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16. Abstract (MAXIMUM 200 WORDS)

This report describes the efforts to identify and close performance gaps for containing and recovering oil spills in fast water areas. An initial assessment indicated that little was being done in fast water environments because the technology and training were limited. An evaluation and development program was initiated to identify and test potential equipment to be used in currents greater than one knot.

Tests were conducted at Ohmsett, the National Oil Spill Response Facility, and promising equipment was demonstrated in field tests on both coasts of the United States. As a result of the tests at Ohmsett, changes were made that improved the performance of several existing systems and prototype equipment was developed that appear to be useful in fast currents. It was determined that two pieces of equipment that were demonstrated in the field, the Boom Vane and Boom Deflectors, can enhance the oil recovery performance of booms in fast water conditions.

Information about fast water response techniques also has been gathered within the fast water project and included in a fast water field guide. Recommendations are provided in this report to integrate the information gathered, ensure the best use of response equipment, and review existing regulations and procedures for fast water requirements.

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EXECUTIVE SUMMARY

This report describes the efforts of the U.S. Coast Guard Research and Development Center to identify performance gaps for responses to oil spills in currents over one knot and to identify potential equipment and techniques to close these gaps. An initial assessment indicated potential improvements to fast water containment and recovery were possible because the existing present technology and training were limited (Coe and Gurr, 1999). This assessment also reported that the threat was real because between 1992 and 1997, 58 percent of all oil spills occurred on waterways with currents that routinely exceeded one knot. Potential equipment and techniques were demonstrated in the field on both coasts of the U.S. and tested at Ohmsett, the National Oil Spill Response Facility.

Two pieces of equipment that were demonstrated in the field, the Boom Vane and Boom Deflectors, can enhance the oil recovery performance of booms in fast water conditions. Both systems reduce the amount of rigging hardware required to deflect oil towards the shore for recovery or away from sensitive areas. Both systems perform best in steady currents. The Boom Vane is especially useful when a boat is not available to deploy anchors out in the current. The District Response Assist Team (DRAT) from both USCG District 1 and District 13 each has one vane in its inventory and has been using them during exercises.

The assessment report (Coe and Gurr, 1999) specifically identified three systems that had been developed for fast currents but had never been tested with oil. The Vikoma Fasflo from England, the High Speed Circus from Finland, and the Current Buster from Norway were tested at Ohmsett. To ensure that the tests were consistent, a fast-current testing protocol was developed using the USCG High Speed Skimmer (HSS) and all four systems were tested in the summer of 2000 using the protocol. The tests indicated that all of the systems can efficiently collect oil in two knots of current. The two larger systems, the HSS and the Current Buster, can work effectively up to 3.5 knots in the absence of waves. The HSS was able to recover some oil up to five knots. Although the size of the Current Buster did not permit tow speeds over 3.5 knots, the trends indicate that it can efficiently recover oil at higher speeds. All of the systems are small enough to be deployed from vessels, although some heavy lifting and rigging may be required. All of the skimmers were affected by the flow created by the lead-in booms.

Another series of tests was conducted during the summer of 2000 at Ohmsett in order to increase the state-of-the-art in fast water response. The systems were selected from proposals in response to a Broad Agency Announcement (BAA) seeking improvements to containment and recovery capabilities in currents from three to five knots. The systems included USCG HSS (JBF DIP600) Design Modifications, Towing Forces on Fast Water Diversion Booms, Flow Diverters, Floating Oil Sorbent Recovery Systems, and a Zero Relative Velocity (ZRV) Rope Mop Skimming System (Stream Stripper). Improvements have been made in the HSS that increase Throughput Efficiency (TE) to over 60 percent at three knots and over 35 percent at four knots. A simple equation was developed for use in stationary or advancing deflection booms that requires that the user know only the current velocity and the projected area of the boom. The prototype flow diverters can help to deflect oil up to 19 feet to one side. Use of sheet sorbent booms can be more effective and may be easier to handle for sheen spills than conventional sorbent booms. The Stream Stripper TE performance exceeded 80 percent at two knots and over 60 percent at three knots.

An effort was made to adapt the submergence plane concept to the USCG Spilled Oil Recovery System (SORS) and Vessel of Opportunity Skimming System (VOSS). A redesign of the system was needed because of the tendency for the plane to rise out of the water at higher speeds; a half-scale model was built and tested at Ohmsett. Recovery efficiency was over 60 percent at 2.8 knots and over 30 percent at 4.2 knots. This could help buoy tenders maneuver more easily. The

system, however, does not appear to collect light oil very well; therefore, additional work is needed so that a full range of oils can be recovered. In addition, the submergence plane configuration does not perform well in low speeds. Sufficient flow to drive the oil down the plane is not created at speeds less than one knot.

A fast water guide, "Oil Spill Response in Fast Currents, A Field Guide," was developed during this project. This guide can be used in conjunction with equipment evaluations to develop a systematic approach to responding to oil spills in fast waters. This guide brings together all of the information needed for fast water response and will assist CG and commercial responders to plan, train for and execute safe and efficient responses.

Steps that should be taken to ensure that equipment is in the right place and can perform the required tasks are:

- Encourage the use of equipment such as the Boom Vane, Boom Deflectors, and Flow Diverters in areas where high-speed currents are always present. These systems should be stored downstream in an easily accessible area where trained crews can quickly deploy them.

- Include fast water response techniques in the regulations for facilities and Oil Spill Response Organizations (OSRO). The definition of fast water areas can be taken from current tables, actual data, or the analysis conducted in Coe and Gurr (1999). The OSRO would meet requirements if it had small draft boom and contingency plans that indicate knowledge of fast water response techniques. Fast water exercises should be periodically conducted.

- Evaluate the performance and location of CG VOSS and SORS systems in fast water areas. This includes the time to deploy and the recovery performance. Locate the HSS where it will be the most useful. A risk-based assessment could provide some guidance in lieu of actual exercises.

- Disseminate the information in the field guide, “Oil Spill Response in Fast Currents, a Field Guide.” Cooperate with the U.S. Environmental Protection Agency and inland responders to keep the guide up-to-date. Work with area committees, Marine Safety Offices and possibly American Society for Testing and Materials (ASTM) committee F-20 (hazardous substances and oil spill response).