime incidents. The case of a terrorist attack, however, is decidedly different and brings new challenges. Existing funds such as those in the Oil Spill Liability Trust Fund (OSLTF) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) can be accessed under the system when the threat of pollution exists. Under a federal disaster declaration, the Federal Emergency Management Agency (FEMA) can be called in. In case of a major maritime incident, the U.S. Captain of the Port can respond immediately. In the case of a terrorist incident, however, it is not clear at this time how funding would be handled. In practice, it appears that immediate emergency funding for a major disaster comes quickly, whereas funding for longer-term activities such as salvage and wreck removal could be more difficult to obtain. One important issue the group identified is how to best access various existing funding mechanisms given the fact that many exist for various purposes but none fit the particular situation of a terrorist attack. Following the attacks of September 11, 2001, insurance coverage for terrorist incidents became difficult to obtain. However, enactment in late 2002 of the Terrorism Risk Insurance Act (TRIA) generally restored the availability of such insurance because TRIA provides a Federal backstop to help pay for damage to insured property caused by foreign-sponsored terrorism. As a result, marine insurers are making terrorism coverage available. However, TRIA does not cover U.S. domestic-based or sponsored terrorism, and it generally allows insurers to exclude damage or loss caused by use of nuclear, biological or chemical devices. Consequently, private insurance may

not provide a source of funding for emergency response to all terrorist incidents.

The decision on whether the Federal Government will respond under TRIA involves a threshold determination by the Secretary of Treasury, with concurrence with the Secretary of State and the Attorney General, to certify that an "act of terrorism" has occurred. This certification triggers federal payments covering 90 percent of the damage up to a maximum of $100 billion, with the insurer retaining 10 percent. (Federal payments would subsequently be recouped through surcharges on policyholders.) Therefore, unless TRIA is allowed to expire at the end of 2005, in which case insurance coverage for terrorism may again become difficult to obtain, marine insurance can be expected to cover at least some terrorist-caused losses.

One concern related to how funding would be handled is who makes the decision that the incident is a terrorist attack, how that decision is made, and how fast it is made. It was noted that a process is needed to define a terrorist incident and that the process should lead directly to a funding mechanism to cover all aspects of a response. The process would also need to involve investigative agencies so that a correct decision would result. Regarding the necessary marine salvage response, under the existing system, the needed salvage assets would be moved under the aegis of the Principal Federal Official (PFO) or Federal On-Scene Coordinator (FOSC) designated by the Initial National Response Plan.[3] Participants cautioned, however, that proposed new salvage regulations would need to be revised to allow the PFO or FOSC to activate salvage response if necessary. The existing unified command approach appears to be satisfactory, but it may be necessary to strengthen the authority of the FOSC and define more clearly the funding responsibilities. The experience of the World Trade Center attack shows that initial emergency responses can be initiated quickly regardless of existing funding schemes, but funding of long-term response becomes more difficult. The National Response Plan that is under development may address some of these issues.

The group also discussed whether and how the financial issues could be identified and evaluated using tabletop or field exercises to model incidents and responses. Within such an exercise, experts in existing funding systems and new proposals could participate. Using the OSLTF as a model, it may be possible to explore other mechanisms for funding and decision making that incorporate all aspects of a unified response. It may also be possible to use the existing National Response Plan structure by including another layer for terrorist incidents. Drills are useful to explore liability issues, insurance issues, and the extent of an owner's responsibilities. Participants also observed that adequate funding is needed to conduct in-depth exercises, which can be used to explore the adequacy of authorities for funding and the coordination of funding systems.

In summary, although existing funding mechanisms are designed for other purposes (e.g., OSLTF), most participants thought that they provide useful models on which to build a new terrorist response fund. In addition, the need was cited for a process to declare that an incident is caused by a terrorist attack in which (*a*) key decision makers would be identified, (*b*) the agency with authority would be specified, (*c*) direction would be given to response funding, and (*d*) access would be provided to salvage resources.

Economic Issues

Economic issues related to the given terrorist scenarios were discussed including (*a*) the direct and immediate local effects of a port shutdown, (*b*) the impact on the national economy caused by a prolonged port closure, (*c*) the effects on other ports caused by the need to handle diverted cargo and to meet new security measures that would naturally follow the attack, and (*d*) the ripple effect on all transportation modes, especially those that move waterborne cargo to and from the ports.

Many participants believed that total economic consequences are incalculable at this time but that a thorough detailed analysis that provides some estimates of specific impacts would be instructive. This analysis, however, could be a very complex undertaking. It could include impacts on all port facilities and terminals; refineries and chemical facilities; rail, truck, and barge operations; local populations; and nearby industry. One unique impact related to the New Orleans region is the possibility of catastrophic flooding caused by damage to the locks on the Mississippi River and the shutdown of all coastwise barge traffic along the Gulf Coast using the Gulf Intracoastal Waterway.

A key question related to reducing the economic impacts is how much time would be needed for a full salvage and wreck-removal operation. In addition, the level of effort that would be needed to reduce the total response time significantly is unknown. If the economic impacts were large enough, it might be cost-effective to spend much more to clear channels faster in order to resume the flow of commerce. A trade-off analysis would provide good guidance for decisions on this approach. It might also be helpful to consider the use of

[3] Workshop participants noted that an interim plan for terrorist incidents has been published and will be in effect until a final plan is developed. The interim plan calls for a PFO, whereas other emergency response plans in effect (such as one for oil spills) have designated an FOSC. Details of these plans and how salvage issues are incorporated will need to be addressed in the future.

government (military or other) assets within the response plan in order to respond more quickly or bring in needed equipment faster.

Political Issues

Several aspects of political issues were discussed that would be critical to an adequate emergency and salvage response to the hypothetical incidents. One political issue relates to legal and regulatory systems that are in place or are needed. The existing National Contingency Plan for pollution incidents establishes a process for assuming no specific liability and a vessel's insurance covers emergency funding but calls for a responsible party to recover costs later. With a terrorist incident, the responsible party will only be identified through law enforcement actions, and no response funds are usually available. Although vessel owners are required to have a response plan, in the case of a terrorist event there appears to be a need for a clear definition of liability for the plan to be adequate.

Another political aspect is whether the public is satisfied with how a response is being conducted, how to address questions about what happened and what is being done, how to respond to pressures for action, when and how to handle public fears and the restoration of confidence, and how to conduct and manage relations with the media. These questions and others can be identified through advance planning, and the adopted response plan needs to incorporate all of these aspects.[4]

The subject of restoring public confidence was also cited as a most important consideration in addressing a series of economic impacts. With regard to salvage response, an overriding question is how soon an all-clear signal can be given so that it will be safe to enter the site and begin salvage operations—how responders are equipped and trained to identify risks and work in areas with hazardous chemical spills. USCG is developing a new CERCLA response manual that will be useful to train responders in terrorist or chemical incidents. It includes considerations about trade-offs between victim rescues and responder safety. Currently, only a limited number of certified responders are readily available, and it may be necessary to evaluate these capabilities and determine what improvements might be needed. Both improved training and field exercises might be useful to consider. It was noted that proper training for hazardous materials responders, a key consideration in any readiness improvement program, could be very expensive.

[4] For a similar discussion of public response and confidence issues, see the *Marine Board Roundtable on Search and Recovery of Air Crashes at Sea* (NRC 1997).

Legal, Forensic, and Human Casualty Issues

The legal, forensic, and human casualty issues group began its discussions with reference to existing legislation and possible legislative solutions to problems identified. When faced with an emergency response, equipment owners might need protection from contractual or consequential damages with respect to equipment and personnel assets moved by government order. In such cases, it might be useful to provide legislative protection. Some participants were also concerned about liability issues and believed that responding to a terrorist incident could lead to situations in which certain existing laws might conflict with a need to act quickly and decisively. Therefore, under some circumstances there may be a need to provide some form of responder immunity for salvors similar to that available under the Oil Pollution Act of 1990 (OPA 90).

On the subject of preparation for salvage response, many believed that it is necessary to provide affordable terrorism risk insurance rates for salvors and for workers' compensation coverage and third-party liability. Another issue of concern was immunity for provision of information to government investigators in the absence of criminal intent and possibly class-action immunity for responders. Finally, salvors might need antitrust immunity for collective action in a crisis.

The group also discussed issues related to government policies that affect responders and their ability to meet the challenges presented by the scenario effectively. Many thought that field exercises or tabletop drills involving both industry and government would be a useful way to prepare for terrorism incidents. In these drills, it would be important to include coordination of family assistance and forensic recovery, to include forensic plans within salvage plans in coordination with the FBI, and to consider these in ranking recovery tasks by priority. It was noted that the exercises should also include complete after-action reports.

With respect to improving readiness posture, many participants believed that basic ordering agreements should be used as the contractual instrument for salvors since they provide advantages such as prompt payments, which are necessary to ensure that work moves ahead expeditiously in emergency situations. Importance was also given to defining the responsibilities and roles of key agencies and private industry when a national transportation emergency is declared. These definitions could logically be addressed in the National Response Plan.

The group also suggested that a salvage advisory committee of salvage industry representatives (including the U.S. Navy) be established to serve as a liaison to DHS. In addition, such a salvage advisory committee

could be useful to coordinate with state emergency management officials in a local-level exercise.

The group discussed the responsibilities and roles of vessel owners and operators when the Secretary of Homeland Security declares a national transportation emergency. Many participants thought that these roles and responsibilities should be clarified so that responses are efficient and effective. In addition, some suggested that a forensics plan should be prepared by the FBI and be a required part of a salvage plan. Such a plan would include

- Awareness at the time of the incident,
- Plan at the time of salvage, and
- Domestic emergency support plans.

The salvor needs basic awareness of document control and the chain of custody through preplanning with trade associations. The plan must recognize that life-saving efforts take precedence over preservation of evidence and that there are many difficulties in victim recovery, such as dealing with hazardous chemicals and including families of victims in decisions and plans. For example, although it is usually both essential and difficult to address the needs of victims' families, this process may also complicate actual salvage operations.

Another value in conducting a field exercise is to evaluate how to address local-level participation. Local drills with salvors and local briefs to and from salvors should be part of the overall response plan. In past incidents, the National Transportation Safety Board (NTSB) has assumed the lead until it has been determined that a crime has been committed.[5] However, many issues related to investigation of a crime scene must be considered, including whether a retrieval protocol is needed and how is it assigned; how to ensure that evidence that can be easily lost is secured as soon as possible, whether and how to move the scene when needed, and how to provide secure communications and vessel traffic services.

Finally, some key issues for the industry include how to ensure adequate effort by the salvage community in a declared national emergency without fear of antitrust violations, how to provide responder immunity for salvors (both civil and criminal), and whether and how to provide immunity for master, crew, and owners to assist in salvage.

Perhaps a key to improving readiness is to address the issue of realistic insurance coverage premiums for terrorist acts that could perhaps be provided by the government or through subsidies. It was also noted that it is important to address worker protection and third-party coverage in the event that a salvor's equipment and personnel are attacked.

Environmental Issues

The environmental issues group discussed environmental aspects of salvage response from the standpoint of both impacts from the incident itself and those from salvage operations. The group also addressed human health issues because of the potential for health impacts as a consequence of environmental effects.

Some of the potential environmental issues arising from maritime terrorist incidents such as the ones under consideration by the workshop include the need for containment and cleanup of hazardous materials in the course of the salvage operations, the potential need to jettison cargo to achieve vessel stability and limit further releases, and proper disposal of firefighting waste. Human health issues arise in the context of potential impacts on the general public as well as on responders to hazardous materials from both direct contact and airborne contaminants.

Many in the group believed that it is important to factor environmental concerns into the decision process for salvage response to terrorist events. Specifically, it was recognized that integrated crisis decision making lends itself to the inclusion of environmental considerations. It was suggested that such a process be explored as an effective approach for resolving potential environmental and economic trade-offs in the context of salvage operations in response to incidents.

Participants also recognized that decisions regarding the priority of salvage operations and response must carefully account for the environmental consequences from the incident itself as well as those from the response efforts. In addition, it was acknowledged that environmental concerns must be accounted for throughout the response to a terrorist event. Many thought that public health impacts are of paramount importance in responding to terrorist events.

The need for transparency in decision making and integration of interagency roles and responsibilities to ensure appropriate consideration of human health and environmental factors in response and salvage operations were also discussed. It was suggested that critical operations including salvage, mass rescue, and public health and environmental concerns should all be managed at the operational level.

With regard to effective planning and decision making, the group also expressed concern about personnel turnover, especially in agencies like USCG. Many believed that the importance of building and preserving long-term

[5] The *Marine Board Roundtable on Salvage Responses to Air Crashes at Sea* describes this process of NTSB leadership in the initial response while the question of whether a crime was committed is being determined (NRC 1997).

expertise for maintaining readiness was frustrated by frequent personnel changes.

The group discussed the issue of a "salvage gap" in two contexts. One is the question of whether there is a significant gap between needs and capabilities in salvage response. Many considered that there was a need to get more information about existing salvage capabilities and that any salvage gap should be closed. Another form of salvage gap was raised by some participants, who defined it in the context of a prevention and response continuum under the circumstances of a pollution incident. This continuum begins with the occurrence of an event that may not immediately result in pollution but ends with a pollution incident. The gap between these two events was defined as a salvage gap because it represents the time period during which an effective salvage response may be utilized to prevent the pollution incident from occurring. Some suggested that the potential for timely and effective salvage to contribute to pollution prevention is not accounted for in current plans.

In this context, many believed that the current regulatory structure does not provide for adequate maintenance of salvage capacity and readiness. In order to provide the most effective response in a terrorist incident and to thereby close the salvage gap, many participants suggested that readily available (e.g., standby) salvage assets could be strategically positioned for emergency response in vulnerable coastal areas.

Many participants expressed the opinion that, from an environmental perspective, it is important to provide incentives for salvage operations that focus on pollution prevention. Several disincentives for salvors were identified. First, the issue of potential criminal liability is a concern for salvors, who may inadvertently pollute in the course of a salvage operation. Therefore, there may be a need for immunity provisions in the event of a terrorist or other maritime incident. Second, the pollution prevention compensation provisions under current regulations may not be sufficient to provide an incentive for salvage operations aimed solely at pollution prevention. Third, it was noted that there is a need to address at the national, state, and local levels the provision of places of refuge or safe havens for vessels in dire situations. In the event of a maritime casualty, whether induced by terrorism or some other cause, it may often be desirable to undertake salvage in a protected area. The failure to provide a safe haven in the case of the *Prestige* oil spill, for example, is recognized as a major contributor to the disastrous outcome of that incident. Many thought that this critical issue should be addressed in the short term to facilitate more effective salvage in maritime incidents and to avert more serious environmental and other consequences during terrorist attacks. The establishment of safe havens may increase the effectiveness of response operations (e.g., salvage, mass rescue) and thus reduce environmental consequences and public health impacts.

REFERENCES

DHS **Department of Homeland Security**
NRC **National Research Council**

DHS. 2003. *Initial National Response Plan*. September 30, 2003. Available online at www.dhs.gov/interweb/assetlibrary/Initial_NRP_100903.pdf.

NRC. 1997. *Marine Board Roundtable on Search and Recovery of Air Crashes at Sea*. A Summary of Meeting Discussions including Key Issues and Questions Related to Future Needs. Marine Board, Washington, D.C.

Committee Assessment of Response Capabilities Based on Workshop Discussions

In this chapter several key issues are discussed that resulted from the committee's review and evaluation of workshop discussions and from the breakout group results. Also presented are the committee's assessment of the status of existing marine salvage response capabilities based on workshop results and the committee's evaluation of what is and is not known about that capability (in terms of both physical and organizational response). Physical capability addresses equipment and personnel; organizational capability focuses on current response plans as well as organizational structures. In the final section of the chapter, salvage response exercises or drills are addressed. From workshop discussions, the committee believes that these procedures offer the best opportunity to develop a more detailed and accurate evaluation of capabilities and thus to determine the most pressing issues that need to be addressed to improve the nation's marine salvage response readiness posture.

Status of Physical Salvage Response Capabilities

The U.S. marine salvage industry has significant capabilities to respond to seaport terrorist incidents, but it is not known if that capability is adequate for a wide range of specific threats and can be sustained over time to meet future threats. The historical role of the marine salvor has been to save property, typically the vessel and its cargo, at sea. This role has expanded to include efforts to minimize environmental damage and wreck removal and harbor clearance. The latter functions may be of particular importance in the event of terrorist acts involving U.S. marine waterways because such actions may be specifically designed to inflict economic distress by impeding or blocking use of the waterway. The modern salvor has a responsibility for minimizing the public (e.g., economic) consequences of an event, which places increased importance on rapid and effective response. In its expanded role, salvage capabilities include

- Emergency towing of a stricken vessel,
- Ability to patch and refloat a sunken vessel,
- Ability to right and refloat a capsized vessel,
- Internal transfer operations to mitigate stress in the vessel's hull and to enhance seaworthiness,
- Lightering of liquid cargo and offloading of other hazardous cargoes,
- Dredging to free a stranded vessel or open an impeded waterway,
- Heavy lift capability,
- Firefighting, and
- Deep water search and recovery.

Over the last two decades, there has been a steady decline in marine incidents, resulting in a reduction in requests for traditional marine salvage services (NRC 1994). This issue was raised by many salvors at the workshop, who stressed the difficulty of maintaining appropriate physical resources and trained personnel should the reduction in salvage workload continue. Unfortunately, data on salvage response efforts in U.S.

waters were not collected during this period. The U.S. Coast Guard (USCG) maintained a marine accident database (CASMAIN) through 1990 and replaced it with the Marine Safety Information System (MSIS) database. It is difficult to assess trends in salvage needs on the basis of these data since they were not collected consistently over the time period.

USCG has collected data on large oil spills in a reasonably consistent manner since 1973, and these data provide an indication of accident rates and salvage needs. The decline in spills is illustrated in Figure 1, which shows the number of oil spills over 1,000 gallons in size that have occurred in U.S. waters since 1973. The statistics suggest that the decline in incidents has accelerated following the implementation of regulations associated with the Oil Pollution Act of 1990 (OPA 90). The recent adoption of additional international maritime safety codes such as the International Safety Management Code (ISM) and Standards of Training, Certification, and Watchkeeping (STCW) suggests that the number of maritime casualties could continue to decline in the coming years.

The decline in demand for traditional salvage has led to fundamental changes in the way the salvage industry operates. Representatives from the major U.S. salvage companies attending the workshop indicated that only 10 to 25 percent of their business comes from marine salvage. The diversification of the salvage companies is likely a result of both reduced demand and the sporadic nature of incidents. Since compensation for salvage is not sufficient to sustain personnel and salvage resources during the growing interval between salvage incidents, salvors have sought other sources of income and now provide a variety of services including towing and marine engineering. This diversification may be a positive development because it allows companies to maintain physical assets and personnel that can respond in times of need.

Other ways that the salvage industry has adapted to the reduced demand for its services and the increased public expectation for quick and effective response is through enhanced cooperation between salvage companies and the use of pre-positioned fly-away packages (equipment designed for rapid mobilization and shipping by air). The sharing and dissemination of salvage-related information has been fostered through the establishment of the American Salvage Association (ASA). The major U.S. salvors are members of ASA and participate in its meetings, at which salvage-related commercial and technical issues are openly discussed. When the size of a job exceeds the capabilities of a company or there is a need for specialized skills, the U.S. salvage companies regularly cooperate and share resources. The salvors maintain an awareness of outside resources and are prepared to contract for equipment and personnel to supplement their own assets.

Fly-away packages are strategically located around the United States. These packages, consisting of salvage equipment such as pumps, oil spill booms, firefighting equipment, and diving systems, are maintained by the oil spill removal organizations (OSROs) as well as by the U.S. Navy Office of the Supervisor of Salvage and Diving (SupSalv) and USCG.

Another way salvors have enhanced their response capability is through the increased use of advanced tools for salvage engineering. Although there is no substitute

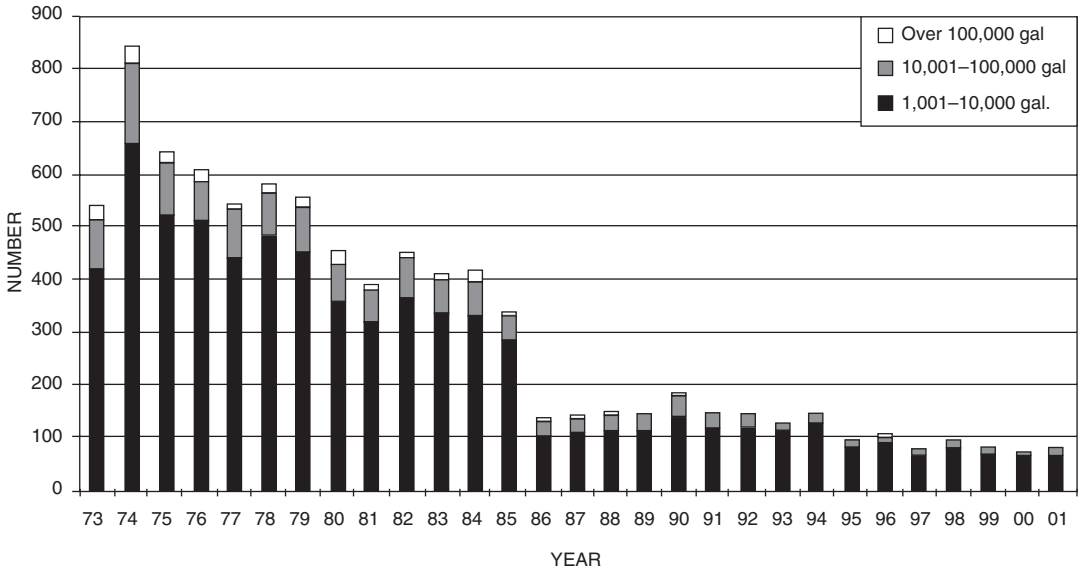

FIGURE 1 Oil spills of more than 1,000 gallons in U.S. waters. (SOURCE: NRC 1999.)

for good judgment refined by prior hands-on experience, analysis is playing an increasingly important role in salvage response. Traditionally, salvors have relied on back-of-the-envelope calculations, but today there are suites of commercially available software for personal computers that can perform a wide range of analyses such as stranding calculations, lightering evaluations, oil outflow projections, and hull girder residual strength assessments. Examples of commercial salvage engineering packages with widespread use within the United States are Herbert Engineering Corporation's salvage software (HECSALV) and the General Hydrostatics System (GHS) developed by Creative Systems. The salvage companies and their engineers have become skillful in using these packages and applying them to a variety of salvage scenarios. SupSalv has sponsored development of the Program of Ship Salvage Engineering (POSSE), one such software program that is used to perform real-time engineering analyses of complex ship salvage situations, including assessment of ship stability, draft and trim, structural strength, ground reaction and freeing force, oil outflow and flooding, tidal effects, and so forth. POSSE is used by the Navy, USCG, and the British Ministry of Defense.

The traditional approach, in which salvage companies maintained large, dedicated vessels and personnel trained to operate the vessels, is no longer commercially viable, and few such vessels remain in service. Similarly, over the last two decades, the Navy has disposed of nearly all its salvage tugs. To some extent, this loss of dedicated salvage tugs is offset by the introduction of escort tug requirements, particularly on the West Coast. For example, the states of California, Washington, and Alaska have implemented requirements for escorting laden tankers in state waters. These tugs tend to be high powered and highly maneuverable and are frequently fitted with firefighting equipment. However, the geographic location of escort tugs is dependent on oil transport paths (e.g., Long Beach and San Francisco Bay, in California; the Strait of Juan de Fuca, between the United States and Canada; and Valdez, in Alaska) rather than the perceived need for salvage capability. Furthermore, there is no certainty that such vessels would respond to a stricken vessel other than the vessel under escort.

Notwithstanding this phasing out of dedicated salvage vessels, the 1994 NRC report *Reassessment of the Marine Salvage Posture of the United States* found that "in general, the nation's salvage capability and readiness appears to have increased in the decade since 1982" (p. 1). Similarly, the commercial salvors who participated in the workshop believed that they currently have sufficient salvage equipment to effectively carry out a salvage response in U.S. waters. However, both in the 1994 NRC report and among the salvage community attending the workshop, concern was expressed about the future; it was noted that further declines in salvage activity could negatively affect the ability of the industry to respond in a timely manner.

Availability of Personnel

There is considerable concern in the salvage industry that salvors are a graying community and that the next generation of salvors is not being groomed to take over. The 1994 NRC study concluded that with "few opportunities to practice the salvage profession, the next generation of salvors is not being trained or attracted to the industry" (p. 5). This, of course, is a problem for any industry in decline, but it is exacerbated in the salvage industry, in which on-the-job training is critical to success.

SupSalv maintains a training program at its facility in Panama City and regularly trains its engineering design officers in salvage engineering. This program, combined with opportunities to participate in salvage operations related to government and commercial vessels, has produced some experienced salvors within the Navy. The Supervisor of Salvage and Diving is selected from this group of experienced personnel within the Navy and is a valuable resource when the government is called upon to make salvage-related decisions. Similarly, USCG trains its strike team members in salvage engineering, although USCG personnel generally have less continuity of service in salvage-related areas. Unfortunately, upon retirement from the military, few Navy and USCG personnel assume positions in the commercial salvage industry.

Salvage Assets and Readiness

Salvors who participated in the workshop could not recall an incident in which they were unable to respond effectively because of a shortage of equipment. However, salvage and firefighting equipment is generally located in regions where vessel traffic is concentrated, and there is concern that rapid and effective response may not be possible in all geographical areas.

Salvage-Capable Tugs

To effectively tow a large tanker or similar vessel in heavy weather, a tug of at least 6,000 horsepower is needed. The 1994 NRC study concluded that the management of disabled vessels within U.S. waters could in large part be accomplished using existing tug assets. These tugs are in commercial use, usually engaged in point-to-point service, and can be diverted for emergency salvage service. The

study did identify a potential shortage of high-powered tugs in the Pacific region, noting the long distance between ports.

OPA 90 authorizes USCG to require and regulate vessel response plans (VRPs). Currently, VRP regulations are focused on planning for oil recovery. USCG has decided to enhance the salvage and marine firefighting provisions of VRPs to ensure that salvage and firefighting resources are identified and available. The Notice of Proposed Rulemaking for VRPs, which was disseminated for comment in May 2002, is contained in 33 CFR Part 155, but implementation of the rule has been delayed.

The proposed rulemaking sets response times for each salvage and marine firefighting requirement. For instance, for near-shore and inland areas, on-site resources would be required for emergency towing capability within 12 hours, for external emergency transfer operations and emergency lightering operations within 18 hours, and for specialized salvage operations, including heavy lift capability, within 72 hours. In its regulatory assessment for this proposed rulemaking, USCG concluded that current salvage and marine firefighting assets were inadequate to meet these response times and estimated an initial capital cost of about $130 million to finance needed physical assets. The most costly salvage equipment are tugs, vessels, barges, and heavy lift systems. In order to meet the proposed response times, the USCG regulatory assessment identified the need for about 10 new high-powered tugs in the United States.

Marine Firefighting

Marine firefighting expertise within the United States is concentrated in a few companies, which have well-trained personnel and adequate assets. They maintain fly-away packages of firefighting equipment, ready for deployment. In the event of a major fire, it is expected that one or more of these larger companies would respond. These companies have been effective in handling fires that have occurred in U.S. waters over the last 20 years. In the 1994 NRC study, however, a lack of fireboats or tugs with fire monitors was noted in certain port areas. The study also expressed concern that local fire departments frequently lack sufficient training in marine firefighting. There are notable exceptions—for instance, the Port of Houston has made significant investments in firefighting equipment and personnel training. Also, subsequent to the events of September 11, 2001, communications between local fire departments and ports have improved. However, in many areas there remains a lack of funds for training local firefighting personnel in marine firefighting.

USCG proposed rulemaking for salvage and marine firefighting requirements in VRPs also sets minimum requirements for response to fires. The proposed regulation calls for external firefighting teams to be on site within 8 hours and for external vessel firefighting systems to be on site within 12 hours. Pre-positioning of fly-away packages in locations on the East Coast, West Coast, and Gulf Coast and in Alaska and Hawaii should be sufficient to comply with these response times. This level of response can, in most cases, be achieved by existing companies and their assets.

In the event of a fire on a passenger vessel or ferry, in which large numbers of people are at risk, quicker response times will be expected. The ability to respond to such incidents in a timely manner needs further consideration.

Availability of Heavy Equipment

Heavy lift equipment is needed for a variety of purposes: to assist in righting capsized vessels, to raise sunken vessels, and so forth. USCG regulatory assessment for the proposed rulemaking for VRPs identified deficiencies in heavy lift capability in inland areas, Alaska, and Guam.

Because of the episodic nature of major salvage incidents, most heavy equipment suitable for marine salvage is employed for other purposes and requisitioned for salvage when needed. During the workshop, concern was raised as to availability of certain equipment for emergency response. For instance, in the Gulf Coast region heavy lift equipment is frequently under contract to oil companies and their contractors, and there are no guarantees that these assets could be secured for emergency purposes. However, in the event of a major incident such as a significant terrorist attack, a release from contracts could likely be secured.

Dredging Capability

The U.S. Army Corps of Engineers (USACE) as well as private contractors maintain dredges at various locations around the country. Dredging has important salvage uses, potentially to free a stranded vessel and also to open a waterway impeded by a sunken vessel or other debris. Dredging, however, can have negative impacts on the environment that may preclude a timely response in some areas.

For the maritime terrorist scenario developed by the committee in which multiple vessels are sunk in the Houston ship channel, it was estimated that a patch-and-refloat salvage effort might be accomplished in two to three days. If the vessels were too severely damaged

to be refloated, wreck removal could take months. However, workshop participants estimated that widening the channel adjacent to the incident site could be achieved in as little as 24 hours.

Minimum response times for dredging capability are not incorporated into the USCG proposed rulemaking for VRPs. Because of the potential role of dredging in emergency harbor and waterway clearance, the availability of dredging equipment and personnel at major ports should be assessed further.

Hazardous Materials Response

The 1994 NRC report found that the marine salvage community lacked expertise in performing salvage in the presence of hazardous materials. The report noted that USCG strike teams are trained in hazardous materials response, although their role in commercial salvage is not well defined. The events of September 11, 2001, as well as the subsequent anthrax incidents highlight the critical role that government teams play in supporting a response when hazardous materials are concerned.

As a quick resource for information on the capabilities of the various government special teams to respond to incidents related to oil, hazardous materials, and weapons of mass destruction, the National Fire Protection Association produced the *Hazardous Materials Response Handbook* (2002). A summary of the salvage-related capabilities of these special teams is given in Table 1. SupSalv participants explained to the committee that their office does not have specific in-house expertise for response to biological or radiological

TABLE 1 Special Team Salvage Capability Matrix

	SupSalv	*NSF*	*EPA/ERT*	*USACE*	*NOAA*
Vessel Fire Assessment					
Oil	x				
Chemical Commercial	x				
Chemical Warfare Agent	x				
Biological	x				
Radiological	x				
Vessel Damage Assessment					
Oil	x	x	x		
Chemical Commercial	x	x	x		
Chemical Warfare Agent	x	x	x		
Biological	x		x		
Radiological	x		x		
Vessel Salvage					
Oil	x				
Chemical Commercial	x				
Chemical Warfare Agent	x				
Biological	x				
Radiological	x				
Vessel Plugging/Patching					
Oil	x	x		x	
Chemical Commercial	x	x		x	
Chemical Warfare Agent		x		x	
Radiological				x	
Diving Expertise					
Oil	x		x	x	x
Chemical Commercial	x		x	x	x
Chemical Warfare Agent	x		x	x	
Radiological	x		x	x	

SupSalv: U.S. Navy Supervisor of Salvage and Diving
NSF: U.S. Coast Guard National Strike Force
EPA/ERT: Environmental Protection Agency Emergency Response Team
USACE: U.S. Army Corps of Engineers Rapid Response Team
NOAA: National Oceanic and Atmospheric Administration, Office of Response and Restoration, Hazardous Materials Response Division

incidents but can turn to appropriate military components to help formulate the best response. This capability to access specialized expertise as needed for biological and radiological incidents applies to all aspects of salvage response. According to SupSalv representatives at the workshop, the failure of the special teams handbook to properly reflect that capability for SupSalv in the area of vessel plugging and patching was merely an oversight (J. Wilkins, U.S. Navy, personal communication, August 6, 2003).

Findings

Salvage and marine firefighting companies in the United States have a proven track record over the last 20 years. Response has generally been timely and effective, although recent events such as the stranding and eventual breakup of the M/V *New Carissa* suggest that rapid response could be enhanced if more salvage-capable tugs were available. The M/V *New Carissa*, a 639-foot bulk freight ship, was grounded off the coast of Coos Bay, Oregon, in February 1999. Within hours of the incident, various spill and salvage experts were en route to the scene. There were no salvage-capable vessels in the vicinity of Coos Bay, the closest being one based in Astoria, Oregon, approximately 170 miles to the north. Heavy weather in Astoria delayed departure of the salvage vessel for two days, thwarting efforts to quickly refloat the *New Carissa*. Eventually, the *New Carissa* broke apart, spilling a portion of its fuel oil.

USCG proposed rulemaking for VRPs requiring on-site emergency towing capability within 12 hours of an incident would likely require the addition of up to 10 high-powered tugs. Promulgation of the final rule on VRPs will be helpful in setting performance standards for timeliness of salvage response and will provide important guidance in assessing salvage readiness capability.

A complete inventory of available salvage assets that have access to U.S. waters is not maintained, and therefore it is difficult to fully assess needs. Such an inventory would be valuable for identifying and allocating salvage assets in the event of a major salvage incident. There is also a need to conduct a gap analysis, matching available assets with needs. Such an analysis should include dredging and heavy lift capabilities, which might be needed to quickly clear an impeded waterway.

Overview of Current Response Plans

Federal emergency response authority, responsibilities, and activities in the United States are found in a variety of contingency plans involving a wide range of federal agencies. For maritime contingencies, the National Maritime Search and Rescue Plan (NMSARP), administered by USCG, deals with locating and rescuing survivors of maritime disasters; the National Contingency Plan, administered by the Environmental Protection Agency (EPA), deals with response to spills of oil and hazardous substances, but USCG is the Federal On-Scene Coordinator (FOSC) in coastal areas; and the Federal Response Plan, administered by the Federal Emergency Management Administration (FEMA), includes a number of annexes dealing with various disaster scenarios, including natural disasters (such as hurricanes and earthquakes) as well as response to pollution incidents and terrorist incidents. Although the NMSARP and the National Contingency Plan are implemented generally for any such contingency, the Federal Response Plan is only implemented in response to a Presidential Disaster Declaration.

A recent addition to this family of response plans is the Initial National Response Plan (INRP), administered by the Department of Homeland Security (DHS) (DHS 2003). DHS has been tasked with development of a single integrated National Response Plan (NRP) for all types of contingencies and disasters covered by the range of existing plans, including those outlined above. The INRP has been developed as an interim measure and is administered by the Transportation Security Administration (TSA).

Current Response Organizational Structures

Search and Rescue Operations

Under the NMSARP, USCG is the principal federal agency with responsibility for maritime search and rescue. The maritime search and rescue policy is developed at USCG Headquarters, in Washington, D.C. Field operations are executed by a wide range of multimission ships, boats, and aircraft that are capable of search and rescue. These operations are coordinated from national, area, district, and local search operations centers depending on the scope and complexity of the situation.

Pollution Response Operations

In contrast to search and rescue operations, the National Contingency Plan involves the activities of a wide range of federal agencies with authority, responsibility, and expertise in the various aspects of pollution response. USCG, as previously noted, serves as the FOSC for coastal response operations. Overall response organization includes various federal, state, and local government agencies and the party responsible for creating the

pollution incident, known as the responsible party. Response operations are managed under the National Interagency Incident Management System (NIIMS) using the Incident Command System (ICS), Unified Command System (UCS) approach, in which the federal and state on-scene coordinators and the responsible party form a triangular command structure for decision making, with the FOSC directing the response and having ultimate decision-making authority. For spills of national significance that affect or threaten to affect a wide geographical area, a response organization reflecting an expanded UCS is used.

Response planning and technical recommendations for decision making are vested in the National Response Team, Regional Response Teams, and area committees at the local level. Within USCG, the Chief of the Office of Response under the Assistant Commandant for Marine Safety, Security, and Environmental Protection serves as the cochair of the National Response Team and develops overall response policy within USCG.

SupSalv acts in an advisory capacity to the FOSC within the UCS if requested and works through the U.S. Department of Defense member of the National Response Team. Professional salvors have no specified role in the National Response Team or within the UCS structure.

Response to Terrorist Threats and Incidents

Much like the National Contingency Plan, under the Federal Response Plan, Annex 10, numerous federal agencies have a role in the response to a terrorist incident. In this case the Federal Bureau of Investigation (FBI) is the lead agency. Under the new INRP, the NIIMS was created and employs the UCS for response; the FBI has the ultimate decision-making authority for a terrorist incident, as the FOSC does for pollution incidents.

In a maritime terrorist scenario, USCG would be a principal supporting agency to the FBI and would carry out various roles, as required, involving law enforcement, search and rescue, pollution response, and waterways management. Organizationally, within DHS, USCG homeland security prevention activities and planning for response activities are under the management of the Director of Homeland Security, on the staff of the Assistant Commandant for Marine Safety, Security, and Environmental Protection. A National Maritime Security Advisory Committee has been chartered by the Secretary of Homeland Security to advise USCG on maritime security prevention and response matters. Currently, the INRP simply provides an umbrella over existing plans until such time as a final National Response Plan may be promulgated.

Response Plans and Organization

In the case of an incident like that described in the workshop scenario involving the need for salvage after a terrorist incident has resulted in the sinking of a ship, existing plans such as the NMSARP, the National Contingency Plan, and potentially the Federal Response Plan would be implemented under the INRP. Although salvage would be a critical function to reestablish the use of the navigation channel, no formal consideration of salvage needs and capabilities forms any part of the existing planning process, nor do salvors or SupSalv take any formal part in that process. There is currently a Notice of Proposed Rulemaking dealing with salvage and firefighting planning requirements for tankers trading in the United States, but no other requirement for salvage contingency planning exists.

Utility of Exercises or Drills

The complexity of coping with the aftermath of any terrorist attack is daunting, and the economic impact of closing a port or ports will only compound that complexity. Terrorist attacks could be coordinated to affect more than one port, could cause extreme damage, or could simply close a channel. The planning to enable a response effort that is flexible enough to address different scenarios in different geographic locations must therefore be diligently pursued, particularly since there are myriad agencies and organizations involved. The conduct of carefully planned exercises and drills has proved to be extremely helpful in the past for preparing for a disaster response.

The utility of holding exercises or drills emerged from discussions in two of the workshop breakout groups (the one on physical salvage and harbor clearance issues and the one on legal, forensic, and human casualty issues). The problems of initiating interagency actions necessary to coordinate, assess, and handle the aftermath of the closings of major ports can best be understood by using these exercises or drills, involving the relevant local, state, and national agencies as well as organizations outside government. In particular, the issues involved in the mobilization of the proper salvage and harbor clearance resources might also be best understood by well-planned exercises.

The interagency aspects of any response must be a precursor to the mobilization of salvage assets. Different scenarios involving different geographic locations must be a part of any overall plan since the agencies and organizations involved are, to some extent, dependent on the location and the nature of the incident, as is the response itself. This aspect is especially true for salvage response and will determine the type of

salvage assets needed. Therefore, exercises that are undertaken should be designed to allow interaction at two levels: one high enough to enable all relevant agencies to interact and the other low enough to allow detailed-enough interactions to assess the issues involved with supporting matters such as the mobilization of the proper salvage assets to restore port traffic in the most efficient fashion.

It is envisioned that a high-level exercise be conducted initially as a tabletop interaction and involve decision-making high-level representatives from the key agencies and organizations literally gathered around a large table and connected by telephonic communications to relevant support from their individual organizations.

On the basis of these considerations, the committee had the following suggestions for designing such an exercise:

- Allow participants to self-organize, establish leadership, and develop a response;
- Identify conflicting priorities among commercial interests (which want to open the port), security forces (which must deal with an ongoing potential threat), and forensic organizations (which are investigating and reconstructing the crime scene);
- Include environmental and public health interests, which want to minimize loss of lives, public health impacts, and ecological impacts;
- Demonstrate the importance of having sufficient salvage capability available when needed and demonstrate the coordination required to allow salvage assets to clear the port efficiently;
- Consider the financial and legal (liability) issues;
- Include participants who are actual decision makers from participating organizations;
- Establish working relationships between command-level personnel who will work together during an event;
- Assign facilitators to keep the exercise on track; and
- Identify a funding source or assign fair-share assessments of common costs to participating organizations.

Suggested participants (including federal organizations with an interest or that would participate in an actual event) were the following:

- DHS-TSA: USCG–Captain of the Port/On-Scene Coordinator;
- FEMA;
- FBI;
- NTSB;
- Navy:
  - SupSalv;
  - Salvage community;
- Department of Commerce;
- USACE (for dredging);
- EPA;
- Public affairs specialists; and
- Experienced facilitators from organizations well versed in interactive gaming exercises, such as the National Defense University or the Naval War College.

Steps to establish the exercise starting point should be as follows:

- Select a major port or ports (e.g., Houston, New Orleans) that is
  - Vulnerable to blockage and
  - Nationally prominent;
- Assume a breach of port security (shoreside, waterside, or both);
- Assume suicide terrorists; and
- Feature successive disclosure of new information (to highlight conflicting priorities).

Scenario results should include the following:

- Blocked channel (with multiple ships if possible),
- Restricted physical access to the casualty site,
- Civilian casualties,
- Landside issues such as transporting the injured to hospitals,
- Pollution,
- Contamination,
- Impact (contamination and casualties) on local area,
- Potential for ongoing activity (delayed explosives), and
- Demand for interviews by the press.

Questions to be answered are as follows:

- How is the response funded?
- What is the role of the National Response Plan (or Interim Plan) in this event?
- Does another national plan suited for this disaster response exist already?
- What organizations, groups, or plans are already in place or available to be implemented?
- What organizations or groups need to be developed or planned for?
- How are interagency communications handled?
- What information is needed to establish priorities?
- How are decisions made? By whom? Who sets priorities?
- How are decisions promulgated and implemented?
- How are assets brought to bear on the problem?
- How is progress monitored?

Evaluation of results should include these follow-up questions:

- What were the deficiencies in the existing plans?
- How will deficiencies (e.g., organizational, financial) be addressed?

Following the top-level interagency exercise, an exercise should be conducted to test the interactions necessary to mobilize the salvage assets required to restore the port or ports to normal operation. A series of exercises with differing scenarios and geographic locations will demonstrate the organizational issues as well as identify whether sufficient assets are available for the required response and whether these assets can be mobilized and brought into action in a fashion timely enough to meet the requirements for port restoration.

Key features of this exercise are as follows:

- The exercise should be specific to a particular area or port;
- The scenario should be tailored to exploit local vulnerabilities in terms of
  - Port blockage, and
  - Ship types that have the most dangerous or vulnerable cargoes (e.g., explosives, liquid natural gas, toxics such as chemicals and petroleum, and passengers and crew on cruise ships);
- A salvage plan should be developed;
- Specific salvage assets to be used should be identified; and
- Impediments should be identified.

Participants should include the following federal agency representatives and state and local officials who have an interest or who would participate in the case of an actual incident:

- Federal representatives from agencies listed earlier (not necessarily decision makers but familiar with results of the top-level exercise, including public affairs specialists);
- State agencies such as the Department of Emergency Services and environmental protection;
- Local agencies such as the following:
  - Mayor's office,
  - Port authority,
  - Police and fire departments, and
  - Pilots' association;
- Private-sector participants from the
  - Salvage industry and
  - Off-shore oil industry.

Questions to be answered include the following:

- How is the response to be funded?
- Is there a national-level plan that incorporates state and local organizations?
- What is the interaction of federal, state, and local officials and organizations?
- What organizations, groups, plans, and equipment are already in place or available to be implemented?
- What organizations and groups need to be developed or planned for?
- How are interagency communications handled?
- What information is needed to establish priorities?
- How are decisions made? By whom? Who sets priorities?
- How are decisions promulgated and implemented?
- How are assets brought to bear on the problem?
- What are the impacts of previously existing contractual and other agreements and commitments of the particular salvage resources identified as needed for this exercise? In general, how do previous commitments affect the availability of salvage ships and equipment, particularly those needed from other industries, such as off-shore oil?
- How is progress monitored?

Evaluation of results should cover the following questions:

- What were the deficiencies in the existing plans?
- What are the deficiencies in resource availability?
- How will deficiencies (e.g., organizational, financial) be addressed?

Additional similar exercises should be conducted at the agency or organization level, (e.g., FBI, USACE, USCG, TSA, state and local).

REFERENCES

DHS **Department of Homeland Security**
NRC **National Research Council**

DHS. 2003. *Initial National Response Plan*. September 30, 2003. Available online at www.dhs.gov/interweb/assetlibrary/Initial_NRP_100903.pdf.

National Fire Protection Association. 2002. *Hazardous Materials Response Handbook*. Quincy, Mass.

NRC. 1982. *Marine Salvage in the United States*. National Academy Press, Washington, D.C.

NRC. 1994. *Reassessment of the Marine Salvage Posture of the United States*. National Academy Press, Washington, D.C.

NRC. 1999. *Spills of Nonfloating Oils: Risk and Response*. Committee on Marine Transportation of Heavy Oils. National Academy Press, Washington, D.C.

Committee Recommendations to Improve Salvage Readiness

The United States has considerable capabilities to respond to a terrorist attack on major seaports. Physical assets and professional personnel are available within responsible federal agencies or can be readily mobilized from the private sector, and organizational capabilities are in place or under active development within the new homeland security infrastructure. Nevertheless, the committee concludes from the evidence presented that more needs to be done to retain confidence that the United States will continue to have an adequate readiness posture. These needs arise from the fact that terrorist threats are complex and could have widespread impacts and the fact that detailed assessments of marine salvage response readiness have not been conducted.

In addition, little attention has been given to comprehensive training or drills involving the myriad government and industry entities that are necessary for a major marine salvage operation (NRC 1994, 1997). For example, salvage and marine firefighting companies in the United States have had a proven track record over the last 20 years. Response has generally been timely and effective, although some recent events suggest that rapid response could be enhanced if more salvage-capable tugs and other major equipment were available. Nevertheless, a complete inventory of salvage assets that have access to U.S. waters is not currently available and such an inventory is vital to fully assess needs. An inventory could be used to allocate salvage assets in the event of a major incident. It also could provide the basis for a needed gap analysis that would match available assets with needs.

With regard to organizational readiness, there is a need to more completely address salvage response plans and to upgrade the organizations that implement them. For example, in the case of incidents like those described in this workshop, existing plans would be implemented under the Initial National Response Plan. Although salvage would be a critical function to reestablish use of a navigation channel, no formal consideration of salvage needs and capabilities exists as any part of the existing planning process, nor do salvors or the U.S. Navy Office of the Supervisor of Salvage and Diving (SupSalv) take any formal part in that process. There is currently a Notice of Proposed Rulemaking dealing with salvage and firefighting planning requirements for tankers trading in the United States, but no other requirement for salvage contingency planning exists.

To address deficiencies in the current organizational readiness posture, the committee endorses the need to carry out a series of comprehensive exercises or drills that would identify problems that can only be understood partially with existing data. For example, the complexities of coping with the aftermath of any terrorist attack are daunting, and the economic impact of closing a port or ports will only compound those complexities. Terrorist attacks can be coordinated to affect more than one port, can cause extreme damage, or can simply close a vital shipping channel. The planning to enable a response effort flexible enough to address different scenarios in different geographic locations must therefore be diligently pursued, particularly since there are myriad agencies and organizations involved. The conduct of carefully planned exercises and drills has

proved to be extremely helpful in the past for preparing for similar disaster response.

The necessity to hold exercises or drills emerged from much of the workshop discussions. The problems of initiating interagency actions necessary to coordinate, assess, and handle the aftermath of the closings of major ports can best be understood by exercises or drills involving the relevant local and national organizations. In particular, the issues involved in the mobilization of the proper salvage and harbor clearance resources might also be best understood by well-planned exercises. Different scenarios involving different geographic locations can be included in the exercises to determine the type of salvage assets needed and to identify mobilization needs. Exercises will be most productive if they are conducted to allow interaction at two levels: one to enable all relevant agencies to interact and the other to allow detailed interactions to assess the issues involved with supporting aspects such as the mobilization of the proper salvage assets to restore port traffic in the most efficient fashion.

The workshop discussions and the results of each group's consideration of the questions posed focused on two general areas of concern regarding capabilities, both physical and organizational. Although discussions were not specific enough to highlight the need to obtain or maintain specific assets, they suggest that more work is needed to accurately define the extent of both physical assets and the organizational competency to meet a terrorist threat.

The committee reviewed the workshop results and concluded that several key steps could address a number of unanswered questions and improve the nation's readiness posture regarding marine salvage capabilities. These key action items are (*a*) maintaining an inventory and evaluation of available physical salvage assets, (*b*) conducting tabletop exercises to test the physical and organizational response readiness posture, (*c*) revising organizational structures to include salvage expertise and input in both planning and response operations, (*d*) and conducting further study of related legal, regulatory, and policy issues. The committee's recommended next steps in these four areas are described in more detail in the following sections.

Inventory of Salvage Assets

Because the committee did not have the time or resources to conduct a comprehensive review of physical assets in the salvage industry and the relevant government agencies, conclusions about readiness lacked good documentation. In addition, many workshop participants believed that any answers to questions about the adequacy of response or readiness were very dependent on specific assumptions about the incident and the need for specific capabilities. Therefore, the committee concluded that it would be highly valuable for response planners to have access to an inventory of salvage assets that would be maintained for reference by the responsible agencies and the salvage industry. In addition, the committee concluded that a gap analysis should be prepared to assess salvage needs and compare them with available assets, taking into account the need for timely response.

Specific committee recommendations are as follows:

- SupSalv, in consultation with the U.S. Coast Guard (USCG) and the commercial salvage industry, should maintain an inventory of available salvage and marine firefighting assets. The inventory should be updated at regular intervals with sufficient frequency to maintain current information.
- SupSalv should conduct a series of gap analyses by comparing available assets with those required to respond effectively to a range of potential terrorist activities as well as to other major salvage incidents. The analyses should consider all critical salvage response measures including rescue towing, harbor and channel clearing, dredging, search and recovery, patching and refloating of vessels, and marine firefighting. The adequacy of anticipated response times on a regional basis should be included in the gap analyses.
- USCG should promulgate final rules for Vessel Response Plans as soon as practical to provide necessary guidance on effective response times for salvage operations.
- If the gap analyses show that current salvage assets are insufficient to respond to plausible terrorist threats in U.S. seaports and waterways, responsible federal agencies should consider revising the existing national salvage policy to provide for the necessary salvage capability in the future.

The committee believes that the inventory and gap analyses are necessary first steps in an overall process of readiness enhancement. The workshop discussions showed that only general observations are possible with the current level of knowledge about specific assets, and it is difficult to move beyond these generalizations without concerted efforts to prepare an inventory and match it against needs.

Marine Salvage Response Exercises

The committee concluded that a logical next step to evaluate marine salvage readiness more completely and accurately would be to conduct detailed exercises incorporating plausible terrorist incidents, the entire

complement of response systems and equipment, and the total response organizational structure. Such exercises would be designed to assess U.S. salvage readiness posture in the event of a terrorist act affecting U.S. harbors and waterways. Specific committee recommendations are as follows:

- Responsible federal agencies should plan and conduct a high-level tabletop salvage response exercise. Participants in the exercise should be senior members from the relevant agencies and private organizations who are capable of making the decisions necessary to ensure proper responses. The exercise could follow scenarios similar to those used in the workshop. The exercise should be carefully planned and led by an experienced facilitator. Additional exercises should follow the first for the purpose of testing different scenarios in different geographic locations.
- Responsible agencies should conduct a supplemental exercise utilizing the same scenarios as the high-level tabletop exercise to test the interactions necessary to identify and mobilize the salvage assets necessary to clear harbors and channels so that the ports can be reopened in the most efficient fashion. This exercise should include representatives from the Navy, the salvage industry, and other related stakeholders.
- In addition, individual agencies should conduct their own exercises designed to test the responses necessary to support the opening of the port or ports in the most efficient manner. An example would be an exercise conducted by the Federal Bureau of Investigation to determine the most efficient handling of the crime scene so that clearance operations could proceed in a timely fashion. Other agencies might include the U.S. Army Corps of Engineers, USCG, National Transportation Safety Board, and local fire and police departments, among others.
- Public affairs specialists from the various federal entities participating in the exercises should also be involved. Such a procedure would acquaint public affairs specialists with salvage efforts and should prepare them to handle the myriad public affairs challenges in an actual salvage operation.

Revision of Salvage Response Organizational Structures

The committee considered the workshop discussions and concerns voiced about how existing organizational structures are implemented within the responsible federal agencies and how these organizations receive and utilize expertise and advice about marine salvage operations and capabilities. The committee concluded that response readiness could be significantly enhanced by improving interagency coordination and agency planning and comprehension of marine salvage work. The existing organizational structures need to be revised at several levels in order to include salvage expertise in both planning and response operations. The committee made the following specific recommendations:

- The membership of the Secretary of Homeland Security's National Maritime Security Advisory Committee should be modified to include a marine salvage expert.
- The USCG Director of Homeland Security should develop a liaison position with the Supervisor of Salvage and Diving.
- The structure of the National Response Plan should provide for the inclusion of salvage expertise in the National Incident Management System (NIMS).

Study of Legislative, Regulatory, and Policy Issues

Finally, the committee recommends that further study of certain important policy issues is critical to maintaining an adequate readiness posture. The workshop participants identified a number of unresolved legislative, regulatory, and policy issues associated with salvage operations resulting from terrorist attacks. The committee noted that marine salvage companies are not guaranteed immunity during response operations and thus there is potential for civil or criminal liability if pollution incidents occur during salvage operations. Many industry participants believed that this potential liability is a serious disincentive for salvors to undertake some salvage operations.

Concern was also expressed that adequate funding methods are not in place to cover an effective salvage response to terrorist attacks. A number of funding options could be explored, including expansion of existing systems or development of new ones patterned after successful funding mechanisms that are now in place. Workshop participants, noting the use of standby salvage in other parts of the world, discussed the potential for increased use of standby salvage capability as a mechanism to fill the gap in salvage capacity in the United States and to ensure timely response in emergency situations.

Another issue identified by workshop participants was the absence of a process for designating places of refuge or safe havens for the conduct of salvage operations. Past experience has shown that this lack can present a critical obstacle to effective salvage actions. Some issues identified in the workshop relate to topics other than salvage but have an effect on the conduct of salvage operations. For example, environmental impacts and public health considerations need to be an integral part of any crisis

management decision-making process. Participants noted that a protocol for addressing public health impacts of a terrorist incident or consequent salvage operations is not clearly defined and this deficiency contributes to the potential vulnerability of the public during a terrorist incident. In addition, the absence of a protocol for addressing human casualties in maritime incidents could result in potential confusion over jurisdiction and logistics for the effective handling of decedent affairs.

Because these policy issues need to be resolved before salvage response readiness can be ensured, the committee recommends that a study of outstanding legal, regulatory, and policy issues be conducted to determine how best to address the following concerns:

- The development of an appropriate process within the emergency response organizations to fund adequately salvage operations resulting from a terrorist incident;
- The development of a process to designate places of refuge or safe havens in which to conduct salvage operations;
- The potential need for responder immunity and consequent civil liability for nonnegligent salvage operations that result in pollution or other unintended or unavoidable damages;
- The establishment of a protocol for addressing public health impacts of a terrorist incident or consequent salvage operations;
- The establishment of a protocol for addressing human casualties and decedent affairs for maritime incidents; and
- The establishment of standby salvage capability in some particularly vulnerable and busy port and harbor areas.

REFERENCES

NRC National Research Council

NRC. 1994. *A Reassessment of the Marine Salvage Posture of the United States*. National Academy Press, Washington, D.C.

NRC. 1997. *Marine Board Roundtable on Search and Recovery of Air Crashes at Sea*. A Summary of Meeting Discussions including Key Issues and Questions Related to Future Needs. Washington, D.C.

APPENDIX A
Marine Salvage Response Capability Workshop Agenda

AUGUST 5, 2003

8:30 a.m. **Opening Session**

Malcolm MacKinnon III, *Committee Chair*

- Welcoming Remarks and Introductions
- Setting the Stage
  - Purpose and Goals of Workshop
  - Initial Conditions

Panel Discussions—Response to Scenarios

9:15 a.m. **Panel 1: Federal Agency Representatives**

Moderator:
Robert C. North, Committee Member

Panelists:
Rear Admiral Thomas Gilmour, *U.S. Coast Guard*
Edward Hecker, *U.S. Army Corps of Engineers*
Mark Johnson, *Office of Maritime and Land Security, Transportation Security Administration*
Steve Krueger, *Federal Bureau of Investigation*
Captain James Wilkins, *U.S. Navy*

10:30 a.m. Break

10:45 a.m. **Panel 2: Marine Salvage Industry Representatives**

Moderator:
R. Keith Michel, *Committee Member*

Panelists:
Cappy Bisso, *Bisso Marine*
Roger Elliott, *Smit Americas, Inc.*
Mauricio Garrido, *Titan Maritime, LLC*
James Shirley, Jr., *Holland & Knight*
Robert Umbdenstock, *Extreme Marine Services*
J. Arnold Witte, *Donjon Marine*

12:15 p.m. Lunch

1:30 p.m. **Breakout Discussion Groups**

Participants will break out into four topical groups to address issues the steering committee has identified as key to the theme of the workshop. Each group will discuss the scenario results, responses, and likely impacts from their perspectives on these topics. The group moderator will summarize the discussions at a plenary session at the end of the day.

Group 1: Physical Salvage and Harbor Clearance Issues

Moderator:
R. Keith Michel, *Committee Member*

Group 2: Financial, Economic, and Political Issues

Comoderators:
Paul S. Fischbeck and Robert C. North, *Committee Members*

Group 3: Legal, Forensic, and Human Casualty Issues

Moderator:
Reginald E. McKamie, Sr., *Committee Member*

Group 4: Environmental Issues

Moderator:
Sally Ann Lentz, *Committee Member*

4:00 p.m. **Plenary Session—Initial Results of Group Discussions**

Moderator:
Malcolm MacKinnon III, *Committee Chair*

6:00 p.m. Reception

AUGUST 6, 2003

8:00 a.m. Breakfast

8:30 a.m. **Plenary Session—Discussion of Group Results**

Moderator:
Malcolm MacKinnon III, *Committee Chair*

9:30 a.m. **Breakout Groups Meet to Draft Findings**

12:00 noon Lunch

1:15 p.m. **Final Plenary Session—Summary of Workshop Results and Discussion of Next Steps**

Moderator:
R. Keith Michel, *Committee Member*

2:00 p.m. Adjourn

APPENDIX B
Marine Salvage Response Capability Workshop Participants

COMMITTEE

Malcolm MacKinnon III, *Chair, Managing Member, MacKinnon-Searle Consortium, LLC*
Paul S. Fischbeck, *Director, Center for the Study and Improvement of Regulation, and Department of Social and Decision Sciences, Carnegie Mellon University*
Sally Ann Lentz, *Executive Director and General Counsel, Ocean Advocates*
Reginald E. McKamie, Sr., *Houston, Texas*
R. Keith Michel, *President, Herbert Engineering Corporation*
Robert C. North, *President, North Star Maritime, Inc.*

TRB STAFF

Joedy W. Cambridge, *Marine Board Staff Director*
Steve Godwin, *Director, Studies and Information Services*
Beverly Huey, *Senior Staff Officer*
Peter Johnson, *Consultant*
Mary Kissi, *Staff Assistant*
Mark R. Norman, *Director, Technical Activities*
Robert E. Skinner, Jr., *Executive Director*

PANELISTS

Cappy Bisso, *Bisso Marine*
Roger Elliott, *Smit Americas, Inc.*
Mauricio Garrido, *Titan Maritime, LLC*
Rear Admiral Thomas Gilmour, *U.S. Coast Guard*
Edward Hecker, *Homeland Security Section, U.S. Army Corps of Engineers*
Mark Johnson, *Department of Homeland Security, Transportation Security Administration*
Steve Krueger, *Headquarters, Federal Bureau of Investigation*
James Shirley, Jr., *Holland & Knight*
Robert Umbdenstock, *Extreme Marine Services*
Captain James Wilkins, *Office of the Supervisor of Salvage and Diving (SupSalv), U.S. Navy*
J. Arnold Witte, *Donjon Marine*

OTHER PARTICIPANTS

Richard C. Asher, *Supervisor of Salvage and Diving, Naval Sea Systems Command*
Tim Beaver, *Global Diving and Salvage, Inc.*
Captain J. H. (Huntly) Boyd, *U.S. Navy (Ret.)*
Alan Becker, *PCCI, Inc.*
Joanne Bintz, *Ocean Studies Board, National Academies*
Captain Ronald Branch, *U.S. Coast Guard Marine Safety Office, New Orleans*
Amy Brandt, *American Waterways Operators*
Richard Buckingham, *Naval Sea Systems Command*
Gregory Buie, *Team III, Case Management Division, National Pollution Funds Center, U.S. Coast Guard*
Peyton Coleman, *Maritime/Land Directorate (TSA-8), Transportation Security Administration*
Bill Cooper, *Counsel, House Committee on Energy and Commerce*
Michelle Daigle, *U.S. Army Corps of Engineers*

Commander Steve Danielczyk, *U.S. Coast Guard*
David A. DuPont, *Standards Evaluation and Analysis Division, U.S. Coast Guard*
Richard Fiske, *MacKinnon-Searle Consortium, LLC*
Richard Fredricks, *American Salvage Association*
Captain A. J. Gibbs, *Crescent River Port Pilots Association*
Devon Grennan, *Global Diving and Salvage, Inc.*
John Harrald, *Department of Engineering Management, George Washington University*
Commander David Hawes, *Captain of the Port, Houston*
Jeff High, *U.S. Coast Guard*
Mike Hokana, *Maritime Administration, U.S. Department of Transportation*
Commander Rob Holzman, *U.S. Coast Guard (Ret.), Inspection Coordination and Review, Marine Safety Office, New Orleans*
J. Bernie Jacobsen, *IBJ Associates*
Laura Johnson, *Environmental Protection Agency*
Michael Kidberg, *U.S. Army Corps of Engineers*
Alex Landsburg, *Maritime Administration, U.S. Department of Transportation*
Scott Linsky, *Transportation Security Administration, U.S. Department of Transportation*
Marjorie Murtagh, *Office of Marine Safety, National Transportation Safety Board*
Rebecca Nadel, *Ocean Studies Board, National Academies*
Captain Roy Nash, *U.S. Coast Guard*
Jim O'Brien, *O'Brien's Oil Pollution Service, Inc.*
Michael Park, *U.S. Army Corps of Engineers, New Orleans*
Mike Rampolla, *Crowley Marine Services, Inc.*
Dragos Rauta, *INTERTANKO*
Aled Roberts, *Matthews Daniel*
Gary Root, *Technical Salvage Advisors, Inc.*
Bob Rzemieniewski, *Department of Homeland Security, Transportation Security Administration*
Thomas Salmon, *Naval Sea Systems Command*
Lieutenant Derek Schade, *U.S. Coast Guard Marine Safety Center, Salvage Engineering Response Team*
Captain Willard Searle, Jr., *U.S. Navy (Ret.)*
Doug Slitor, *Safety and Enforcement Branch, Minerals Management Service*
Malcolm Spaulding, *University of Rhode Island*
Ted Thompson, *International Council of Cruise Lines*
Steven Tomisek, *Strategic Policy Forum, National Defense University*
Kathleen Toone, *Strategic Policy Forum, National Defense University*
Thomas Waite, *Environmental Engineering, National Science Foundation*
Ann Hayward Walker, *Sea Consulting*
W. Mark Whitworth, *Federal Bureau of Investigation*
John Witte, Jr., *Donjon Marine Co., Inc.*
George Wittich, *Weeks Marine, Inc.*

Study Committee Biographical Information

Malcolm MacKinnon III, *Chair*, is Managing Member of MacKinnon-Searle Consortium, LLC, a firm that specializes in ship design and acquisition, salvage, technology insertion, and shipyard management, among other things. Admiral MacKinnon served in various executive and command positions with the U.S. Navy from 1955 until his retirement in 1990, including Deputy Commander of Naval Sea Systems Command (NAVSEA) Ship Design and Engineering, Chief Engineer of the Navy, and Vice Commander, NAVSEA. He was Project Officer for the design and construction of SeaLab II, an underwater habitat, and directed the conceptual design efforts for the Trident and SSN 688 classes of nuclear submarines. He is active in the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers. Admiral MacKinnon received a BS in naval science from the U.S. Naval Academy and an MS in naval architecture and marine engineering from the Massachusetts Institute of Technology. He is a member of the National Academy of Engineering and has served on several National Research Council (NRC) committees, including the Marine Board Committee to Review NOAA's Fleet Replacement and Modernization Plan and Committee on Marine Transportation of Heavy Oils.

Paul S. Fischbeck is Director of the Center for the Study and Improvement of Regulation and Associate Professor of Engineering and Public Policy and Social and Decision Sciences at Carnegie Mellon University. Widely published, Dr. Fischbeck has served on a number of national research committees and review panels, including the Transportation Research Board (TRB) Committee on School Transportation Safety, the National Science Foundation Decision, Risk, and Management Sciences Proposal Review Committee and Small Business Innovative Research Proposal Review Committee, and the TRB Marine Board Committee for Evaluating Double-Hull Tanker Design Alternatives and Committee on Risk Assessment and Management of Marine Systems. He is involved with a number of professional research organizations including the American Society for Engineering Education, the Institute for Operations Research and Management Sciences, the Military Operations Research Society, and the Society of Risk Analysis. He holds a BS in architecture from the University of Virginia, an MS in operations research and management science from the Naval Postgraduate School, and a PhD in industrial engineering and engineering management from Stanford University.

Sally Ann Lentz is the Executive Director and General Counsel of Ocean Advocates, Clarksville, Maryland, a national, nonprofit environmental organization dedicated to the protection of the marine environment. She represents environmental interests in national and international forums on ocean dumping, vessel source pollution, and other marine public policy issues. She has served as advisor to the U.S. delegations to the International Maritime Organization and develops and coordinates policy positions for coalitions of domestic and international environmental organizations on shipping, coastal, and marine issues. Ms. Lentz represents

these organizations at international conventions related to oil pollution from tanker accidents. Previously she was Staff Attorney for Friends of the Earth and the Oceanic Society and conducted a private practice. She has a BA from Oberlin College, a postgraduate degree in European integration from the University of Amsterdam, and a JD from the University of Maryland. A member of the District of Columbia and Maryland Bars, Ms. Lentz is also a member of the TRB Marine Board and has served on a number of Marine Board committees. She has published extensively in professional and legal journals on marine and ocean environmental protection issues.

Reginald E. McKamie, Sr., is a practicing maritime attorney in Houston, Texas. He is also a certified public accountant (CPA). He received a BS from the U.S. Merchant Marine Academy at Kings Point in 1975, an MBA from the University of Southern California (USC) in 1976, and a JD from the University of Houston in 1986, where he was a member of the Phi Delta Phi legal fraternity. He served as lead counsel for the Port of Houston Authority in a case involving a major maritime casualty and oil spill in Galveston Bay, which was considered by the court a case of first impression for the Fifth Circuit and is reported in *American Maritime Cases*. Following graduation from USC, he accepted a position as an able-bodied seaman aboard an ocean-going vessel. While pursuing a seagoing career, he also worked with the accounting firm of Cook & Robinson, CPA. In 1981, Mr. McKamie earned his license as both Unlimited Master Mariner and CPA. He also worked for Exxon Shipping Company, where he held the positions of Assistant Fleet Manning Supervisor and Senior Financial Specialist. He returned to sea in 1986 and served as Captain of the S/S *Exxon North Slope*, S/S *Exxon Philadelphia*, and the S/S *Exxon Benicia*. He is a member of the American, Texas, and Houston Bar Associations and the Texas and Houston Chapters of the Texas Society of Certified Public Accountants.

R. Keith Michel is President of Herbert Engineering Corporation, Alameda, California. In his 30 years with the company, he has worked on design, specification development, and contract negotiations for containerships, bulk carriers, and tankers. Mr. Michel has served on industry advisory groups developing guidelines for alternative tanker designs, including groups advising the International Maritime Organization and the U.S. Coast Guard (USCG). His work has included development of methodology, vessel models, and oil outflow analysis. He was a project engineer for the USCG report on oil outflow analysis for double-hull and hybrid tanker arrangements, which was part of the U.S. Department of Transportation's technical report to Congress on the Oil Pollution Act of 1990. He has also worked on the development of salvage software used by the U.S. and Canadian Coast Guards, the Navy, the National Transportation Safety Board, the Maritime Administration, the American Bureau of Shipping, Lloyd's, and numerous oil and shipping companies. Mr. Michel holds a BS in naval architecture and marine engineering from the Webb Institute of Naval Architecture. He was first appointed a member of the Marine Board in 1998 and is currently serving as chair.

Robert C. North is currently President of North Star Maritime, Inc., Queenstown, Maryland, specializing in marine industry consulting in merchant marine safety, port safety and security, waterways management, merchant marine personnel qualifications and training, and marine environmental protection regulatory issues. He served for 34 years as a USCG commissioned officer. His career culminated with service as the USCG Assistant Commandant for Marine Safety and Environmental Protection, directing national and international programs for commercial vessel safety, merchant mariner licensing and documentation, port safety and security, and waterways management. He led the effort involving 14 federal agencies and public- and private-sector stakeholders to develop the concept of the Marine Transportation System, a project aimed at ensuring that U.S. ports, waterways, and intermodal connections are able to support anticipated increased levels of maritime trade in the coming years in a safe, secure, and environmentally sound manner. He directed the creation of Qualship 21, a unique safety and environmental protection quality incentives program for foreign vessels calling in U.S. ports. He also managed development of the Marine Information for Safety and Law Enforcement project to consolidate USCG commercial vessel databases for merchant marine safety and maritime law enforcement programs. RADM North is a graduate of the State University of New York Maritime College with a degree in marine engineering and is a graduate of the U.S. Army War College of the National Defense University.

TRB

TRANSPORTATION RESEARCH BOARD

500 Fifth Street, NW

Washington, DC 20001

www.TRB.org

ADDRESS SERVICE REQUESTED

PRSRT First Class
US Postage
PAID
Washington, DC
Permit No. 8970

ISBN 0-309-09459-3