

U.S. Department
of Transportation
**United States
Coast Guard**



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U.S. Coast Guard

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DEPARTMENT OF TRANSPORTATION

U. S. COAST GUARD

STATEMENT OF CAPTAIN DONALD S. JENSEN

ON OIL SPILL CLEANUP TECHNOLOGY

BEFORE THE SUBCOMMITTEE ON OCEANOGRAPHY, GREAT LAKES AND

THE OUTER CONTINENTAL SHELF

AND

SUBCOMMITTEE ON COAST GUARD AND NAVIGATION

COMMITTEE ON MERCHANT MARINE AND FISHERIES

HOUSE OF REPRESENTATIVES

18 JUNE 1991

CAPTAIN DONALD S. JENSEN

U.S. COAST GUARD

Captain Jensen is Chief, Applied Science Division and Acting Chief, Applied Engineering Division, U.S. Coast Guard Research and Development Center, Groton, CT. He reported to this assignment in July 1988. His previous assignment was Commanding Officer, Marine Safety Office Providence, RI.

Captain Jensen graduated from the U.S. Coast Guard Academy in 1965 and holds post-graduate level degrees in Naval Architecture/Marine Engineering and Mechanical Engineering from the University of Michigan.

Captain Jensen has gained broad experience during his 26 years of Coast Guard service. Assignments in the Marine Safety program include tours at Marine Safety Office Providence, Marine Inspection Office Baltimore, the Atlantic Strike Team and the Marine Safety Staff of the Commander, Fifth Coast Guard District. He has had two assignments in the Coast Guard's Research and Development program. Captain Jensen's Coast Guard sea duty includes engineering tours aboard an icebreaker, an ocean station vessel and a high endurance cutter.

In his present assignment, he is responsible for the technical direction of research and development efforts underway in support of all of the Coast Guard's operational and support programs. Following the EXXON VALDEZ incident, he organized the public affairs and protocol functions for the Federal On-Scene Coordinator. Captain Jensen was active in the development of an interagency oil spill research program mandated by OPA 90. Most recently he was selected to serve as Chief of the U.S. Interagency Assessment Team dispatched to advise the Government of Saudi Arabia immediately following the Persian Gulf oil spill.

Captain Jensen is under orders to serve as Commanding Officer of the National Strike Force Coordination Center to be established during Summer 1991 in Elizabeth City, NC. He will report to that assignment in July 1991.

CAPTAIN WILLIAM F. HOLT

U.S. COAST GUARD

Captain Holt is presently serving as the Chief, Marine Environmental Protection Division, Coast Guard Headquarters, Washington, DC, where he is the manager for the Coast Guard's Marine Environmental Protection Program, and one of the primary officers charged with implementing the Oil Pollution Act of 1990. He has had a variety of operational and staff assignments in his 22-year career. After graduation from the Coast Guard Academy in 1968, he served on board the High Endurance Cutters Casco and Owasco, the Buoy Tender Mariposa, and commanded the Cutter Cape Fairweather. Following his service at sea, Captain Holt was assigned to the Environmental Coordination Branch at Coast Guard Headquarters followed by assignments as the alternate Captain of the Port in Sault Ste. Marie, Michigan, Chief of the Environmental Protection Division for the Third District in New York, and Supervisory Inspector for the Coast Guard's Marine Inspection Office in New York City. His most recent assignment was as Commanding Officer of the Marine Safety Office in Huntington, West Virginia.

Captain Holt was awarded a Master of Science Degree in Natural Resource from the University of Michigan in 1975. His military decorations include 2 Coast Guard Commendation Medals and the Coast Guard Achievement Medal.

He is married to the former Valerie Zucker of Arlington, Mass and they have 4 children.

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GOOD MORNING CHAIRMEN AND DISTINGUISHED MEMBERS OF THE
SUBCOMMITTEES. I AM CAPTAIN DONALD S. JENSEN, CHIEF OF THE
APPLIED ENGINEERING DIVISION OF THE COAST GUARD RESEARCH AND
DEVELOPMENT CENTER. WITH ME IS CAPTAIN WILLIAM F. HOLT, CHIEF OF
THE MARINE ENVIRONMENTAL PROTECTION DIVISION OF COAST GUARD
HEADQUARTERS.

THE TOPIC OF DISCUSSION TODAY IS THE CURRENT STATE OF OIL SPILL
CLEANUP TECHNOLOGY. THIS INCLUDES A RANGE OF RESPONSE ACTIONS
WHICH BEGIN WITH STABILIZING THE VESSEL AND OFFLOADING REMAINING
CARGO, REMOVING THE OIL FROM THE SURFACE OF THE WATER IF IT
ESCAPES FROM THE SHIP, AND MONITORING SHORELINE CLEANUP IF THE
OIL REACHES THE SHORE.

OIL SPILL CLEANUP TECHNOLOGY BECAME THE FOCUS OF ATTENTION
FOLLOWING THE EXXON VALDEZ OIL SPILL ON 24 MARCH 1989, WHEN
GOVERNMENT AND INDUSTRY APPEARED INCAPABLE OF CLEANING UP A MAJOR
SPILL IN AN ENVIRONMENTALLY-SENSITIVE AREA. THE TECHNIQUES USED
IN THE EXXON VALDEZ CLEANUP, AND IN THE CLEANUP OF SUBSEQUENT

MAJOR SPILLS, WERE OFTEN DESCRIBED AS "PRIMITIVE."
UNFORTUNATELY, THIS ASSESSMENT OVERLOOKED THE VAST QUANTITY OF
OIL SPILLED, THE EVEN LARGER QUANTITY OF OIL THAT WAS
SUCCESSFULLY REMOVED FROM THE VESSEL, THE ALMOST INSTANTANEOUS
RELEASE, AND THE COMPLEX LOGISTICS INVOLVED IN MOUNTING A
RESPONSE EFFORT OF THIS MAGNITUDE IN ALASKA.

FOLLOWING THE EXXON VALDEZ SPILL, STUDIES WERE INITIATED BY THE
GOVERNMENT ACCOUNTING OFFICE, THE CONGRESSIONAL OFFICE OF
TECHNOLOGY ASSESSMENT (OTA), THE CENTER FOR MARINE CONSERVATION,
AND THE NATIONAL RESPONSE TEAM TO EXAMINE SHORTCOMINGS IN THE
RESPONSE EFFORT. ALL THE STUDIES CITE THE NEED FOR UPGRADED
RESPONSE TECHNOLOGIES. THE OTA REPORT ON THE SUBJECT, "COPING
WITH AN OILED SEA," PRESENTED A COMPREHENSIVE AND OBJECTIVE
PERSPECTIVE ON THE STATE OF OIL SPILL RESPONSE TECHNOLOGY. THE
OTA REPORT CLEARLY RECOGNIZED THAT RESPONSE EFFECTIVENESS IS NOT
SOLELY DEPENDENT ON INDIVIDUAL CLEANUP TECHNIQUES AND EQUIPMENT,
BUT RATHER DEPENDS ON ALL ASPECTS OF A TOTAL RESPONSE EFFORT
INCLUDING SOUND DECISION-MAKING THROUGH EFFECTIVE CONTINGENCY
PLANNING AND ADEQUATE TECHNICAL INFORMATION, ADEQUATE LOGISTICS
TO MOBILIZE AND SUPPORT CLEANUP PERSONNEL AND EQUIPMENT ON SCENE,
AND PROPER TRAINING IN ADVANCE OF THE SPILL.

IN AUGUST OF 1989, THE COAST GUARD UNDERTOOK A SURVEY OF THE
CURRENT TECHNOLOGY TO IDENTIFY CAPABILITIES LACKING IN RECENT
RESPONSES AND TO DETERMINE WHERE TECHNOLOGICAL INITIATIVES MIGHT
IMPROVE THESE CAPABILITIES. FOLLOWING THIS PRELIMINARY REVIEW,

THE COAST GUARD SPONSORED AN AD-HOC FEDERAL INTERAGENCY PLANNING WORKSHOP ON OIL SPILL RESEARCH AND DEVELOPMENT, WHERE PARTICIPANTS FROM GOVERNMENT AND INDUSTRY MET TO EXCHANGE INFORMATION, STRENGTHEN WORKING RELATIONSHIPS, AND INITIATE THE DEVELOPMENT OF A COORDINATED NATIONAL R&D EFFORT TO IMPROVE OIL SPILL RESPONSE TECHNOLOGY. PERHAPS THE MOST SIGNIFICANT OUTCOME OF THE WORKSHOP WAS A COORDINATED FIRST-ATTEMPT AT IDENTIFYING TECHNOLOGICAL DEFICIENCIES AND R&D INITIATIVES FOR THE FUTURE. THE AD-HOC COMMITTEE FORMED AT THIS WORKSHOP HAS SINCE BEEN FORMALIZED BY TITLE VII OF THE OIL POLLUTION ACT OF 1990 (OPA 1990) AS THE "INTERAGENCY COORDINATING COMMITTEE ON OIL POLLUTION RESEARCH."

SINCE THE EXXON VALDEZ SPILL, THE COAST GUARD HAS INITIATED A COMPREHENSIVE R&D PROGRAM IN MARINE ENVIRONMENTAL RESPONSE. IN THE AREA OF SPILL PLANNING AND MANAGEMENT, THE COAST GUARD, IN COOPERATION WITH NOAA, HAS DEVELOPED A PROTOTYPE SPILL RESPONSE DECISION SUPPORT SYSTEM FOR OIL AND HAZARDOUS CHEMICAL SPILL RESPONSE THAT IS PRESENTLY IN THE TESTING AND EVALUATION PHASE OF DEVELOPMENT. THIS PROTOTYPE DECISION SUPPORT SYSTEM IS DESIGNED TO PROVIDE ACCURATE AND ACCESSIBLE TECHNICAL INFORMATION TO THE COAST GUARD FEDERAL ON-SCENE COORDINATORS AND NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) SCIENTIFIC SUPPORT COORDINATORS TO ENHANCE RAPID AND SOUND DECISION MAKING DURING A SPILL. WE ARE ALSO DEVELOPING ADDITIONAL TECHNICAL DATABASES WITH NOAA, AND INITIATING PROJECTS TO UPGRADE, STANDARDIZE, AND SUPPORT OUR RISK ASSESSMENT AND CONTINGENCY PLANNING PROCESS.

THESE EFFORTS WILL INSURE IMPROVED SPILL RESPONSE PLANNING, ORGANIZATION, MANAGEMENT, AND TRAINING.

IN THE AREA OF SPILL SURVEILLANCE, WE ARE WORKING WITH OTHER U.S. AND CANADIAN AGENCIES AS WELL AS PRIVATE INDUSTRY, TO PROVIDE CRITICALLY-NEEDED DAY/NIGHT, ALL-WEATHER OIL SPILL SURVEILLANCE CAPABILITY THROUGH DEVELOPMENT OF ADVANCED OIL SPILL SENSORS. THIS SYSTEM IS REQUIRED STRATEGICALLY, TO MAP THE AREA AND MOVEMENT OF THE SPILL, AND TACTICALLY, TO DIRECT CLEANUP EQUIPMENT TO AREAS OF HIGH OIL CONCENTRATION. ALTHOUGH RESEARCH, DEVELOPMENT, TESTING AND EVALUATION OF THESE SENSORS WILL TAKE TIME, THEIR INTEGRATION INTO AN OPERATIONAL SYSTEM WILL GREATLY ENHANCE OUR CURRENT CAPABILITY. WE ARE ALSO LOOKING AT NEAR-TERM MODIFICATIONS IN OUR CURRENT HU-25 "GUARDIAN" AIRCRAFT AIREYE SYSTEM, INCLUDING SENSOR UPGRADES AND ADDITION OF STATE-OF-THE-ART DATA ANALYSIS AND TRANSMISSION CAPABILITIES.

THE COAST GUARD IS ALSO CONCENTRATING IN THE AREA OF TANKER COUNTERMEASURES TO DEVELOP IMPROVED METHODS AND EQUIPMENT TO ASSESS DAMAGE TO THE TANKER, STABILIZE THE VESSEL, AND REMOVE REMAINING CARGO BEFORE IT CAN SPILL. THESE ARE OFTEN THE CRITICAL FIRST RESPONSE EFFORTS UNDERTAKEN BY OUR STRIKE TEAMS DURING A SPILL. ONE OF THE ENCOURAGING ASPECTS DURING THE EXXON VALDEZ INCIDENT WAS THE SUCCESSFUL REMOVAL OF 80 PERCENT OF THE REMAINING OIL FROM THE TANKER. ACCORDINGLY, WE HAVE INITIATED EFFORTS TO UPGRADE THE AIR DEPLOYABLE ANTI-POLLUTION TRANSFER SYSTEM (ADAPTS) OIL OFFLOADING SYSTEM, AND ARE INVESTIGATING

ADVANCED TECHNOLOGIES TO ASSESS TANKER DAMAGE AND STEM THE FLOW OF OIL THROUGH HULL PENETRATIONS. WE ARE ALSO REVISITING THE TECHNOLOGY FOR ONBOARD TANKER COUNTERMEASURES AND CLEANUP SYSTEMS TO SUPPORT THE REQUIREMENTS OF OPA 1990.

THE OTA REPORT INDICATED THAT NO MORE THAN 30 PERCENT OF A MAJOR OIL SPILL COULD BE RECOVERED USING MECHANICAL MEANS UNDER IDEAL CONDITIONS, AND THAT PROBABLY LESS THAN HALF THAT AMOUNT IS MORE LIKELY. WE AGREE IT IS ALSO UNLIKELY THAT SUBSTANTIAL IMPROVEMENTS CAN BE MADE IN MECHANICAL CONTAINMENT AND RECOVERY SINCE BOOMING AND SKIMMING TECHNOLOGIES ARE ALREADY FAIRLY ADVANCED, AND ARE DOMINATED BY THE PHYSICS OF OIL BEHAVIOR IN THE OCEAN ENVIRONMENT. THE DYNAMICS OF SPILLED OIL IN THE ENVIRONMENT IS SIMILAR TO THE GENIE THAT IS RELEASED FROM THE LAMP; ONCE IT IS OUT, IT IS HARD TO RETURN IT TO ITS LAMP, OR FOR SPILLED OIL, TO ANOTHER TANKSHIP.

EACH OF THE VARIOUS TECHNIQUES FOR CONTROLLING OIL POLLUTION HAS POSITIVE AND NEGATIVE ATTRIBUTES. DISPERSANTS OFFER THE OPPORTUNITY TO FACILITATE NATURAL PROCESSES BUT AT THE RISK OF AFFECTING ORGANISMS IN THE WATER COLUMN. BIOREMEDIATION SIMILARLY FACILITATES THE NATURAL PROCESSES, BUT AT A SPEED AND EFFICIENCY THAT LIMIT ITS UTILITY IN "FIRST" RESPONSE. BURNING MAY EFFICIENTLY REMOVE OIL BUT IT ADDS AIR POLLUTANTS.

DESPITE ITS INEFFICIENCIES, MECHANICAL CONTAINMENT AND RECOVERY REMAINS THE PREFERRED METHOD OF OIL SPILL RESPONSE OVER THE WIDE

RANGE OF POSSIBLE CONDITIONS AND LOCATIONS OF AN OIL SPILL. SOME PROGRESS CAN BE MADE IN DEVELOPING BETTER EQUIPMENT AND TECHNIQUES TO STREAMLINE MECHANICAL RECOVERY OPERATIONS, PARTICULARLY FOR DEBRIS-HANDLING, OIL/WATER SEPARATION, TEMPORARY STORAGE, AND OIL DISPOSAL. WE ARE CURRENTLY INITIATING RESEARCH EFFORTS TO UPGRADE OIL/WATER SEPARATION AND TEMPORARY STORAGE TECHNOLOGY. EVEN THOUGH WE CANNOT ANTICIPATE SIGNIFICANT IMPROVEMENTS IN THE OVERALL PERCENTAGE OF OIL RECOVERED DURING MAJOR SPILLS, WE WILL BE BETTER ABLE TO RECOVER LIMITED AMOUNTS OF OIL TO PROTECT ENVIRONMENTALLY AND ECONOMICALLY SENSITIVE RESOURCES DURING MAJOR SPILLS, AND TO EFFECTIVELY RECOVER SMALLER SPILLS. IN ADDITION, WE ARE WORKING WITH THE MINERALS MANAGEMENT SERVICE (MMS), NAVY, AND "ENVIRONMENT CANADA" TO REOPEN THE OIL AND HAZARDOUS MATERIALS SIMULATION AND EVALUATION TESTING TANK (OHMSETT) FACILITY IN NEW JERSEY, WHERE MECHANICAL RECOVERY EQUIPMENT CAN BE TESTED USING STANDARD PROTOCOLS TO CLEARLY DEFINE THE CAPABILITIES OF THESE SYSTEMS. THIS WILL ALLOW US TO BETTER JUDGE THE ADEQUACY OF CONTINGENCY PLANS.

OF THE VARIOUS TECHNIQUES FOR REMOVING OIL FROM THE WATER, IN-SITU BURNING HOLDS THE MOST PROMISE FOR RESPONDING TO CATASTROPHIC SPILLS IN OPEN WATERS. ON THE SECOND DAY FOLLOWING THE EXXON VALDEZ SPILL, APPROXIMATELY 15,000 TO 30,000 GALLONS OF OIL WERE SUCCESSFULLY BURNED WITH AN ESTIMATED EFFICIENCY OF 98 PERCENT. WE ARE NOW PARTICIPATING IN AN AGGRESSIVE GOVERNMENT/INDUSTRY RESEARCH EFFORT TO THOROUGHLY INVESTIGATE THE OVERALL EFFECTIVENESS AND ENVIRONMENTAL EFFECTS OF IN-SITU

BURNING. MEDIUM-SCALE TESTS HAVE JUST BEEN COMPLETED AT THE COAST GUARD FIRE & SAFETY TEST FACILITY IN MOBILE, ALABAMA, WITH ENCOURAGING RESULTS. HOWEVER, OFFSHORE FULL-SCALE TESTS ARE NOW REQUIRED TO FURTHER MEASURE EFFECTIVENESS AND ENVIRONMENTAL EFFECTS, AND REFINE THE LOGISTICS AND SAFETY PROCEDURES FOR EMPLOYING THIS TECHNIQUE.

CHEMICAL COUNTERMEASURES, SUCH AS DISPERSANTS, SURFACTANTS, ELASTOMERS, AND GELLING AGENTS, ARE ANOTHER IMPORTANT TECHNOLOGY FOR DEALING WITH MAJOR SPILLS, PARTICULARLY IN PROTECTING SENSITIVE RESOURCES OR ENHANCING MECHANICAL RECOVERY. WE ARE NOT UNDERTAKING RESEARCH AND TESTING EFFORTS ON OUR OWN SINCE THE ENVIRONMENTAL PROTECTION AGENCY (EPA) AND MMS ARE TAKING THE LEAD IN THIS AREA. WE ARE COMPILING A COMPREHENSIVE DATA BASE ON CHEMICAL COUNTERMEASURES TO CAPTURE THE AVAILABLE INFORMATION ON TOXICITY, EFFECTIVENESS, AND APPLICATION PROCEDURES. THIS WILL ALLOW THE ON-SCENE COORDINATOR (OSC) TO IDENTIFY THOSE SITUATIONS WHERE CHEMICAL COUNTERMEASURES CAN BE USED, AND WHICH PRODUCT MIGHT BE MOST EFFECTIVE.

VARIOUS AGENCIES' RESEARCH IN SHORELINE CLEANUP IS BEING MONITORED BY THE COAST GUARD WITH GREAT INTEREST. WE ARE PROVIDING FUNDING FOR THE CURRENT NOAA STUDY ON THE EFFECTS OF SHORELINE CLEANUP IN PRINCE WILLIAM SOUND. PRELIMINARY RESULTS OF THIS STUDY INDICATE THAT THE MECHANICAL SHORELINE CLEANUP METHODS WHICH WERE EMPLOYED THERE REMOVED SOME OF THE OIL, BUT ONLY AT CONSIDERABLE COST TO SHORELINE ECOSYSTEMS. THE USE OF

BIOREMEDIATION WAS SOMEWHAT MORE PROMISING AS A NON-INTRUSIVE SHORELINE CLEANUP TECHNIQUE AS DOCUMENTED IN THE EPA/EXXON BIOREMEDIATION PROJECT. THIS PROMPTED THE EPA TO FOCUS R&D EFFORTS IN THIS AREA.

WE ARE CURRENTLY COORDINATING THE ABOVE EFFORTS THROUGH THE INTERAGENCY COORDINATING COMMITTEE ESTABLISHED UNDER TITLE VII OF OPA 1990. THIS COMMITTEE, CHAIRED BY THE COAST GUARD, HAS WORKED DILIGENTLY OVER THE PAST YEAR TO DEVELOP A COMPREHENSIVE FIVE-YEAR FEDERAL OIL SPILL R&D PLAN. INTERAGENCY SUBCOMMITTEES HAVE DEVELOPED THE FIVE MAIN SECTIONS OF THE PLAN: PREVENTION; SPILL PLANNING AND MANAGEMENT; SPILL RESPONSE; FATE AND EFFECTS; AND RESTORATION. THE DRAFT PLAN HAS BEEN REVIEWED BY THE NATIONAL ACADEMY OF SCIENCES AND THE STATE REPRESENTATIVES ON THE REGIONAL RESPONSE TEAMS, AND IS UNDERGOING FINAL AGENCY REVIEW. WE ANTICIPATE THE PLAN WILL BE SUBMITTED TO CONGRESS IN THE NEAR FUTURE. CONCURRENTLY, THE COMMITTEE IS ADDRESSING MECHANISMS TO IMPLEMENT THE REGIONAL GRANTS PROGRAM AND DEMONSTRATION PROJECTS CALLED FOR BY OPA 1990.

INTERNATIONALLY, THE UNITED STATES RECENTLY PARTICIPATED IN CONCLUDING AN INTERNATIONAL AGREEMENT ON OIL POLLUTION PREPAREDNESS, RESPONSE AND COOPERATION (OPRC). THE OPRC AGREEMENT, WHICH WAS DEVELOPED UNDER THE AUSPICES OF THE INTERNATIONAL MARITIME ORGANIZATION (IMO) AND SIGNED BY OVER 90 COUNTRIES, ESTABLISHES A FRAMEWORK FOR COOPERATION IN DEVELOPING ENHANCEMENTS IN TECHNOLOGIES AND TECHNIQUES FOR THE HOST OF

ACTIVITIES ASSOCIATED WITH OIL SPILL RESPONSE. IT ENCOURAGES COUNTRIES TO PARTICIPATE IN INTERNATIONAL SYMPOSIA AND TO ESTABLISH LINKS BETWEEN RESEARCH INSTITUTIONS. IT ALSO PROMOTES THE DEVELOPMENT OF INTERNATIONAL STANDARDS FOR COMPATIBLE TECHNIQUES AND EQUIPMENT.

IN SUMMARY, WE ARE NOT SUGGESTING THAT TECHNOLOGICAL INITIATIVES AND SUCCESSES CAN GUARANTEE THE COMPLETE MITIGATION AND CLEANUP OF A CATASTROPHIC OIL SPILL. THERE IS NO PANACEA NOW OR IN THE FORESEEABLE FUTURE FOR OIL SPILLED ON THE WATER. A CATASTROPHIC SPILL OF THE NATURE AND MAGNITUDE OF THE EXXON VALDEZ SPILL CAN ALWAYS RESULT IN SIGNIFICANT ENVIRONMENTAL DAMAGE. WE DO ANTICIPATE THAT A COORDINATED INTERAGENCY AND INDUSTRY R&D PROGRAM WILL SUBSTANTIALLY IMPROVE OUR ABILITY TO RESPOND TO MAJOR SPILLS, AND PERHAPS ELIMINATE ENVIRONMENTAL DAMAGE FROM SMALLER ONES. HOWEVER, TECHNOLOGICAL PROGRESS CAN BE ACHIEVED ONLY THROUGH A SUSTAINED FEDERAL OIL SPILL R&D PROGRAM, WHICH INCLUDES SEA-TESTING OF VARIOUS TECHNIQUES AND EQUIPMENT TO FULLY DEFINE THEIR CAPABILITIES.

GIVEN THE DYNAMICS OF THE OCEANS, THE PHYSICAL AND CHEMICAL PROPERTIES ASSOCIATED WITH VARIOUS OILS SPILLED, AS WELL AS THE LOGISTICAL PROBLEMS ASSOCIATED WITH MOVING MASSIVE AMOUNTS OF OIL RECOVERY EQUIPMENT TO A REMOTE SPILL SITE, PRESENT A CHALLENGE. THE MOST PRUDENT APPROACH TO PROTECTING THE OCEAN ENVIRONMENT IS PREVENTION. PREVENTION HAS BEEN AND WILL REMAIN A COAST GUARD PRIORITY. AS I MENTIONED EARLIER, IF WE CAN KEEP THE GENIE IN

THE LAMP, WE HAVE DONE AN EFFECTIVE JOB OF PROTECTING THE OCEAN ENVIRONMENT.

I FEEL THAT THE APPROACH BEING TAKEN BY THE RESEARCH AND DEVELOPMENT COMMUNITY IS SOUND, COMPREHENSIVE, AND SHOULD BE SUPPORTED IN THE FUTURE.