OIL SPILL RESEARCH NEEDS

HEARING

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

SEPTEMBER 7, 1989

[No. 72]

Printed for the use of the
Committee on Science, Space, and Technology

U.S. GOVERNMENT PRINTING OFFICE

25-550 ++ WASHINGTON : 1990

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

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WITNESSES

OIL SPILL RESEARCH NEEDS

THURSDAY, SEPTEMBER 7, 1989

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE
RESEARCH AND ENVIRONMENT,
Washington, D.C.

The subcommittee met, pursuant to call, at 9:35 a.m., in Room 2318, Rayburn House Office Building, Hon. C. Thomas McMillen presiding.

Mr. MCMILLEN. I would like to call this hearing of the Subcommittee on Natural Resources, Agriculture Research, and Environment to order on Oil Spill Research Needs.

I'm Congressman Tom McMillen. Chairman Scheuer is not here today so I will be chairing this hearing. I thank all the witnesses for appearing. I would first like to open up with my statement.

The purpose of today's hearing is to consider section 211 of H.R. 3027, the Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989, introduced by the Honorable Glenn Anderson.

Section 211 creates a Federal research and development program related to oil spills.

This Science, Space, and Technology Committee plans to expand and amend section 211, and our discussions here today will help us guide—will help guide us in that endeavor.

In a report to the President, the National Response Team, our Nation's interagency spill response team, concluded that "the Exxon Valdez oil spill severely tested our oil spill preparedness and response capabilities, and revealed shortcomings that require immediate attention."

One of the shortcomings listed in the report is our currently low level of research and development activities.

Oil spill research programs peaked in the late 1970's, but in the last several years, research funding has dwindled to a mere trickle.

Had we maintained a steady Federal R&D program over the last decade, one that concentrated on improving our capabilities for oil spill prevention, response, recovery, and cleanup, we may have fared much better in Valdez, Alaska last March.

In the frenzy immediately following the spill, our ability to organize and coordinate the many public and private entities involved was severely taxed.

The spill quickly showed us how little we know about cold water oil spill responses.

The event seemed to mock our current knowledge of oil spill containment and recovery, of when and how to use chemical dispersants, and how to clean up beaches.

It reminded us of our vulnerability to accidents, accidents that have a statistical probability and are an inevitable result of the increasingly heavy traffic of crude oil and petroleum products in our waterways.

Reducing the risk of all oil spills, especially large ones, must be our first priority.

Under the best of conditions and readiness, when current technologies—with current technologies—we can only expect to recover a fraction of the oil in a large spill.

Once oil is spilled, we can count on a certain amount of damage, a certain amount of marine mortality, a certain reduction in the aesthetic value of our natural resource.

Research which improves our preventative strategies must take first priority.

This is especially true for the area I am privileged to represent, an area which includes part of the Chesapeake Bay.

The Bay is a productive ecosystem which is especially vulnerable to a major oil spill, because it has a limited capacity to flush itself of contamination.

Our second priority must be to enhance significantly our ability to respond quickly to all releases, equipped with the appropriate technologies and the know-how for the substance spilled and the conditions of the spill site.

We must improve existing technologies, and we should have in place a system for objectively evaluating new technologies, and for measuring their effectiveness.

Although the National Institute of Standards and Technology is not testifying today, they have provided us with written testimony addressing ways that it could assist the Nation in putting in place such an evaluation system.

Third, we should reevaluate our current state of knowledge regarding the long-term effect of oil on ecosystems.

Although we have learned much about oil in the environment, many questions remain.

For example, how long does it take for the environment to bounce back after a spill?

Which species are most vulnerable to oil releases, and at what stage in their life cycles?

We should also learn more about the extent to which we can restore ecosystems affected by oil spills.

This is a new field and we know very little about it.

One of the most difficult challenges of all will be ensuring that our national oil spill research and development effort is well coordinated.

Half a dozen agencies play a role in oil spill response and clean-up.

The only successful national research program will be one that is coordinated and cohesive, not fragmented and characterized by selfish interests and turf battles.

Coordinating Federal research efforts with those of the petroleum industry, which has just formed the Petroleum Industry Response Organization, should also be one of our first concerns.

As we hear today, PIRO is committed to spending $35 million over the next five years to improve our oil spill response capabilities, including research and development.

We commend the industry for taking this admirable initiative. The committee looks forward to working with the industry to conduct joint research, and to make the best use of every research dollar.

We should also look for more ways to engage in cooperative research efforts with other nations, and to better involve our fine academic institutions in our research endeavors.

I look forward to hearing from our distinguished witnesses, and to finding out how each of them plans to assist us in accomplishing the ambitious but highly necessary list of tasks I've just outlined.

[The bill, H.R. 3027, follows:]

101ST CONGRESS
1ST SESSION

H. R. 3027

To provide liability for damages resulting from oil pollution, to establish a fund for the payment of compensation for such damages, to improve oil pollution prevention and response, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JULY 27, 1989

Mr. ANDERSON (for himself, Mr. HAMMERSCHMIDT, Mr. NOWAK, and Mr. STANGELAND) introduced the following bill; which was referred jointly to the Committees on Public Works and Transportation, Merchant Marine and Fisheries, and Science, Space, and Technology

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A BILL

To provide liability for damages resulting from oil pollution, to establish a fund for the payment of compensation for such damages, to improve oil pollution prevention and response, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE AND TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989".

(b) TABLE OF CONTENTS.—The contents of this Act are as follows:

TITLE I—OIL POLLUTION LIABILITY AND COMPENSATION

SEC. 101. DEFINITIONS.

For the purposes of this Act—

(1) ACT OF GOD.—The term "act of God" means an unanticipated grave natural disaster or other natural phenomenon of an exceptional, inevitable, and irresistible character the effects of which could not have been prevented or avoided by the exercise of due care or foresight.

(2) CLAIM.—The term "claim" means a request, made in writing for a sum certain, for compensation for damages or removal costs resulting from an incident.

(3) CLAIMANT.—The term "claimant" means any person who presents a claim for compensation under this Act.

(4) DAMAGES.—The term "damages" means damages for injury to, destruction of, or loss of natural resources and damages for economic loss specified in section 102(a)(2) of this Act, and includes the cost of assessment of damages.

(5) DISCHARGE.—The term "discharge" means any emission (other than natural seepage), intentional or unintentional, and includes spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

(6) EXCLUSIVE ECONOMIC ZONE.—The term "exclusive economic zone" means the zone established by Presidential Proclamation Numbered 5030, dated March 10, 1983.

(7) FACILITY.—The term "facility" means any structure, group of structures, equipment, or device (other than a vessel) which is used for one or more of the following purposes: exploring for, drilling for, producing, storing, handling, transferring, processing, or transporting oil. Such term includes any motor vehicle, rolling stock, or pipeline used for one or more such purposes.

(8) FOREIGN OFFSHORE UNIT.—The term "foreign offshore unit" means a facility which is located, in whole or in part, in the territorial sea or on or over the continental shelf of a foreign country.

(9) FUND.—The term "Fund" means the Oil Spill Liability Trust Fund established by section 9509 of the Internal Revenue Code of 1986.

(10) GROSS TON.—The term "gross ton" means tonnage measured in accordance with the provisions of the International Convention on Tonnage Measurement of Ships, 1969.

(11) GUARANTOR.—The term "guarantor" means any person, other than the responsible party, who pro-

vides evidence of financial responsibility for a responsible party under this Act.

(12) INCIDENT.—The term "incident" means any occurrence or series of occurrences having the same origin, involving one or more vessels, facilities, or any combination thereof, resulting in the discharge or substantial threat of discharge of oil.

(13) INDIAN TRIBE.—The term "Indian tribe" means any Indian tribe, band, nation, or other organized group or community, but not including any Alaska Native regional or village corporation, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

(14) LESSEE.—The term "lessee" means a person holding a leasehold interest in an oil or gas lease on lands beneath navigable waters (as such term is defined in section 2(a) of the Submerged Lands Act (43 U.S.C. 1301(a)) or on submerged lands of the Outer Continental Shelf, granted or maintained under applicable State law or the Outer Continental Shelf Lands Act.

(15) NATIONAL CONTINGENCY PLAN.—The term "national contingency plan" means the national contingency plan published under section 311(c) of the Fed-

eral Water Pollution Control Act and revised pursuant to section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act.

(16) NATURAL RESOURCES.—The term "natural resources" includes land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States (including the resources of the exclusive economic zone), any State or local government or Indian tribe, or any foreign government.

(17) NAVIGABLE WATERS.—The term "navigable waters" means the waters of the United States, including the territorial sea.

(18) OFFSHORE FACILITY.—The term "offshore facility" means—

(A) a facility which is located, in whole or in part, on lands beneath navigable waters (as such term is defined in section 2(a) of the Submerged Lands Act (43 U.S.C. 1301(a)) or on the Outer Continental Shelf (as defined in section 2 of the Outer Continental Shelf Lands Act), and

(B) a deepwater port licensed under the Deepwater Port Act of 1974

(19) OIL.—The term "oil" means petroleum, including crude oil or any fraction or residue therefrom.

(20) ONSHORE FACILITY.—The term "onshore facility" means any facility (excluding any offshore facility) any portion of which is located in, on, or under any land within the United States.

(21) OWNER.—The term "owner" means any person holding title to, or in the absence of title any other indicia of ownership of (whether by lease, permit, contract, license, or other form of agreement), a vessel or facility; except that such term does not include a person who, without participating in the management or operation of a vessel or facility, holds indicia of ownership primarily to protect a security interest therein.

(22) PERSON.—The term "person" means an individual, corporation, partnership, association, Federal agency, State, municipality, commission, or political subdivision of a State, or any interstate body.

(23) PERMITTEE.—The term "permittee" means a person holding an authorization, license, or permit for geological exploration issued under section 11 of the Outer Continental Shelf Lands Act or applicable State law.

(24) PUBLIC VESSEL.—The term "public vessel" means a vessel owned or bareboat chartered and operated by the United States, or by a State or political subdivision thereof, or by a foreign nation, except when such vessel is engaged in commerce.

(25) REMOVE; REMOVAL.—The term "remove" or "removal" refers to removal of the oil from the water and shorelines or the taking of such other actions as may be necessary to minimize or mitigate damage to the public health or welfare, including damage to fish, shellfish, wildlife, and public and private property, shorelines, and beaches.

(26) REMOVAL COSTS.—The term "removal costs" means the costs of removal taken after a discharge of oil has occurred, including all costs of completing removal and the costs to prevent, minimize, or mitigate oil pollution where there was a substantial threat of a discharge of oil including costs incurred under subsection (c), (d), (e), or (l) of section 311 of the Federal Water Pollution Control Act, the Intervention on the High Seas Act, or section 18 of the Deepwater Port Act of 1974.

(27) RESPONSIBLE PARTY.—The term "responsible party" means the following:

(A) VESSELS.—In the case of a vessel, any person owning, operating, or chartering by demise the vessel.

(B) FACILITIES.—In the case of a facility (including a pipeline but not including any other offshore facility), any person owning or operating the facility; except that such term does not include a Federal agency, State, municipality, commission, or political subdivision of a State, or any interstate body, that, as the owner of an onshore facility, transfers possession and right to use the property to another person by lease, assignment, or permit.

(C) OFFSHORE FACILITIES.—In the case of an offshore facility (other than a pipeline or a deepwater port licensed under the Deepwater Port Act of 1974), the lessee or permittee of the area in which the facility is located or the holder of a right of use and easement granted under applicable State law or the Outer Continental Shelf Lands Act for the area in which the facility is located (if the holder is a different person than the lessee or permittee).

(D) DEEPWATER PORTS.—In the case of a deepwater port licensed under the Deepwater Port Act of 1974, the licensee.

(E) ABANDONMENT.—In the case of an abandoned vessel, onshore facility, or offshore facility, the persons who were, or would have been, responsible parties immediately prior to the abandonment of the vessel or facility.

(28) SECRETARY.—The term "Secretary" means the Secretary of Transportation.

(29) TANKER.—The term "tanker" means a vessel constructed or adapted for the carriage of oil in bulk or in commercial quantities as cargo; except that the term does not include a non-self-propelled vessel of less than 3,000 gross tons carrying oil in bulk as cargo or in residue from cargo and operating on waters of the United States lying inside the baseline from which the territorial sea is measured or on waters outside such baseline which are part of the Gulf Intracoastal Waterway.

(30) UNITED STATES; STATE.—The term "United States" and "State" mean the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Com-

monwealth of the Northern Marianas, and any other territory or possession over which the United States has jurisdiction.

(31) VESSEL.—The term "vessel" means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water other than a public vessel.

SEC. 102. LIABILITY.

(a) ELEMENTS OF LIABILITY.—

(1) JOINT, SEVERAL, AND STRICT LIABILITY.—Notwithstanding any other provision of law and subject to the provisions of this section, the responsible party for a vessel or a facility from which oil is discharged, or which poses the substantial threat of a discharge of oil, into or upon the navigable waters or adjoining shorelines or the waters of the exclusive economic zone is jointly, severally, and strictly liable for the removal costs specified in paragraph (2) which arise out of or directly result from such incident and for the damages specified in paragraph (2) which are proximately caused by such incident.

(2) COVERED REMOVAL COSTS AND DAMAGES.—

(A) REMOVAL COSTS.—The removal costs referred to in paragraph (1)—

(i) are removal costs for removal actions taken by the United States, a State, or an Indian tribe which are not inconsistent with the national contingency plans; and

(ii) are removal costs for removal actions taken by any other person which are consistent with the national contingency plan.

Such costs shall be recoverable by any claimant.

(B) DAMAGES.—The damages referred to in paragraph (1) are the following:

(i) NATURAL RESOURCES.—Damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss. Such damages shall be recoverable by the following: a United States trustee, a State trustee, and an Indian tribe trustee.

(ii) REAL OR PERSONAL PROPERTY.—Damages for injury to, or economic losses resulting from destruction of, real or personal property. Such damages shall be recoverable by a claimant who owns or leases such property.

(iii) SUBSISTENCE USE.—Damages for loss of subsistence use of natural resources. Such damages shall be recoverable by any claimant who so uses natural resources which have been injured, destroyed, or lost.

(iv) REVENUES.—Damages equal to the net loss of taxes, royalties, rents, fees, or net profits shares, for a period not to exceed 2 years, due to the injury, destruction, or loss of real property, personal property, or natural resources. Such damages shall be recoverable by the Government of the United States, a State, or a political subdivision thereof.

(v) PROFITS AND EARNING CAPACITY.—Damages equal to the loss of profits or impairment of earning capacity (based on prior profits and earnings) due to the injury, destruction, or loss of real property, personal property, or natural resources. Such damages shall be recoverable by any claimant who derives at least 25 percent of his or her earnings from the activities which utilize such property or natural resources, or, if such activities are seasonal in nature, 25 percent of

his or her earnings during the applicable season.

(3) EXCLUDED DISCHARGES.—Paragraph (1) shall not apply to any discharge authorized by a permit issued under Federal, State, or local law.

(4) LIABILITY OF THIRD PARTIES.—

(A) IN GENERAL.—In any case in which the responsible party for a vessel or facility establishes that a discharge and the resulting removal costs and damages were caused solely by an act or omission of 1 or more third parties described in subsection (b)(1)(B) (or solely by such an act or omission in combination with an act of God or an act of war), such third party or parties shall be treated as the responsible party or parties for purposes of determining liability under this Act.

(B) LIMITATION APPLIED.—

(i) OWNER OR OPERATOR OF VESSEL OR FACILITY.—If such third party or parties are the owner or operator of a vessel or facility which caused the incident, the liability of such third party or parties shall be subject to the limits provided in subsection (c), as applied with respect to such vessel or facility.

(ii) OTHER CASES.—In any other case, the liability of such third party or parties shall not exceed the limitation which would have been applicable to the responsible party of the vessel or facility from which the discharge actually occurred if such responsible party were liable.

(b) DEFENSES TO LIABILITY.—

(1) COMPLETE DEFENSES.—Except when the responsible party has failed or refused to report the incident where required by law and the responsible party knows or has reason to know of the incident, there is no liability under subsection (a) for the responsibility if the responsible party establishes that the incident—

(A) resulted from an act of God, an act of war, hostilities, civil war, or insurrection; or

(B) was solely caused by an act or omission of 1 or more persons other than—

(i) a responsible party;

(ii) an employee or agent of a responsible party; or

(iii) one whose act or omission occurs in connection with a contractual relationship with a responsible party.

(2) DEFENSES AS TO PARTICULAR CLAIMANTS.—There is no liability under subsection (a)—

(A) as to a particular claimant, where the incident is caused, in whole or in part, by the gross negligence or willful misconduct of that claimant; or

(B) as to a particular claimant, to the extent that the incident is caused by the negligence of that claimant.

(c) LIMITS ON LIABILITY.—

(1) GENERAL RULE.—The total of the liability of a responsible party under subsection (a) and any removal costs incurred by, or on behalf of, the responsible party with respect to each incident shall not exceed—

(A) $500 per gross ton or $5,000,000, whichever is greater (but not to exceed $150,000,000), for any tanker;

(B) $300 per gross ton or $500,000, whichever is greater, for any other vessel; or

(C) $75,000,000 for any facility.

(2) EXCEPTIONS.—

(A) PROXIMATE CAUSE.—Paragraph (1) shall not apply if the incident was proximately caused by—

(i) willful misconduct or gross negligence within the privity or knowledge of the responsible party; or

(ii) a violation, within the privity or knowledge of the responsible party, of applicable Federal safety, construction, or operating regulations.

(B) FAILURE OR REFUSAL OF RESPONSIBLE PARTY.—Paragraph (1) shall not apply if the responsible party fails or refuses—

(i) to report the incident where required by law and the responsible party knows or has reason to know of the incident;

(ii) to provide all reasonable cooperation and assistance requested by a responsible official in connection with removal activities; or

(iii) without sufficient cause, to comply with an order issued under section 311(e) of the Federal Water Pollution Control Act.

(3) ADJUSTING LIMITS OF LIABILITY.—

(A) FACILITIES.—

(i) GENERAL RULE.—The Secretary is authorized to establish, by regulation, with respect to any class or category of facility

(other than an offshore facility which is not a deepwater port, as defined in section 3 of the Deepwater Port Act of 1974) a maximum limit of liability under this section of less than $75,000,000, but not less than $8,000,000, taking into account the size, storage capacity, oil throughput, proximity to sensitive areas, type of oil handled, history of discharges, and other factors relevant to risks posed by the class or category of facility.

(ii) PERIODIC REPORTS.—The Secretary shall, within 6 months after the date of the enactment of this Act, and from time to time thereafter, report to Congress on the desirability of adjusting the limits of liability specified in paragraph (1) of this subsection.

(B) VESSELS.—

(i) STUDY.—The Secretary shall conduct a study of the relative operational and environmental risks posed by the transportation of oil by vessel to deepwater ports (as defined in section 3 of the Deepwater Port Act of 1974) versus the transportation of oil by vessel to other ports. Such study shall in-

clude a review and analysis of offshore lightering practices used in connection with such transportation, an analysis of the volume of oil transported by vessel using such practices, and an analysis of the frequency and volume of oil discharges which occur in connection with the use of such practices.

(ii) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit to Congress a report on the results of the study conducted under this subparagraph.

(iii) RULEMAKING PROCEEDING.—If the Secretary determines, based on the results of the study conducted under this subparagraph, that the use of deepwater ports in connection with the transportation of oil by vessel results in a lower operational or environmental risk than the use of other ports in connection with such transportation, the Secretary shall initiate, not later than the 180th day following the date of submission of the report to Congress under this subparagraph, a rulemaking proceeding to lower the limits of liability under this section with respect to

vessels transporting oil to deepwater ports and with respect to such ports and may lower such limits of liability as the Secretary determines appropriate but with respect to such ports only in accordance with subparagraph (A).

(d) LIABILITY FOR INTEREST.—

(1) GENERAL RULE.—The responsible party or his or her guarantor shall be liable to the claimant for interest on the amount paid in satisfaction of a claim under this section for the period described in paragraph (2).

(2) PERIOD.—

(A) IN GENERAL.—Except as provided in subparagraph (B), the period for which interest shall be paid under paragraph (1) is the period beginning on the 30th day following the date on which the claim is presented to the responsible party, or guarantor, and ending on the date on which the claimant is paid, inclusive.

(B) EXCLUSION OF PERIOD DUE TO OFFER BY GUARANTOR.—If the guarantor offers to the claimant an amount equal to or greater than that finally paid in satisfaction of the claim, the period described in subparagraph (A) shall not include

the period beginning on the date such offer is made and ending on the date such offer is accepted. If such offer is made within sixty days after the date upon which the claim is presented pursuant to section 104(a), the period described in subparagraph (A) shall not include any period before such offer is accepted.

(C) EXCLUSION OF PERIODS IN INTEREST OF JUSTICE.—If, in any period, a claimant is not paid due to reasons beyond the control of the responsible party or because it would not serve the interest of justice, no interest shall accrue under this subsection during such period.

(D) CALCULATION OF INTEREST.—The interest paid under this subsection shall be calculated at the average of the highest rate for commercial and finance company paper of maturities of 180 days or less obtaining on each of the days included within the period for which interest must be paid to the claimant, as published in the Federal Reserve bulletin.

(E) INTEREST NOT SUBJECT TO LIABILITY LIMITS.—Interest under this paragraph shall be in addition to damages for which claims may be asserted under section 102 and shall be paid with-

out regard to any limitation of liability under subsection (c)(1) of this section. The payment of interest under this subsection by a guarantor shall be subject to section 107(e).

(e) NATURAL RESOURCES.—

(1) LIABILITY.—In the case of an injury to, destruction of, or loss of natural resources under this section, liability shall be—

(A) to the United States Government for natural resources belonging to, managed by, controlled by, or appertaining to the United States,

(B) to any State for natural resources within the State or belonging to, managed by, controlled by, or appertaining to such State,

(C) to any Indian tribe for natural resources belonging to, managed by, controlled by, or appertaining to such Indian tribe, and

(D) where subsection (f) of this section applies, to the government of a foreign country for natural resources belonging to, managed by, controlled by, or appertaining to such country.

(2) DESIGNATION OF TRUSTEES.—

(A) IN GENERAL.—The President, or the authorized representative of any State or of the Indian tribe or of the foreign government, shall

act on behalf of the public or Indian tribe as trustee of such natural resources to recover for such damages.

(B) FEDERAL TRUSTEES.—The President shall designate the Federal officials who shall act on behalf of the public as trustees for natural resources under this Act.

(C) STATE TRUSTEES.—The Governor of each State shall designate State and local officials who may act on behalf of the public as trustee for natural resources under this Act and shall notify the President of such designation.

(D) INDIAN TRIBE TRUSTEES.—The governing body of any Indian tribe shall designate tribal officials who may act on behalf of the tribe or its members as trustee for natural resources under this Act and shall notify the President of such designation.

(3) FUNCTIONS OF TRUSTEES.—

(A) FEDERAL TRUSTEES.—The officials designated under paragraph (2)(B)—

(i) shall assess damages for injury to, destruction of, or loss of natural resources for purposes of this Act for the natural resources under their trusteeship;

(ii) may, upon request of and reimbursement from a State or Indian tribe and at the Federal officials' discretion, assess damages for the natural resources under the State's or tribe's trusteeship; and

(iii) shall develop and implement a plan for the restoration, rehabilitation, or replacement or acquisition of the equivalent of the natural resources under their trusteeship.

(B) STATE TRUSTEES.—The officials designated under paragraph (2)(C)—

(i) shall assess damages to natural resources for the purposes of this Act for the natural resources under their trusteeship; and

(ii) shall develop and implement a plan for the restoration, rehabilitation, or replacement or acquisition of the equivalent of the natural resources under their trusteeship.

(C) INDIAN TRIBE TRUSTEES.—The officials designated under paragraph (2)(D)—

(i) shall assess damages to natural resources for the purposes of this Act for the natural resources under their trusteeship; and

(ii) shall develop and implement a plan for the restoration, rehabilitation, or replace-

ment or acquisition of the equivalent of the natural resources under their trusteeship.

(D) NOTICE AND OPPORTUNITY TO BE HEARD.—Plans shall be developed and implemented under subparagraphs (A)(iii), (B)(ii), and (C)(ii) only after adequate public notice and opportunity for hearing and consideration of all public comment.

(4) MEASURE OF DAMAGES.—

(A) IN GENERAL.—The measure of damages in any action under this section for injury to, destruction of, or loss of natural resources shall be—

(i) the costs of restoring, rehabilitating, replacing, or acquiring the equivalent of the damaged natural resources; and

(ii) the value of the lost public uses of such resources in the period beginning on the date the damage occurs and ending on (I) the date such resources are restored, rehabilitated, or replaced or the equivalent is acquired, or (II) the date on which it is determined that such resources cannot be restored, rehabilitated, or replaced or no equivalent can be acquired.

(B) DETERMINE COSTS WITH RESPECT TO PLANS.—Costs shall be determined under subparagraph (A) with respect to plans adopted under paragraph (3) (A), (B), and (C).

(C) NO DOUBLE RECOVERY.—There shall be no double recovery under this Act for natural resource damages, including the costs of damage assessment or restoration, rehabilitation, replacement, or acquisition for the same incident and natural resource.

(5) DAMAGE ASSESSMENT REGULATIONS AND STUDY.—

(A) REGULATIONS.—Not later than 2 years after the date of enactment of this Act, the President shall issue regulations, consistent with paragraph (4)(A), for the assessment of damages to natural resources arising out of an incident.

(B) REBUTTABLE PRESUMPTION.—Any determination or assessment of damages to natural resources for the purposes of this Act made pursuant to paragraph (4)(A)(i) by a Federal, State, or Indian tribe trustee in accordance with the regulations issued under subparagraph (A) shall have the force and effect of a rebuttable presumption

on behalf of the trustee in any administrative or judicial proceeding under this Act.

(C) STUDY.—The President shall conduct a study of techniques and methods of valuing natural resource damages and shall transmit to Congress, not later than 1 year after the date of the enactment of this Act, a report on the results of such study.

(6) USE OF RECOVERED SUMS.—Sums recovered under this Act by a Federal, State, or Indian tribe trustee for damages to natural resources shall be retained by the trustee for use only to reimburse or pay costs incurred by the trustee under paragraph (3) with respect to the damaged natural resources. Any amounts in excess of those required for these reimbursements and costs shall be deposited in the Fund.

(7) CIVIL PENALTY.—

(A) IN GENERAL.—Any responsible party liable under this section for damages resulting from a discharge of oil shall be subject to a civil penalty not to exceed the greater of $1,000,000 or 1/2 of the responsible party's liability under this section if the discharge results in damages to natural resources that cannot be restored, reha-

bilitated or replaced, and for which no equivalent can be acquired.

(B) ASSESSMENT, SETTLEMENT, AND COLLECTION.—The President or authorized representative of a State or Indian tribe, acting under this section as trustee, may request the Attorney General to bring an action in court to recover from the responsible party a civil penalty under this paragraph. In determining the amount of a civil penalty under this paragraph, the court shall consider the nature and extent of the damages to natural resources, the value of the natural resources, the degree of culpability of the person held liable for the discharge, and the nature and extent of efforts taken by that person to prevent, mitigate, and restore the damages to natural resources.

(C) SEPARATE LIABILITY.—Except as provided in section 302, any liability for a civil penalty under this paragraph shall be separate from and in addition to any liability for a discharge of oil under this section.

(D) DEPOSIT INTO FUND.—Sums received under this paragraph shall be deposited in the Fund.

(f) RECOVERY BY FOREIGN CLAIMANTS.—

(1) IN GENERAL.—A foreign claimant may recover removal costs and damages under this Act only in accordance with this subsection.

(2) COVERED DISCHARGES.—A foreign claimant may recover only if the discharge of oil was from—

(A) a facility,

(B) a vessel in the navigable waters of the United States, or

(C) a tanker carrying oil originally received at the terminal of the pipeline constructed under the Trans-Alaska Pipeline Authorization Act for transportation to a port in the United States, the incident having occurred prior to delivery to that port,

and resulted in the presence of oil in or on the territorial sea, internal waters, or adjacent shoreline of a foreign country.

(3) REQUIREMENTS.—A foreign claimant may recover only if—

(A) the claimant first seeks compensation under title III;

(B) the claimant has not been otherwise compensated for the removal costs or damages; and

(C) recovery is authorized by a treaty or executive agreement between the United States and the claimant's country, or the Secretary of State, in consultation with the Attorney General and other appropriate officials, has certified that the claimant's country provides a comparable remedy for United States claimants.

(4) EXCEPTION FOR CANADIAN CLAIMANTS RESPECTING TRANS-ALASKA PIPELINE OIL.—Paragraph (3)(C) shall not apply with respect to recovery by a resident of Canada in the case of an incident described in paragraph (2)(C).

(5) FOREIGN CLAIMANT DEFINED.—For purposes of this subsection, the term "foreign claimant" means any person residing in a foreign country, the government of a foreign country, or any agency or political subdivision thereof.

(g) RECOVERY OF REMOVAL COSTS AND DAMAGES BY RESPONSIBLE PARTY.—

(1) IN GENERAL.—The responsible party for a vessel or facility from which oil is discharged, or which poses the substantial threat of a discharge of oil, may assert a claim for removal costs and damages under subsection (a) only if the responsible party establishes that—

(A) he or she is entitled to a defense to liability under subsection (b), or

(B) he or she is entitled to a limitation of liability under subsection (c).

(2) EXTENT OF RECOVERY.—A responsible party who is entitled to a limitation of liability, may assert a claim under paragraph (1) of subsection (a) only to the extent that the sum of the removal costs and damages incurred by the responsible party plus the amounts paid by the responsible party or by the guarantor on behalf of the responsible party for claims asserted under subsection (a) exceeds the amount to which the total of the liability under subsection (a) and removal costs and damages incurred by, or on behalf of, the responsible party is limited under subsection (c).

(h) CONTRIBUTION.—A person may bring an action for contribution against any other person who is liable or potentially liable under this section. Such an action shall be brought in accordance with section 108.

(i) INDEMNIFICATION AGREEMENTS.—

(1) IN GENERAL.—No indemnification, hold harmless, or similar agreement or conveyance shall be effective to transfer any liability imposed under this section from any responsible party for any vessel or facility or from any person who may be liable for an incident

under this section to any other person. Nothing in this subsection shall bar any agreement to insure, hold harmless, or indemnify a party to such agreement for any liability under this section.

(2) RELATIONSHIP TO OTHER CAUSES OF ACTION.—Nothing in this Act, including the provisions of paragraph (1) of this subsection, shall bar a cause of action that a responsible party subject to liability under this section, or a guarantor, has or would have, by reason of subrogation or otherwise against any person.

(j) CONSULTATION ON REMOVAL ACTIONS.—The Secretary shall consult with the affected trustees designated under section 102(e)(2) on the appropriate removal action to be taken in connection with any discharge of oil. Removal with respect to any discharge shall be considered completed when so determined by the Secretary in consultation with the Governor or Governors of the affected State or States and in accordance with the national contingency plan.

SEC. 103. USES OF THE FUND.

(a) IN GENERAL.—

(1) USES.—The Fund shall be available to the Secretary for—

(A) the payment of removal costs, and the costs of monitoring removal actions, incurred by Federal authorities;

(B) the costs incurred by Federal, State or Indian tribe trustees in carrying out their functions under section 102(e) for assessing damages to natural resources and for developing and implementing plans for the restoration, rehabilitation, or replacement of damaged resources;

(C) the payment of obligations under subsection (e) of this section;

(D) the payment of removal costs and damages resulting from the discharge, or substantial threat of discharge, of oil from a foreign offshore unit;

(E) the payment of personnel, equipment, and training costs associated with the maintenance of the strike forces authorized under section 311(c) of the Federal Water Pollution Control Act;

(F) the payment of administrative and personnel costs and expenses reasonably necessary for and incidental to the implementation and administration of this Act; and

(G) the payment of contributions to the International Fund under title III of this Act.

(2) SETTLEMENT OF CLAIMS.—The Fund shall also be available to the Secretary for the payment of

otherwise uncompensated claims for removal costs and damages in accordance with section 104.

(b) DEFENSES TO LIABILITY FOR THE FUND.—The Fund shall not be available to pay any claim for removal costs or damages—

(1) as to a particular claimant, where the incident or economic loss is caused, in whole or in part, by the gross negligence or willful misconduct of the claimant; or

(2) as to a particular claimant, to the extent that the incident or economic loss is caused by the negligence of the claimant.

(c) MAXIMUM AMOUNT PAYABLE FROM FUND.—The maximum amount which may be paid from the Fund with respect to any incident in combination with payment, if any, under the International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage, 1984, shall not exceed $1,000,000,000. The President may increase the maximum amount with respect to the incident if the President determines that such increase is necessary and in the best interests of the United States. The authority granted the President under this subsection may not be delegated.

(d) FEDERAL AND STATE OFFICIALS WHO MAY OBLIGATE FROM THE FUND.—The Secretary is authorized to

issue regulations designating 1 or more Federal officials who may obligate money in the Fund in accordance with subsection (a) of this section or portions thereof. The Secretary shall designate the Commandant of the Coast Guard to be a Federal official who may obligate money in the Fund in accordance with subsection (a). The Secretary is also authorized to delegate authority to obligate money in the Fund or to settle claims to officials of a State with an adequate program operating under a cooperative agreement with the Federal Government.

(e) OBLIGATION OF THE FUND BY STATE OFFICIALS.—

(1) AUTHORITY.—In accordance with regulations issued under this subsection, the Governor of each State, or any appropriate State official designated by the Governor, is authorized to obligate the Fund for payment in an amount not to exceed $250,000 for removal costs not inconsistent with the national contingency plan required for the immediate response to an incident.

(2) NOTIFICATION.—A Governor or designee exercising the authority granted by this subsection shall notify the Secretary within 24 hours after any obligation of a payment from the Fund.

(3) REGULATIONS.—Not later than 6 months after the date of the enactment of this Act, the Secretary shall publish proposed regulations detailing the manner in which the authority to obligate the Fund and to enter into agreements under this subsection is to be exercised, and, not later than 3 months after the close of the comment period on such proposed regulations, the Secretary shall issue the regulations.

(f) RIGHTS OF SUBROGATION.—Payment of any claim by the Fund under this Act shall be subject to the United States Government acquiring by subrogation of all rights of the claimant to recover from the responsible party.

(g) AUDIT.—The Comptroller General shall provide an audit review team to audit all payments, obligations, reimbursements, or other uses of the Fund, to assure that the Fund is being properly administered and that claims are being appropriately and expeditiously considered. The Comptroller General shall submit to Congress an interim report 1 year after the date of the establishment of the Fund. The Comptroller General shall thereafter provide such auditing of the Fund as is appropriate. Each Federal agency shall cooperate with the Comptroller General in carrying out this subsection.

(h) PERIOD OF LIMITATIONS FOR CLAIMS.—

(1) REMOVAL COSTS.—No claim may be presented under this section for recovery of removal costs unless the claim is presented within three years after the date of completion of all removal action.

(2) DAMAGES.—No claim may be presented under this section for recovery of damages unless the claim is presented within three years after the date on which the loss and its connection with the discharge in question were reasonably discoverable with the exercise of due care, or in the case of damages to natural resources under section 102(a)(2), if later, the date on which final regulations are issued under section 102(e)(5).

(i) LIMITATION ON PAYMENT FOR SAME COSTS.—Where the Secretary has paid an amount out of the Fund for any costs or damages specified under subsection (a), no other claim may be paid out of the Fund for the same costs or damages.

(j) OBLIGATION IN ACCORDANCE WITH PLAN.—

(1) IN GENERAL.—Except as provided in paragraph (2), amounts may be obligated from the Fund for the restoration, rehabilitation, or replacement, or acquisition of natural resources only in accordance with a plan adopted under section 102(e)(3).

(2) EXCEPTION.—Paragraph (1) shall not apply in a situation requiring action to avoid irreversible loss of natural resources or to prevent or reduce any continuing danger to natural resources or similar need for emergency action.

SEC. 104. CLAIMS PROCEDURE.

(a) PRESENTATION TO RESPONSIBLE PARTY OR GUARANTOR.—Except as provided in subsection (b), all claims for removal costs or damages shall be presented first to the responsible party or guarantor of the source designated under section 105(a).

(b) PRESENTATION TO FUND.—Claims for removal costs or damages may be presented first to the Fund—

(1) where the Secretary has advertised or otherwise notified claimants in accordance with section 105(c);

(2) by a responsible party who may assert a claim under section 102(g);

(3) by the Governor of a State for removal costs incurred by that State; or

(4) by a United States claimant in a case where a foreign offshore unit has discharged oil causing damage for which the Fund is liable under section 103(a)(1)(D).

(c) ELECTION.—If a claim is presented in accordance with subsection (a) and—

(1) each person to whom the claim is presented denies all liability for the claim, or

(2) the claim is not settled by any person by payment within 180 days after the date upon which (A) the claim was presented, or (B) advertising was begun pursuant to section 105(b), whichever is later,

the claimant may elect to commence an action in court against the responsible party or guarantor or to present the claim to the Fund.

(d) UNCOMPENSATED DAMAGES.—If a claim is presented in accordance with subsection (a) and full and adequate compensation is unavailable, either because the claim exceeds a limit of liability invoked under section 102 or because the responsible party and his guarantor are financially incapable of meeting or unwilling to meet their obligations in full, a claim for the uncompensated damages may be presented to the Fund.

(e) PROCEDURE FOR CLAIMS AGAINST THE FUND.—The Secretary shall issue, and may from time to time amend, regulations for the presentation, filing, processing, settlement, and adjudication of claims under this Act against the Fund.

SEC. 105. DESIGNATION, NOTIFICATION, AND ADVERTISEMENT.

(a) DESIGNATION OF SOURCE AND NOTIFICATION.—After receiving information of an incident, the Secretary shall, where possible and appropriate, designate the source or sources of the discharge. If a designated source is a vessel or a facility, the Secretary shall immediately notify the responsible party and the guarantor, if known, of such designation.

(b) ADVERTISEMENT BY THE RESPONSIBLE PARTY OR GUARANTOR.—If a responsible party or guarantor fails to inform the Secretary, within 5 days after receiving notification of a designation under subsection (a), of his or her denial of the designation, such party or guarantor shall advertise the designation and the procedures by which claims may be presented to such party or guarantor, in accordance with regulations issued by the Secretary. Advertisement under the preceding sentence shall begin no later than fifteen days after the date of the designation made under subsection (a). If advertisement is not otherwise made in accordance with this subsection, the Secretary shall promptly and at the expense of the responsible party or the guarantor involved, advertise the designation and the procedures by which claims may be presented to the responsible party or guarantor. Advertisement under this subsection shall continue for a period of no less than thirty days.

(c) ADVERTISEMENT BY THE SECRETARY.—If—

(1) the responsible party and the guarantor both deny a designation within 5 days after receiving notification of a designation under subsection (a),

(2) the source of the oil pollution was a public vessel, or

(3) the Secretary is unable to designate the source or sources of the oil pollution under subsection (a),

the Secretary shall advertise or otherwise notify potential claimants of the procedures by which claims may be presented to the Fund.

SEC. 106. SUBROGATION.

(a) IN GENERAL.—Any person, including the Fund, who pays compensation pursuant to this Act to any claimant for costs or damages shall be subrogated to all rights, claims, and causes of action that the claimant has under this Act.

(b) ACTIONS ON BEHALF OF THE FUND.—Upon request of the Secretary, the Attorney General shall commence an action on behalf of the Fund to recover any compensation paid by the Fund to any claimant pursuant to this Act, and all costs incurred by the Fund allocable to the claim, including interest (including prejudgment interest), administrative and adjudicative costs, and attorney's fees. Such an action may be commenced against any responsible party or (subject to section 107(e)) guarantor, or against any other person who is liable, pursuant to any law, to the compensated claimant or

to the Fund, for the cost or damages for which the compensation was paid. Such an action shall be commenced against the responsible foreign government or other responsible party to recover any removal costs or damages paid from the Fund as the result of the discharge, or substantial threat of discharge, of oil from a foreign offshore unit.

SEC. 107. FINANCIAL RESPONSIBILITY.

(a) VESSELS.—

(1) REQUIREMENT.—The responsible party for—

(A) any vessel over 300 gross tons (except a non-self-propelled vessel that does not carry oil as cargo or fuel) using any port or place in the United States or the navigable waters, or

(B) any vessel using the waters of the exclusive economic zone to transship or lighter oil destined for a port or place subject to the jurisdiction of the United States,

shall establish and maintain, in accordance with regulations issued by the Secretary, evidence of financial responsibility sufficient to meet the maximum amount of liability to which, in the case of a tanker, the responsible party could be subjected under section 102(c)(1)(A) of this Act, or to which, in the case of any other vessel, the responsible party could be subjected under section 102(c)(1)(B) of this Act, in a case where the re-

sponsible party would be entitled to limit liability under such section. If the responsible party owns or operates more than one vessel, evidence of financial responsibility need be established only to meet the maximum liability applicable to the largest of such vessels.

(2) WITHHOLDING CLEARANCE.—The Secretary of the Treasury shall withhold or revoke the clearance required by section 4197 of the Revised Statutes of the United States of any vessel subject to this subsection that does not have the certification required under this subsection.

(3) DENYING ENTRY AND DETAINING VESSELS.—The Secretary may (A) deny entry to any offshore facility or any port or place in the United States, or to the navigable waters, or (B) detain at such a facility or port or place, any vessel that, upon request, does not produce the certification required under this subsection or the regulations issued under this subsection.

(b) OFFSHORE FACILITIES.—Each responsible party with respect to an offshore facility shall establish and maintain evidence of financial responsibility sufficient to meet the maximum amount of liability to which the responsible party could be subjected under section 102 in a case where the responsible party would be entitled to limit liability under section 102. In cases where a person is the responsible party

for more than one facility subject to this subsection, evidence of financial responsibility need be established only to meet the maximum liability applicable to one such facility.

(c) METHODS OF FINANCIAL RESPONSIBILITY.—Financial responsibility under this section may be established by any one or any combination of the following methods which the Secretary determines to be acceptable: evidence of insurance, surety bond, guarantee, letter of credit, qualification as a self-insurer, or other evidence of financial responsibility. Any bond filed shall be issued by a bonding company authorized to do business in the United States. In promulgating requirements under this section, the Secretary is authorized to specify policy or other contractual terms, conditions, or defenses which are necessary, or which are unacceptable, in establishing such evidence of financial responsibility in order to effectuate the purposes of this Act.

(d) CLAIMS AGAINST GUARANTOR.—Any claim for which liability may be established under section 102 may be asserted directly against any guarantor providing evidence of financial responsibility for a responsible party liable under that section for costs and damages to which the claim pertains. In defending against such a claim, the guarantor may invoke all rights and defenses which would be available to the responsible party under section 102. The guarantor may also invoke the defense that the incident was caused by the

willful misconduct of the responsible party but the guarantor may not invoke any other defense that might be available in proceedings brought by the responsible party against the guarantor.

(e) LIMITATION ON GUARANTOR'S LIABILITY.—Nothing in this Act shall impose liability with respect to an incident on any guarantor for damages or removal costs which exceeds, in the aggregate, the amount of financial responsibility required under this Act which that guarantor has provided for the responsible party for any vessel or facility that was a source or cause of oil pollution in that incident

(f) CIVIL PENALTY.—

(1) IN GENERAL.—Any person who, after notice and an opportunity for a hearing, is found to have failed to comply with the requirements of this section or the regulations issued under this section, or with a denial or detention order issued under subsection (a)(3) of this section, shall be liable to the United States for a civil penalty, not to exceed $25,000 per day of violation. The amount of the civil penalty shall be assessed by the Secretary by written notice. In determining the amount of the penalty, the Secretary shall take into account the nature, circumstances, extent, and gravity of the violation, the degree of culpability, any history of prior violation, ability to pay, and such other mat-

ters as justice may require. The Secretary may compromise, modify, or remit, with or without conditions, any civil penalty which is subject to imposition or which has been imposed under this paragraph. If any person fails to pay an assessed civil penalty after it has become final, the Secretary may refer the matter to the Attorney General for collection.

(2) JUDICIAL RELIEF.—In addition to, or in lieu of, assessing a penalty under paragraph (1) of this subsection, the Secretary may request the Attorney General to secure such relief as necessary to compel compliance with this section, including a judicial order terminating operations. The district courts of the United States shall have jurisdiction to grant such relief as the public interest and the equities of the case may require.

(g) CONTINUATION OF REGULATIONS.—Any regulation respecting financial responsibility which has been issued pursuant to any provision of law repealed or superseded by this Act and which is in effect on the date immediately preceding the effective date of this Act shall be deemed and construed to be a regulation issued pursuant to this section. Such a regulation shall remain in full force and effect unless and until superseded by new regulations issued under this section.

(h) UNIFIED CERTIFICATE.—The Secretary may issue to a responsible party one certificate of financial responsibility for purposes of meeting the financial responsibility requirements of this Act and any other law.

SEC. 108. LITIGATION, JURISDICTION, AND VENUE.

(a) REVIEW OF REGULATIONS.—Review of any regulation issued under this Act may be had upon application by any interested person only in the Circuit Court of Appeals of the United States for the District of Columbia. Any such application shall be made within 90 days from the date of promulgation of such regulations.

(b) JURISDICTION.—Except as provided in subsection (a) of this section, the United States district courts shall have original jurisdiction over all causes of action arising under this Act (which shall be deemed to include actions under the International Convention on Civil Liability for Oil Pollution Damages, 1984, and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1984), without regard to the citizenship of the parties or the amount in controversy.

(c) VENUE.—Venue shall lie in any district in which the incident, injury, or damages occurred, or in which the defendant resides, may be found, has its principal office, or has appointed an agent for service of process. For the purposes of this section, the Fund, and the International Fund es'ab-

lished under article 2 of the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1984, shall reside in the District of Columbia.

(d) SAVINGS PROVISION.—Nothing in this Act shall affect any action commenced before the date of enactment of this Act.

(e) PERIOD OF LIMITATIONS.—

(1) DAMAGES.—Except as provided in paragraphs (3) and (4), an action may not be commenced for damages under this Act, unless such action is commenced within 3 years after—

(A) the date on which the loss and the connection of the loss with the discharge in question were reasonably discoverable with the exercise of due care, or

(B) in the case of damages described in section 102(a)(2)(B)(i), the date on which regulations are issued under section 102(e)(5) if later than the date referred to in subparagraph (A).

(2) REMOVAL COSTS.—Except as provided in paragraphs (3) and (4), an action may not be commenced for recovery of removal costs under this Act, unless such action is commenced within 3 years after completion of the removal action. An action may be

commenced under section 102 for recovery of removal costs at any time after such costs have been incurred.

(3) ACTIONS FOR CONTRIBUTION.—An action may not be commenced for contribution for any removal costs or damages, unless such action is commenced within 3 years after—

(A) the date of judgment in any action under this Act for recovery of such costs or damages, or

(B) the date of entry of a judicially approved settlement with respect to such costs or damages.

(4) SUBROGATION.—An action based on rights subrogated pursuant to this Act by reason of payment of a claim may not be commenced under this Act, unless such action is commenced within 3 years after the date of payment of such claim.

SEC. 109. RELATIONSHIP TO OTHER LAW.

(a) PREEMPTION.—

(1) ACTIONS PREEMPTED.—Except as provided in this Act, no action arising out of a discharge of oil, or a substantial threat of a discharge of oil, from a vessel or facility into or upon the navigable waters or adjoining shorelines or the waters of the exclusive economic zone (other than an action for personal injury or wrongful death), may be brought in any court of the

United States or of any State or political subdivision thereof.

(2) STATE FUNDS AND ACCOUNTS.—Nothing in this Act or in sections 4611 and 9509 of the Internal Revenue Code of 1986 shall affect the authority of any State (A) to establish or continue in effect an oil spill fund or account; or (B) to require any person to contribute to that fund or account. However, if the State fund or account is supported by contributions levied upon persons who contribute to the Fund established by this Act, the State fund or account may not be used to compensate any person for damages under this Act.

(b) NO PREEMPTION OF PENALTIES.—Nothing in this Act or section 9509 of the Internal Revenue Code of 1986 shall affect the authority of the United States or any State or political subdivision thereof to impose, or to determine the amount of, any fine or penalty for any violation of law relating to an incident.

(c) FINANCIAL RESPONSIBILITY.—Except as provided in this Act, a responsible party for a vessel or facility who establishes and maintains evidence of financial responsibility in accordance with this title shall not be required under any State or local law, rule, or regulation to establish or maintain any other evidence of financial responsibility in connection with liability for the discharge, or substantial threat of a dis-

charge, of oil from such vessel or facility. Evidence of compliance with the financial responsibility requirements of this title shall be accepted by a State in lieu of any other requirement of financial responsibility imposed by such State in connection with liability for the discharge of oil from such vessel or facility. A State may enforce, on the navigable waters of the State, the requirements for evidence of financial responsibility imposed under section 107 of this Act.

(d) LIMITATION OF LIABILITY ACT.—The Act of March 3, 1851, shall not apply to removal costs which arise out of or directly result from, and damages which are proximately caused by, an incident involving the discharge or substantial threat or discharge of oil.

SEC. 110. REGULATIONS.

The Secretary shall issue such regulations as may be necessary to carry out this title.

SEC. 111. EFFECTIVE DATE.

(a) IN GENERAL.—Except as provided in subsection (b), this title shall apply with respect to an incident occurring after the date of the enactment of this Act.

(b) PAYMENTS FROM FUND.—Payments under section 103(a) may not be made before the commencement date (as such term is defined in section 4611(f)(2) of the Internal Revenue Code of 1986).

TITLE II—PREVENTION AND RESPONSE

SEC. 201. AUTHORITY TO DIRECT RESPONSES.

In the event of a discharge of oil or the substantial threat of discharge of oil into or upon navigable waters or adjoining shorelines or the waters of the exclusive economic zone, the Secretary is authorized to assume the direction of all Federal, State, and private activities regarding the containment, cleanup, removal, and other responses to the discharge or threat of discharge. The authority granted to the Secretary by this section shall not affect the assessment of liability under this Act with respect to the discharge or threat of discharge.

SEC. 202. RESPONSE PLANS.

(a) DESIGNATION.—

(1) DEADLINE.—Not later than 180 days after the date of the enactment of this Act, the Secretary shall designate those areas for which plans for responding to discharges and threatened discharges of oil are required to be prepared under this section, the persons (including Federal, State, and local officials) who are required to prepare such plans, and the persons who are required to pay for the preparation of such plans.

(2) CONSULTATION.—In designating areas for which plans are required to be prepared under this sec-

tion and the persons to be required to prepare such plans, the Secretary shall consult concerned State officials.

(b) CRITERIA FOR DESIGNATION OF AREAS.—In determining those areas for which plans for responding to discharges and threatened discharges of oil are required to be prepared under this section, the Secretary shall consider the following:

(1) The likelihood of a discharge or threatened discharge of oil in the area.

(2) The likelihood of significant adverse effects resulting from discharges and threatened discharges of oil in the area.

(3) The amount and type of oil handled, stored, or processed in the area.

(4) The presence of natural resources in the area which are likely to be damaged by a discharge of oil and the value, uniqueness, and susceptibility of such resources to damage by such discharge.

(5) The geographic, topographic, weather, and other conditions which might influence the frequency, severity, and effects of oil discharges and responses thereto.

(c) PREPARATION OF PLANS.—

(1) DEADLINE.—Not later than 180 days after the date of designation of an area under subsection (a), the persons designated under subsection (a) shall prepare and submit, in writing, to the Secretary for approval a plan for responding to discharges and threatened discharges of oil in the area. Plans approved by the Secretary under this section must be reviewed on a periodic basis.

(2) CONTENTS.—Each response plan prepared under this section shall include the following:

(A) A description of the general area in which response actions will be required to be taken pursuant to the plan.

(B) The responsibilities of responsible parties, State and local governments, and others in responding to discharges and threatened discharges of oil.

(C) Such other matters as the Secretary may require.

(3) CONSULTATION REQUIREMENT.—Concerned States and local governments shall be consulted in the preparation of each plan under this subsection.

(4) TECHNICAL ASSISTANCE.—The Secretary may provide technical assistance in the preparation of response plans under this subsection.

(d) FUNDING.—All expenses incurred by the Secretary in carrying out this section shall be paid for out of the Fund.

SEC. 203. REVIEW AND REVISION OF RESPONSE CAPABILITY.

(a) EVALUATION.—

(1) IN GENERAL.—Not later than 6 months after the date of enactment of this Act, the Secretary shall conduct an evaluation of the status and effectiveness of personnel and equipment for responding to discharges of oil or threats of discharges of oil into or upon the navigable waters and adjoining shorelines and the waters of the exclusive economic zone. The evaluation shall determine, on a regional basis, whether or not existing personnel and equipment are sufficient for responding to such discharges or threats in an effective and timely manner and the need for teams (including necessary equipment, personnel, and vessels) to respond to and minimize damage from those discharges or threats of discharges occurring in the general regions of Alaska, the Pacific Northwest, California, the Gulf of Mexico, the Great Lakes, the North Atlantic, the South Atlantic, Hawaii, and inland waters of the United States.

(2) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit a report to Congress based on the findings of

the evaluation conducted under this subsection, together with recommendations.

(b) TRAINING.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall revise the national contingency plan issued under section 311(c)(2) of the Federal Water Pollution Control Act, and shall issue such regulations as may be necessary to require oil response personnel to be subjected to—

(1) training approved by the Secretary of Transportation; and

(2) periodic drills, without prior notice, to demonstrate the continued effectiveness and readiness of oil response teams.

(c) CERTIFICATION.—Not later than 6 months after the date of the submission of the report under subsection (a), the Secretary shall issue regulations requiring inspection of equipment for responding to discharges of oil and threats of discharges of oil into the navigable waters and adjoining shorelines and the waters of the exclusive economic zone. Such equipment includes containment booms, skimmers, response vessels, and buoys. The regulations shall require the submission to the Secretary of such information as the Secretary may require for obtaining certification by the Secretary not less than once every 3 years to ensure the equipment is maintained in working condition. The Secretary shall take

such actions as may be necessary to make such certifications and to enforce this subsection and the regulations issued to carry out this subsection.

(d) UPGRADING OF PERSONNEL AND EQUIPMENT.—

(1) BY OWNERS AND OPERATORS.—Not later than 6 months after the date of the submission of the report under subsection (a), the Secretary shall issue regulations which require owners and operators of vessels and facilities to take (within 6 months after the date of the issuance of such regulations) such action as may be necessary to ensure that sufficient personnel and equipment are available, on a regional and collective basis, for responding to discharges of oil and threats of discharges of oil described in the first sentence of subsection (a) in an effective and timely manner.

(2) BY THE SECRETARY.—If owners and operators of vessels and facilities have not taken all actions required by the Secretary under paragraph (1) within 6 months after the date of the issuance of regulations under paragraph (1), the Secretary shall take such actions as may be necessary to ensure that sufficient personnel and equipment for responding to discharges of oil and threats of discharges of oil described in the first

sentence of subsection (a) in an effective and timely manner are available on a regional and collective basis.

(e) FUNDING.—All expenses incurred by the Secretary in carrying out this section shall be paid for out of the Fund.

SEC. 204. COMPUTER LISTING OF EMERGENCY RESPONSE RESOURCES AND AVAILABILITY OF AGENCY DATA.

(a) ESTABLISHMENT OF COMPUTER LISTING.—Not later than 1 year after the date of the enactment of this section, the National Response Center shall (in consultation with State officials responsible for removal of oil from navigable waters and adjoining shorelines and the waters of the exclusive economic zone) establish, maintain, and annually revise a comprehensive nationwide computer listing of emergency response resources which are available to and appropriate for use in responding to discharges and substantial threats of discharges of oil.

(b) CONTENTS OF COMPUTER LISTING.—The computer listing established under this section shall include—

(1) a continually updated description of all Federal, State, local, and private emergency response resources which are available for use, including—

(A) the locations and capabilities of the resources;

(B) specification of the suitability of each resource for use in rivers, harbors, open ocean, and calm waters; and

(C) specification of the suitability of each resource for use in fresh water and in salt water;

(2) a nationwide listing of persons having emergency response resources available for sale or lease, including—

(A) each such person's address, telephone number, and hours of business; and

(B) a description of the types and capabilities of their resources;

(3) a listing of the names, telephone numbers, and areas of expertise of persons residing in the vicinity of areas covered by the National Contingency Plan who are experts in—

(A) responding to discharges or the threats of discharges of oil; or

(B) the effects of such discharges or threats.

(c) INFORMATION ACCESS.—The National Response Center shall provide continuous access to information contained in the listing established under this section to—

(1) each regional response team;

(2) each regional response center;

(3) each on-scene coordinator; and

(4) all State and local government officials responsible for directing State or local governmental response to discharges and substantial threats of discharges of oil.

(d) READY ACCESSIBILITY.—The head of each Federal agency having a representative on the National Response Team shall ensure that, during all periods of activation of the National Contingency Plan, all persons described in subsection (c) with respect to the activation have ready accessibility to all relevant data in the possession of such agency (other than classified data) regarding the geographic, oceanographic, hydrologic, natural resource, and meteorological characteristics of the navigable waters or adjoining shorelines and the waters of the exclusive economic zone for which the National Contingency Plan is activated.

(e) INTERNATIONAL INVENTORY.—The President shall take such actions as may be necessary to encourage appropriate international organizations to establish an international inventory of emergency response resources.

(f) DEFINITIONS.—For purposes of this section—

(1) EMERGENCY RESPONSE RESOURCE.—The term "emergency response resource" means all equipment, supplies (including chemical and biological agents), and personnel having special knowledge or ex-

pertise, that are particularly useful for responding to a discharge or threat of a discharge of oil.

(2) NATIONAL RESPONSE CENTER, NATIONAL RESPONSE TEAM, REGIONAL RESPONSE CENTER, REGIONAL RESPONSE TEAM, AND ON-SCENE COORDINATOR.—The terms "National Response Center", "National Response Team", "Regional Response Center", "Regional Response Team", and "On-Scene Coordinator" have the meaning such terms have in the National Contingency Plan.

SEC. 205. VESSEL TRAFFIC SYSTEMS.

(a) NEEDS SURVEY.—The Secretary shall make a survey of areas of navigable waters to determine the needs for new, expanded, or improved vessel traffic systems.

(b) PRIORITY LIST.—

(1) ESTABLISHMENT.—Based on the results of the needs survey conducted under subsection (a), the Secretary shall establish, in order of priority, those areas of navigable waters which are in need of new, expanded, or improved vessel traffic systems.

(2) FACTORS TO CONSIDER.—In determining the order of priority for the list under paragraph (1), the Secretary shall consider such factors as the Secretary determines appropriate, including the nature, volume, and frequency of vessel traffic in the area and the risks

of collisions, spills, and damages associated with such traffic which could be reduced or eliminated by installation, expansion, or improvement of a vessel traffic system.

(c) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit to Congress a report containing the priority list established under this subsection and such other information as the Secretary considers appropriate.

(d) ACQUISITION, INSTALLATION, AND OPERATION.—The Secretary may acquire, install, and operate such equipment and vessel traffic systems as are necessary for making the improvements and expansions contained on the priority list established under this subsection.

(e) MANDATORY PARTICIPATION.—The Secretary shall make participation in vessel traffic systems operated by the Secretary mandatory for such vessels as the Secretary determines appropriate.

(f) VESSEL FEES.—

(1) ESTABLISHMENT.—The Secretary shall establish and collect from users of vessel traffic systems operated by the Secretary such fees as the Secretary determines are necessary to pay the cost of acquisition, installation, and operation of vessel traffic systems by

the Secretary. Such fees shall be established in accordance with section 9701 of title 31, United States Code.

(2) USE OF FEES.—Fees collected by the Secretary under this subsection shall be credited and available to the Secretary, without fiscal year limitation, to pay the cost of acquisition, installation, and operation of vessel traffic systems by the Secretary.

(3) LIMITATIONS ON STATUTORY CONSTRUCTION.—Nothing in this subsection shall be construed as altering or expanding the duties and liabilities of the United States for the performance of functions or services for which fees are collected under this subsection. The collection of such fees shall not constitute an express or implied undertaking by the United States to perform any service or activity in a certain manner or to provide any service at a particular time or place.

(g) DIRECTION OF VESSEL MOVEMENT.—

(1) STUDY.—The Secretary shall conduct a study of whether or not the Secretary should be given additional authority to direct the movement of vessels upon navigable waters and should exercise such authority.

(2) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit to Congress a report on the results of the study

conducted under paragraph (1) together with recommendations for implementing the results of such study.

SEC. 206. NAVIGATIONAL AIDS.

(a) STUDY.—The Secretary shall conduct a study to determine the areas in which navigation risks are sufficient to require tug escorts of tankers or other navigation aids to improve the safe movement of tankers.

(c) IMPLEMENTATION.—The Secretary shall issue such regulations and take such actions as may be necessary to implement the recommendations contained in the report submitted to Congress under this section.

SEC. 207. TANKER PERSONNEL.

(a) STUDY.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall conduct a study for the purpose of determining appropriate crew sizes for tankers and qualifications of personnel on such tankers.

(b) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit to Congress a report on the results of the study conducted under subsection (a) together with recommendations for implementing the results of such study.

SEC. 208. USE OF LINERS.

(a) STUDY.—The Administrator of the Environmental Protection Agency shall conduct a study to determine whether or not liners should be used as a secondary means of con-

tainment at onshore facilities used for the bulk storage of oil and located near navigable waters to prevent leaching of oil into the ground and to aid in leak detection.

(b) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Administrator of the Environmental Protection Agency shall submit to Congress a report on the results of the study conducted under subsection (a) together with recommendations for implementing the results of such study.

(c) IMPLEMENTATION.—The Administrator of the Environmental Protection Agency shall issue such regulations and take such actions as may be necessary to implement the recommendations contained in the report submitted to Congress under this section.

SEC. 209. MODIFICATIONS TO DREDGES.

(a) STUDY.—The Secretary of the Army shall conduct a study for the purpose of determining the feasibility of modifying dredges for the purpose of making such dredges usable in responding to a discharge of oil or the threat of a discharge of oil.

(b) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary of the Army shall submit to Congress a report on the results of the study conducted under subsection (a) together with recommendations for implementing the results of such study.

SEC. 210. TANKER FREE ZONES.

(a) STUDY.—The Secretary, in consultation with other appropriate Federal and State officials, shall conduct a study of whether or not to designate areas of the navigable waters and exclusive economic zone as zones where the movement of tankers should be prohibited or limited. If the Secretary, as a result of such study, determines that such zones should be designated, the Secretary shall also study which areas to designate as such zones, and what limitations to impose on tanker traffic in any zones so designated, taking into consideration the following: existing navigational risks based on geography, weather, and volume of traffic; potential for danger to natural resources; and availability of alternative methods for transporting oil (such as deepwater port facilities).

(b) REPORT.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall submit to Congress a report on the results of the study conducted under subsection (a) together with recommendations for implementing the results of such study.

SEC. 211. RESEARCH AND DEVELOPMENT PROGRAM.

(a) ESTABLISHMENT.—The President shall establish a program for conducting oil pollution research and development under this section and designate appropriate Federal agencies to participate in such program.

(b) GENERAL PURPOSES.—The purposes of the research and development program under this section includes the following:

(1) Development of new or improved methods to contain discharges of oil from vessels and facilities. Such methods must minimize health risks to persons who will have responsibility for containing such discharges.

(2) Development of new or improved methods (including the use of dispersants and bioremediation) for oil recovery, cleanup, and disposal which are effective and protect the environment.

(3) Development of effective models to predict the effects of discharges of oil and the fate of such oil, including the development of baseline data necessary for determining such effects.

(4) Development of technologies and methods to protect public health and safety from discharges of oil (including the population directly exposed to an oil discharge and response personnel performing cleanup activities).

(5) Development of new or improved methods to ensure the health and safety of response personnel performing cleanup activities.

(6) Development of adequate worker training standards for oil discharge response personnel.

(7) Development of new or improved methods to restore and rehabilitate natural resources damaged by discharges of oil.

(8) Determination of long-term effects of discharges of oil on fish and wildlife.

(c) SPECIFIC RESEARCH AND DEVELOPMENT PROJECTS.—

(1) VESSEL DESIGN AND CONSTRUCTION CRITERIA.—Under the program established under this section, the President shall direct the Secretary to conduct research on changes in vessel design and construction criteria (such as tank size, vessel size, double hulls, and ballast sides) for the purpose of reducing the likelihood of discharges of oil.

(2) TECHNOLOGY.—Under the program established under this section, the President shall direct the Secretary and the Administrator of the Environmental Protection Agency to conduct a joint research and development program for improving technology to prevent discharges of oil and minimize the size of such discharges.

(d) ANNUAL REPORTS.—The President shall submit to Congress an annual report on the activities carried out under

this section in the preceding fiscal year and on activities the President proposes to carry out under this section in the current fiscal year.

(e) FUNDING.—For carrying out the purposes of this section, there is authorized to be appropriated from the Fund $10,000,000 for fiscal year 1991, $10,000,000 for fiscal year 1992, $7,500,000 for fiscal year 1993, $5,000,000 for fiscal year 1994, and $5,000,000 for fiscal year 1995.

SEC. 212. CONSIDERATION OF ALCOHOL ABUSE.

(a) ISSUANCE AND RENEWAL OF LICENSES, CERTIFICATES OF REGISTRY, AND MERCHANT MARINER DOCUMENTS.—

(1) IN GENERAL.—Chapter 71 of title 46, United States Code, is amended by adding at the end the following:

"§7115. Consideration of alcohol abuse in issuing and renewing licenses and certificates of registry

"(a) LIMITATION ON ISSUANCE OF LICENSES AND CERTIFICATES.—The Secretary may not issue or renew a license or certificate of registry under this chapter for any individual who—

"(1) the Secretary determines is a current or chronic abuser of alcohol; or

"(2) fails to make available to the Secretary the information referred to in subsection (b).

"(b) DRIVING RECORD INFORMATION.—The Secretary shall require each individual applying for issuance or renewal of a license or certificate of registry under this chapter to make available to the Secretary, in accordance with section 206(b)(4) of the National Driver Register Act of 1982 (23 U.S.C. 401 note), all information contained in the National Driver Register regarding the motor vehicle driving record of such individual.

"(c) INVESTIGATIONS.—Upon receiving reliable information that an individual applying for issuance or renewal of a license or certificate of registry under this chapter has been found guilty of an alcohol-related infraction resulting in suspension or revocation of a motor vehicle operator license issued to the individual, the Secretary may conduct such investigations as are necessary to determine if the individual is a current or chronic abuser of alcohol.".

(2) CLERICAL AMENDMENT.—The table of sections for chapter 71 of title 46, United States Code, is amended by adding at the end the following:

"7115. Consideration of alcohol abuse in issuing and renewing licenses and certificates of registry.".

(b) CERTIFICATES OF REGISTRY.—Section 7107 of title 46, United States Code, is amended by striking the first sentence and inserting the following: "The Secretary shall determine the term of validity of a certificate of registry.

Such a certificate may be renewed under regulations issued by the Secretary.".

(c) MERCHANT MARINER'S DOCUMENTS.—Section 7302 of title 46, United States Code, is amended by adding at the end the following:

"(c) LIMITATION ON ISSUANCE OF DOCUMENTS.—The Secretary may not issue or renew a merchant mariner's document under this chapter for any individual who—

"(1) the Secretary determines is a current or chronic abuser of alcohol; or

"(2) [illegible]vailable to the Secretary the information referred to in subsection (d).

"(d) DRIVING RECORD INFORMATION.—The Secretary may require each individual applying for issuance or renewal of a merchant mariner's document under this chapter to make available to the Secretary, in accordance with section 206(b)(4) of the National Driver Register Act of 1982 (23 U.S.C. 401 note), all information contained in the National Driver Register regarding the motor vehicle driving record of such individual.

"(e) INVESTIGATIONS.—Upon receiving reliable information that an individual applying for issuance or renewal of a merchant mariner's document under this chapter has been found guilty of an alcohol-related infraction resulting in suspension or revocation of a motor vehicle operator license issued to the individual, the Secretary may conduct such in-

vestigations as are necessary to determine if the individual is a current or chronic abuser of alcohol.

"(f) PERIOD OF VALIDITY.—The Secretary shall determine the term of validity of a merchant mariner's document. Such documents may be renewed under regulations issued by the Secretary.".

(d) SUSPENSION AND REVOCATION OF LICENSES, CERTIFICATES, AND DOCUMENTS.—Section 7703 of title 46, United States Code, is amended—

(1) by inserting "(a)" before the first sentence; and

(2) by adding at the end the following:

"(b) SUSPENSIONS FOR ALCOHOL ABUSE.—

"(1) IN GENERAL.—The Secretary may suspend or revoke a license, certificate of registry, or merchant mariner's document issued by the Secretary to an individual if—

"(A) the Secretary determines the individual is a current or chronic abuser of alcohol; or

"(B) the individual fails to make available to the Secretary the information referred to in paragraph (3).

Any determination of the Secretary to suspend or revoke the license, certificate of registry, or merchant mariner's document of an individual under this para-

graph shall be based on the severity of abuse of alcohol by the individual and the length of time necessary to control that abuse.

"(2) INVESTIGATIONS.—The Secretary may conduct such investigations as are necessary to determine if an individual who holds a license, certificate of registry, or merchant mariner's document issued by the Secretary is a current or chronic abuser of alcohol if the Secretary receives reliable information—

"(A) regarding any alcohol-related misconduct of the individual; or

"(B) pursuant to paragraph (3) that the individual has been found guilty of an alcohol-related infraction resulting in suspension or revocation of a motor vehicle operator license issued to the individual.

"(3) DRIVING RECORD INFORMATION.—The Secretary may request an individual who holds a license, certificate of registry, or merchant mariner's document issued by the Secretary to make available to the Secretary, in accordance with section 206(b)(4) of the National Driver Register Act of 1982 (23 U.S.C. 401 note), all information contained in the National Driver Register regarding the motor vehicle driving record of such individual.

"(4) LIMITATION ON SUSPENSION TERMINATIONS.—The Secretary may not terminate a suspension of a license, certificate of registry, or merchant mariner's document of an individual under paragraph (1)(A) until the individual provides sufficient proof that the individual is no longer a current or chronic abuser of alcohol.".

(e) RELIEF OF MASTER.—Section 8101 of title 46, United States Code, is amended by adding at the end the following new subsection:

"(i) RELIEF OF MASTER.—If the chief mate or equivalent and the next senior crewmember on board a vessel determine that reasonable cause exists to believe that the master or individual in command is intoxicated as a result of the use of dangerous drugs (as defined in section 7704) or alcohol and is therefore incapable of commanding the vessel, the chief mate shall temporarily relieve the master and temporarily assume command of the vessel and shall immediately enter the details in the vessel log and report such details to the Secretary by the most expeditious means available. The chief mate shall also report the circumstances in writing to the Secretary within 12 hours after the vessel arrives at its destination.".

(f) REGULATIONS.—The Secretary is authorized to issue such regulations as may be necessary to implement the amendments made by this section.

SEC. 213. ACCESS TO NATIONAL DRIVER REGISTER.

Section 206(b) of the National Driver Register Act of 1982 (23 U.S.C. 401 note) is amended—

(1) by redesignating paragraphs (4) and (5), and any reference thereto, as paragraphs (5) and (6), respectively; and

(2) by inserting after paragraph (3) the following new paragraph:

"(4) SEAMAN CERTIFICATES.—Any individual who has applied for or received a license or certificate of registry in accordance with section 7101 of title 46, United States Code, or a merchant mariner's document in accordance with section 7302 of title 46, United States Code, or has applied for a renewal of such license, certificate of registry, or document, may request the chief driver licensing official of a State to transmit information regarding the individual under subsection (a) to the Secretary. The Secretary may receive such information and shall, prior to using such information in any adverse action regarding the individual's license, certificate of registry, or document, make such information available to the individual for review and written

comment. The Secretary may not otherwise divulge or use such information, except in accordance with section 7115, 7302, or 7703 of title 46, United States Code. There shall be no access to information in the Register under this paragraph if such information was entered in the Register more than 5 years before the date of such request, unless such information relates to revocations or suspensions which are still in effect on the date of the request. Information submitted to the Register by States under the Act of July 14, 1960 (74 Stat. 526), or under this Act shall be subject to access for the purpose of this paragraph during the transition to the Register established under section 203(a) of this Act.".

TITLE III—IMPLEMENTATION OF INTERNATIONAL CONVENTIONS

SEC. 301. DEFINITIONS.

For the purposes of this title—

(1) SHIP, OWNER, OIL, POLLUTION DAMAGE, AND INCIDENT.—The terms "ship", "owner", "oil", "pollution damage", and "incident" shall have the meanings provided in article I of the Civil Liability Convention.

(2) CIVIL LIABILITY CONVENTION.—The term "Civil Liability Convention" means the International

Convention on Civil Liability for Oil Pollution Damage, 1984.

(3) FINANCIAL RESPONSIBILITY.—The term "financial responsibility" has the same meaning as "financial security" under the Civil Liability Convention.

(4) FUND CONVENTION.—The term "Fund Convention" means the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1984.

(5) INTERNATIONAL FUND.—The term "International Fund" means the International Oil Pollution Compensation Fund established under article 2 of the Fund Convention.

SEC. 302. APPLICABILITY OF CONVENTIONS.

During any period in which the Civil Liability Convention and the Fund Convention are in force with respect to the United States, liability relating to pollution damage arising from an incident involving a ship shall be determined in accordance with the Civil Liability Convention and Fund Convention. Nothing in this title shall constitute a ratification of either the Civil Liability Convention or the Fund Convention.

SEC. 303. RECOGNITION OF INTERNATIONAL FUND.

The International Fund is recognized under the laws of the United States as a legal person, and shall have the capacity to acquire and dispose of real and personal property, and

to institute and be party to legal proceedings. The Director of the International Fund is recognized as the legal representative of the International Fund. The Director shall be deemed to have appointed irrevocably the Secretary of State as the International Fund's agent for the service of process in any legal proceedings involving the International Fund within the United States. The International Fund and its assets shall be exempt from all direct taxation and payment of any customs duties in the United States.

SEC. 304. ACTION IN UNITED STATES COURTS.

(a) SERVICE OF PROCESS ON FUND.—In any action brought in a court in the United States against the owner of a ship or its guarantor under the Civil Liability Convention, the plaintiff or defendant, as the case may be, shall serve a copy of the complaint and any subsequent pleading therein upon the International Fund at the same time the complaint or other pleading is served upon the opposing parties.

(b) INTERVENTION.—The International Fund may intervene as a party as a matter of right in any action brought in a court in the United States against the owner of a ship or its guarantor under the Civil Liability Convention.

SEC. 305. CONTRIBUTION TO INTERNATIONAL FUND.

(a) PAYMENTS TO BE MADE FROM OIL SPILL LIABILITY TRUST FUND.—The amount of any contribution to the International Fund which is required to be made under arti-

cle 10 of the Fund Convention by any person with respect to oil received in any port, terminal installation, or other installation located in the United States shall be paid to the International Fund from the Oil Spill Liability Trust Fund established by section 9509 of the Internal Revenue Code of 1986.

(b) INFORMATION.—The Secretary may, by regulation, require persons who are required to make contributions with respect to oil received in any port, terminal, installation, or other installations in the United States under article 10 of the Fund Convention to provide all information relating to that oil as may be necessary to carry out subsection (a) of this section, articles 10, 12, 13, 14, and 15 of the Fund Conventions, and Article 29 of the Protocol of 1984 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971.

SEC. 306. RECOGNITION OF FOREIGN JUDGMENTS.

Any final judgment of a court of any country which is a party to the Civil Liability Convention or to the Fund Convention in an action for compensation under either convention shall be recognized by any court of the United States having jurisdiction under this Act, when that judgment has become enforceable in that country and is no longer subject to ordinary form of review, except where—

(1) the judgment was obtained by fraud, or

(2) the defendant was not given reasonable notice and a fair opportunity to present its case.

SEC. 307. FINANCIAL RESPONSIBILITY.

(a) UNITED STATES DOCUMENTED SHIPS.—The owner of each ship which is documented under the laws of the United States which is subject to the Civil Liability Convention shall establish and maintain, in accordance with regulations issued by the Secretary, evidence of financial responsibility as required in Article VII of the Civil Liability Convention.

(b) OTHER SHIPS.—The owner of each ship (other than a ship to which subsection (a) applies or a ship which is a public vessel), which is subject to the Civil Liability Convention and which enters or leaves a port or terminal in the United States or uses an Outer Continental Shelf facility or an offshore facility that is or was licensed under the Deepwater Port Act of 1974, shall establish and maintain, in accordance with regulations issued by the Secretary, evidence of financial responsibility as required in article VII of the Civil Liability Convention. Any ship which has on board a valid certificate issued in accordance with article VII of the Civil Liability Convention shall be considered as having met the

requirements of this subsection. Any ship carrying only oil as cargo, fuel, or residue, which has on board a valid certificate issued in accordance with article VII of the Civil Liability Convention shall be considered as having met the requirements of section 107 of this Act.

(c) AUTHORITY OF SECRETARY TO ISSUE.—The Secretary is authorized to issue any certificate of financial responsibility which the United States may issue under the Civil Liability Convention.

(d) WITHHOLDING CLEARANCE.—The Secretary of the Treasury shall withhold or revoke the clearance required by section 4197 of the Revised Statutes of the United States of any ship which does not have a certificate demonstrating compliance with this section.

(e) DENYING ENTRY AND DETAINING VESSELS.—The Secretary may (1) deny entry to any facility or to any port or place in the United States, or (2) detain at the facility or port or place in the United States, any ship subject to this section which, upon request, does not produce the certificate demonstrating compliance with this section or regulations issued hereunder.

(f) CIVIL PENALTY.—Any person who, after notice and an opportunity for a hearing, is found to have violated this section, any regulation issued under this section, section 305(b), or section 308, or any denial or detention order

issued under subsection (e) of this section shall be liable to the United States for a civil penalty, not to exceed $25,000 per day of violation. The amount of the civil penalty shall be assessed by the Secretary in accordance with the procedures set forth in section 107 of this Act.

(g) WAIVER OF SOVEREIGN IMMUNITY.—The United States waives all defenses based on its status as a sovereign State with respect to any controversy arising under the Civil Liability Convention or the Fund Convention relating to any ship owned by the United States and used for commercial purposes.

SEC. 308. REGULATIONS.

The Secretary shall issue such regulations as may be necessary to carry out this title and all obligations of the United States under the International Convention on Civil Liability for Oil Pollution Damage, 1984, and the Fund Convention.

TITLE IV—MISCELLANEOUS PROVISIONS

SEC. 401. TRANS-ALASKA PIPELINE FUND.

(a) AMENDMENTS TO SECTION 204(b).—Section 204(b) of the Trans-Alaska Pipeline Authorization Act (43 U.S.C. 1653(b)) is amended—

(1) in the first sentence by inserting after "any area" the following: "in the State of Alaska";

(2) in the first sentence by inserting after "any activities" the following: "related to the trans-Alaska oil pipeline"; and

(3) by adding at the end the following new sentence: "This subsection shall not apply to removal costs covered by the Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989.".

(b) REPEAL OF SECTION 204(c).—Section 204(c) of the Trans-Alaska Pipeline Authorization Act is repealed. The repeal made by the preceding sentence shall not affect the applicability of such section to claims arising before the date of the enactment of this Act. The repeal of paragraphs (4), (6), and (8) of such section shall only become effective upon the payment by the Board of Trustees of the Trans-Alaska Pipeline Liability Fund of all claims certified under subsection (c) of this section.

(c) CERTIFICATION OF OUTSTANDING CLAIMS.—Not later than 210 days after the date of the enactment of this Act, the Board of Trustees of the Trans-Alaska Pipeline Liability Fund shall certify to the Secretary the total amount of claims outstanding against such Fund as of the date of the enactment of this Act.

SEC. 402. INTERVENTION ON THE HIGH SEAS ACT.

Section 17 of the Intervention on the High Seas Act (33 U.S.C. 1486) is amended to read as follows:

"SEC. 17. AVAILABILITY OF OIL SPILL LIABILITY TRUST FUND.

"The Oil Spill Liability Trust Fund shall be available to the Secretary for actions taken under sections 5 and 7 of this Act.".

SEC. 403. FEDERAL WATER POLLUTION CONTROL ACT.

(a) NATIONAL CONTINGENCY PLAN.—Section 311(c)(2) of the Federal Water Pollution Control Act (33 U.S.C. 1321(c)(2)) is amended—

(1) in subparagraph (C) by striking "establishment or designation of a strike force consisting" and inserting "designation, establishment, and maintenance of a strike force consisting of at least 4 teams";

(2) in subparagraph (D) by inserting "safeguard against as well as" after "surveillance and notice designed to";

(3) in subparagraph (F) by inserting "as well as research and development into methods and techniques to improve existing technology" after "removing oil and hazardous substances"; and

(4) in subparagraph (H) by striking "reimbursed from the fund established under subsection (k) of this section for the reasonable costs incurred in such removal" and inserting "reimbursed, in the case of any discharges of oil from a vessel or facility, for the rea-

sonable costs incurred for such removal, from the Oil Spill Liability Trust Fund".

(b) CLEANUP EXPENSES.—Section 311(d) of such Act is amended by striking the last sentence.

(c) ABATEMENT ACTIONS.—Section 311(e) of such Act is amended to read as follows:

"(e) ABATEMENT ACTIONS.—

"(1) PRESIDENT'S AUTHORITY.—In addition to any action taken by a State or local government, when the President determines that there may be an imminent and substantial threat to the public health or welfare of the United States, including fish, shellfish, and wildlife and public and private property, shorelines, and beaches under the jurisdiction or control of the United States, because of an actual or threatened discharge of oil or a hazardous substance from a vessel or facility in violation of subsection (b) of this section, the President may—

"(A) require the Attorney General to secure such relief as may be necessary to abate such threat; or

"(B) after notice to the affected State, take such other action under this section, including issuing such administrative orders, as may be necessary to protect the public health and welfare.

"(2) ENFORCEMENT OF ORDERS.—If any person fails without sufficient cause to comply with an order under paragraph (1)(B), the President may request the Attorney General to bring an action in the appropriate district court of the United States to enforce such an order, to assess civil penalties of not more than $25,000 a day for each violation, and to assess 3 times the removal costs or damages incurred by the Oil Spill Liability Trust Fund as a result of the failure to comply.

"(3) DISTRICT COURT JURISDICTION.—The district courts of the United States shall have jurisdiction to grant such relief under this subsection as the public interest and the equities of the case may require.".

(d) LIMITATION ON APPLICABILITY TO PREVENT OVERLAPPING COVERAGE.—Subsections (f), (g), (h), and (i) of section 311 of such Act shall not apply with respect to any incident with respect to which section 102 of this Act applies.

(e) RECOVERY FROM 3RD PARTIES.—Section 311(i) of such Act is amended by striking "(1)" and striking paragraphs (2) and (3).

(f) OIL SPILL REVOLVING FUND.—

(1) CONFORMING AMENDMENT.—Section 311(k) of such Act is repealed.

(2) TREATMENT OF REMAINING FUNDS.—Any amounts remaining in the revolving fund established under section 311(k) of the Federal Water Pollution Control Act shall be deposited in the general fund of the Treasury.

(3) TREATMENT OF LIABILITIES.—The Fund shall assume all liability incurred by the revolving fund established under section 311(k) of the Federal Water Pollution Control Act.

(g) FUNDING OF DELEGATED AUTHORITY.—Section 311(l) of the Federal Water Pollution Control Act is amended by striking the second sentence.

(h) EVIDENCE OF FINANCIAL RESPONSIBILITY.—Section 311(p) of such Act is repealed.

(i) AVAILABILITY OF FUND.—Section 311 of such Act is amended by adding at the end thereof the following new subsection:

"(s) AVAILABILITY OF OIL SPILL LIABILITY TRUST FUND.—The Oil Spill Liability Trust Fund shall be available to carry out subsections (c), (d), (i), and (l). Any amounts received by the United States under this section shall be deposited in the Oil Spill Liability Trust Fund.".

(j) NOTICE TO STATE; INCREASED PENALTIES.—Section 311(b)(5) of such Act is amended—

(1) by inserting after the first sentence the following: "The Federal agency shall immediately notify the appropriate State agency of any State which is, or may reasonably be expected to be, affected by the discharge of oil or a hazardous substance."; and

(2) by striking "fined not more than $10,000, or imprisoned for not more than one year, or both" and inserting "fined in accordance with the applicable provisions of title 18 of the United States Code, or imprisoned for not more than 3 years (or not more than 5 years in the case of a second or subsequent conviction), or both".

SEC. 404. DEEPWATER PORT ACT.

(a) SECTION 4(c).—Section 4(c)(1) of the Deepwater Port Act of 1974 (33 U.S.C. 1503(c)(1)) is amended by striking "section 18(l) of this Act;" and inserting "section 107 of the Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989;".

(b) SECTION 18.—

(1) REPEALS.—Subsections (b), (d), (e), (f), (g), (h), (i), (j), (l), (n), and paragraphs (1) and (2) of subsection (m) of section 18 of such Act (33 U.S.C. 1517) are repealed.

(2) SUBSECTION (c)(3).—Subsection (c)(3) of such section is amended by striking "Deepwater Port Liabil-

ity Fund established pursuant to subsection (f) of this section", and inserting "Oil Spill Liability Trust Fund".

(3) REDESIGNATIONS.—Subsections (c), (k), and (m) of such section (and any references thereto) are redesignated as subsections (b), (c), and (d) respectively, and paragraphs (3) and (4) of subsection (m) of such section (and any references thereto) are redesignated as paragraphs (1) and (2), respectively.

(c) SECTION 19.—Section 19(a)(1) of such Act (33 U.S.C. 1518(a)(1)) is amended by striking the period at the end of the second sentence and inserting "; except that discharges from a deepwater port or from a vessel within a deepwater port safety zone which are subject to the civil penalty provisions of section 18(a)(2) of this Act shall not be subject to the penalty provisions of any other Federal law.".

(d) DEEPWATER PORT LIABILITY FUND.—Any amounts remaining in the Deepwater Port Liability Fund established under section 18(f) of the Deepwater Port Act of 1974 shall be deposited into the Fund. The Fund shall assume all liability incurred by the Deepwater Port Liability Fund.

SEC. 405. OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1978.

Title III of the Outer Continental Shelf Lands Act Amendments of 1978 (43 U.S.C. 1811–1824) is hereby repealed. Any amounts remaining in the Offshore Oil Pollution Compensation Fund established under section 302 of such title shall be deposited in the Fund. The Fund shall assume all liability incurred by the Offshore Oil Pollution Compensation Fund.

SEC. 406. QUALIFIED AUTHORIZING LEGISLATION.

This Act shall be considered to be qualified authorizing legislation for purposes of section 4611(f)(2)(B) of the Internal Revenue Code of 1986.

SEC. 407. EFFECTIVE DATE.

Sections 401, 402, 403 (other than subsection (j)), 404, and 405 shall be effective on the commencement date (as such term is defined in section 4611(f)(2) of the Internal Revenue Code of 1986).

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Mr. McMILLEN. I would like to recognize my distinguished colleague from Rhode Island for her opening statement.

Ms. SCHNEIDER. Thank you, Mr. Chairman. And since you outlined such a comprehensive list, I will attempt not to be redundant, but I would like to say that I'm delighted that this committee is holding the hearing on oil spill technologies. Because the wreck of the Exxon Valdez in March, as well as the oil spills that occurred in June in Delaware, Texas, and my own State of Rhode Island, I think very dramatically demonstrated—and particularly to me demonstrated—how very vulnerable our sensitive coastal areas are to these types of accidents, and oftentimes how inadequate our technologies are to cope with some of those accidents.

The oil spills occur, unfortunately, all too frequently in this country. Last year, the Coast Guard responded to about 7,500 spills of oil and toxic substances. Twelve of these were considered major. In Rhode Island alone, we had 420,000 gallons of number 2 heating oil spilled in just a few hours.

And at the same time, regrettably, current R&D efforts on the part of the Federal Government really are insufficient. Right now neither the EPA nor the Coast Guard have any R&D programs that are devoted specifically to oil spill technologies.

On the one hand I can rationalize, thinking, well, maybe we assume that we have what we need. But if you've stood by and watched oil slicks proceed and the booms that are there to supposedly capture much of this oil, you recognize that there is something amiss, and there's got to be a better way to deal with the problem.

Furthermore, we're not very well prepared to determine the environmental and potential health effects of some of these spills. And such a determination really does require an ongoing monitoring commitment and data collection at many of these major spill areas. There is much that improved technologies could achieve, I believe.

And much greater emphasis should be given to prevention. For example, some have argued that perhaps a double-hulled vessel could have prevented the Valdez disaster. I have questions about that.

In addition, some of the current containment and cleanup technologies are ineffective if the condition such as wind speed or water currents are not just right. Some of the innovative solutions should be sought, I believe, using some cutting edged technologies such as bioremediation.

A final note regarding energy policy. I think that as long as we continue to have our increased and increasing heavy reliance on oil and the fact that all too often we are consuming more oil, more energy, per dollar of GNP produced than do our European or our Japanese competitors—and I particularly emphasize Japan since they are also terribly oil dependent—I think that it is incumbent upon us to make sure that whatever oil we do use that we minimize the use through energy efficiency technologies, but at the same time, we develop spill—oil spill—technologies that are adequate to prevent any accidental spillage.

There are many different reasons to pursue more effective efficient use of energy and reductions in the consumption of oil, and

these include increasing our competitiveness, lowering our trade deficit, and reducing the greenhouse effect.

So now I believe that we should add preventing oil spills to that list.

I thank the witnesses who are gathered here today. Hopefully you will be able to enlighten us as to some potential technologies that could receive our attention, and I look forward to working with each of you to solving what I believe to be perhaps not an insurmountable challenge, but one that perhaps we haven't paid enough attention to.

Thank you very much.

Mr. MCMILLEN. I thank the Ranking Minority Member for her statement and I'd like to recognize the gentleman from Texas for his opening statement.

Mr. SMITH OF TEXAS. Thank you, Mr. Chairman. I don't have any additional comments other than to recognize you as chairman of the subcommittee and to say we're glad to see you in that position.

Mr. MCMILLEN. Well, it's—believe me, it's very difficult to fill the shoes of our esteemed chairman but I thank—I thank you.

We have five panelists. I will introduce them and ask that each of their statements be included in the record in its entirety, and please ask that if you would try and summarize your statement in about five minutes so that we will have time to ask questions.

Our first panel is Rear Admiral Joel Sipes, Chief of the Office of Marine Safety, Security, and Environmental Protection, U.S. Coast Guard; Eric Bretthauer, Acting Assistant Administrator, Office of the Research and Development, Environmental Protection Agency, accompanied by Jim Makris, Director of the Chemical Emergency Preparedness and Prevention Office of the EPA, who, I might add, is also Chair of the National Response Team; John Robinson, Chief of the Hazardous Materials Response Branch of NOAA, and Ed Tennyson, Research Scientist, Technology Assessment and Research Branch, Minerals Management Service, Department of Interior.

We begin with the Admiral. Welcome.

STATEMENTS OF REAR ADMIRAL JOEL D. SIPES, CHIEF, OFFICE OF MARINE SAFETY, SECURITY, AND ENVIRONMENTAL PROTECTION, U.S. COAST GUARD; ERICH W. BRETTHAUER, ACTING ASSISTANT ADMINISTRATOR FOR RESEARCH AND DEVELOPMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY; JOHN H. ROBINSON, CHIEF, HAZARDOUS MATERIALS RESPONSE BRANCH, OFFICE OF OCEANOGRAPHY AND MARINE ASSESSMENT, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE, AND ED TENNYSON, RESEARCH SCIENTIST, MINERALS MANAGEMENT SERVICE, TECHNOLOGY ASSESSMENT AND RESEARCH BRANCH

Admiral SIPES. Thank you, Mr. Chairman. It's a pleasure to be here today to appear before the subcommittee. I have with me today Captain Wayne Becker, the Chief of our Research and Development Staff, and my Senior Technical Advisor, Mr. Dan Sheehan.

I will in fact reduce my oral statement significantly and appreciate the opportunity to put my full statement in the record.

Mr. McMILLEN. Without objection.

Admiral SIPES. The Coast Guard provides the predesignated Federal On-Scene Coordinator for pollution incidents that occur in the coastal zone. In the last 10 years, the Coast Guard has responded to 8,800 oil spills annually. And the size of the spills have ranged from one gallon to 2.8 million gallons. And we consider the Exxon Valdez spill to be unique over and above that because of its remote location and enormous size—four times larger than our previous most significant spill.

The vast majority of the spills involve less than 10 gallons; occur in sheltered waters; they are routinely cleaned up using conventional cleanup methods. Technology for these types of spill is generally considered adequate. Major spills in recent years have clearly identified several factors which affect the efficiency and effectiveness of response actions. And those include: each oil type has specific characteristics which influence its behavior when spilled, resulting in differing biological effects; containment barriers lose effectiveness when the current speed exceeds one knot; waves of three feet and higher significantly reduce the effectiveness of containment barriers and most mechanical recovery systems; the use of dispersants is controversial and pose problems when they are considered on the scene as a response method.

Past R&D programs have studied the various factors that affect response. The Coast Guard was active in oil spill technology research and development from 1969 to 1984. Decrease in funding after 1984 was due to the completion of our original R&D plan and the logical progression into hazardous substance technology R&D when our pollution response responsibilities were expanded by CERCLA and the Superfund Amendments and Reauthorization Act.

There were many successes, mixed with some failures, in our R&D program. However, it is just as important to know what will not work as it is to know what will.

Many of our successes resulted in the equipment currently operated by our strike teams and used in Valdez.

The Coast Guard's oil spill R&D program did not completely stop during these past few years. We have continued to fund the mapping of the U.S. coastline environmentally sensitive areas in order to provide definitive maps for the On-Scene Coordinator's decision-making process.

We have also been working closely with NOAA in the development of a computerized spill response information system that will assist the On-Scene Coordinator in decision support and contingency planning for responses to spills for both oil and hazardous substances.

I should point out that our formal R&D efforts are augmented by the exchange of information on the subject at the International Oil Spill Conference, which is held every other year, co-hosted by the Coast Guard, the EPA, and the American Petroleum Institute.

Earlier this year, the Coast Guard recognized the need to re-evaluate its R&D program related especially to the discharges of oil into the marine environment.

The Valdez spill and the three recent major spills brought this into the national spotlight and tightened the time frame of our

evaluation. We have completed the first phase of that effort. The approach taken was to look at oil spill response mechanisms as a system and to examine our capabilities and needs across a variety of environmental conditions. We then divided the identified needs into those which might be addressed by future R&D and those which were more appropriately administrative in nature.

The next step in the process will be to evaluate the state of the art as it exists, both nationally and internationally, concerning specific project areas. We recognize that the oil industry and other Federal departments and agencies, such as EPA, Department of Interior, NOAA, the Department of Energy, have their own oil spill technology research and development needs and plans. Because of this wide and varied interest, the Federal R&D in the future must be coordinated to prevent duplication of effort.

The Coast Guard, as the agency responsible and accountable for response in the coastal zone, is prepared to take the lead in this effort in oil spill response, under Secretary Skinner's direction, to coordinate R&D effort—and I repeat, in oil spill response.

Toward that end, Secretary Skinner has asked the Coast Guard to host a two-day R&D planning session, September 26th and 27th, at our R&D Center in Groton, Connecticut, to review administration needs concerning oil spill response and determine which might appropriately be dealt with by R&D. There's high interest in a variety of agencies in the R&D are, and we feel that a coordinated approach early on will minimize redundant efforts and maximize the utility of our efforts.

In closing, I would just like to comment on where the DOT and the Coast Guard are coming from. We make no bones about saying that if the Coast Guard is to be in the front lines in oil spill response and cleanup, if we are to be held accountable for the way it's done—that is, the techniques used and the decisions made—then we believe that logically it follows that the Coast Guard should have a central role in devising and orchestrating the national R&D plan for oil spill response and cleanup.

There's plenty of work for all the agencies in executing such a plan according to their unique environmental protection role, be it scientific along the lines of your statement, Mr. Chairman, or operational—our special interest.

We have always especially appreciated the way in which agencies in the past have banded together and got the job done, nonterritorial in nature. And I would submit that effort is well under way again.

I believe the language of H.R. 3027 is adequate. What we don't need is a newly mandated organizational mechanism to get on with our work.

Thank you very much.

[The prepared statement of Admiral Sipes follows:]

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

Washington, D.C. 20593-0001
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DEPARTMENT OF TRANSPORTATION

U.S. COAST GUARD

STATEMENT OF REAR ADMIRAL JOEL D. SIPES

COMMITTEE ON SPACE, SCIENCE AND TECHNOLOGY

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH,

AND ENVIRONMENT

UNITED STATES HOUSE OF REPRESENTATIVES

7 SEPTEMBER 1989

DEPARTMENT OF TRANSPORTATION
U.S. COAST GUARD
STATEMENT OF REAR ADMIRAL JOEL D. SIPES
COMMITTEE ON SPACE, SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH, AND ENVIRONMENT
UNITED STATES HOUSE OF REPRESENTATIVES
7 SEPTEMBER 1989

GOOD MORNING MR. CHAIRMAN AND DISTINGUISHED MEMBERS OF THE SUBCOMMITTEE. I AM REAR ADMIRAL JOEL D. SIPES, CHIEF OF THE COAST GUARD'S OFFICE OF MARINE SAFETY, SECURITY AND ENVIRONMENTAL PROTECTION. THANK YOU FOR THE OPPORTUNITY TO APPEAR BEFORE YOU TODAY TO DISCUSS OIL SPILL CLEANUP TECHNOLOGY. WITH ME TODAY ARE CAPTAIN WAYNE BECKER, CHIEF OF THE RESEARCH AND DEVELOPMENT STAFF OF THE OFFICE OF ENGINEERING AND DEVELOPMENT AND MR. DANIEL SHEEHAN, CHIEF, TECHNICAL ADVISOR FOR MY OFFICE.

IN ACCORDANCE WITH VARIOUS PROVISIONS OF THE CLEAN WATER ACT, THE NATIONAL CONTINGENCY PLAN, AND MEMORANDUM OF UNDERSTANDING BETWEEN THE COAST GUARD AND THE ENVIRONMENTAL PROTECTION AGENCY, THE COAST GUARD PROVIDES THE PREDESIGNATED FEDERAL ON-SCENE COORDINATORS FOR POLLUTION INCIDENTS OCCURRING IN THE COASTAL ZONE. IN THE LAST TEN YEARS, THE COAST GUARD HAS RESPONDED TO APPROXIMATELY 8,800 OIL SPILLS ANNUALLY. THE SIZE OF THE SPILLS RANGED FROM ONE GALLON TO 2.8 MILLION GALLONS. WE CONSIDER THE EXXON VALDEZ SPILL TO BE UNIQUE BECAUSE OF ITS REMOTE LOCATION AND ENORMITY, FOUR TIMES LARGER THAN OUR PREVIOUS MOST SIGNIFICANT SPILL. THE VAST MAJORITY OF THE SPILLS INVOLVE LESS THAN 10,000 GALLONS; OCCUR IN SHELTERED WATERS; AND ARE ROUTINELY CLEANED UP USING CONVENTIONAL CLEANUP METHODS.

GENERALLY, MECHANICAL TECHNIQUES ARE USED TO CONTAIN OR DEFLECT OIL INTO AN AREA WHERE IT CAN BE REMOVED FROM THE SURFACE OF THE WATER USING SKIMMERS, PUMPS, ABSORBENT MATERIAL, MANUAL TECHNIQUES AND NON-SPECIALIZED EQUIPMENT, SUCH AS VACUUM TRUCKS. WHEN THE OIL IMPACTS THE SHORELINE, A LENGTHY, TEDIOUS AND LABOR INTENSIVE CLEANUP USUALLY IS NECESSARY. DURING A SHORELINE CLEANUP, GREAT EMPHASIS IS PLACED ON LIMITING ADDITIONAL ENVIRONMENTAL DAMAGE. TECHNOLOGY FOR THESE TYPES OF SPILLS IS GENERALLY CONSIDERED ADEQUATE.

MAJOR SPILLS IN RECENT YEARS HAVE CLEARLY IDENTIFIED SEVERAL FACTORS WHICH AFFECT THE EFFICIENCY AND EFFECTIVENESS OF RESPONSE ACTIONS. THESE FACTORS INCLUDE THE FOLLOWING: EACH OIL TYPE HAS SPECIFIC CHARACTERISTICS WHICH INFLUENCE ITS BEHAVIOR WHEN SPILLED, RESULTING IN DIFFERING BIOLOGICAL EFFECTS; CONTAINMENT BARRIERS LOSE EFFECTIVENESS WHEN THE CURRENT SPEED EXCEEDS ONE KNOT; WAVES OF THREE FEET AND HIGHER SIGNIFICANTLY REDUCE THE EFFECTIVENESS OF CONTAINMENT BARRIERS AND MOST MECHANICAL RECOVERY SYSTEMS; DISPOSAL OF LARGE AMOUNTS OF RECOVERED OIL AND OILY DEBRIS IS ALWAYS A PROBLEM; AND THE USE OF DISPERSANTS IS CONTROVERSIAL AND POSES PROBLEMS WHEN THEY ARE CONSIDERED AS A RESPONSE ACTION.

PAST RESEARCH AND DEVELOPMENT PROGRAMS HAVE STUDIED THE VARIOUS FACTORS AFFECTING RESPONSE ACTIONS. THE COAST GUARD WAS ACTIVE IN OIL SPILL TECHNOLOGY RESEARCH AND DEVELOPMENT FROM 1969 TO 1984. I HAVE INCLUDED A TABLE AT THE END OF MY WRITTEN STATEMENT THAT PROVIDES THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION FUNDING OVER THAT PERIOD. THE DECREASE IN FUNDING

AFTER 1984 WAS DUE TO THE COMPLETION OF OUR ORIGINAL RESEARCH AND DEVELOPMENT PLAN AND THE LOGICAL PROGRESSION INTO HAZARDOUS SUBSTANCE TECHNOLOGY RESEARCH AND DEVELOPMENT WHEN OUR POLLUTION RESPONSE RESPONSIBILITIES WERE EXPANDED BY THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT AND THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT.

DURING OUR RESEARCH PROGRAM, APPROXIMATELY 240 REPORTS WERE PRODUCED BY, OR FOR, THE COAST GUARD ON OIL SPILL TECHNOLOGY. THESE EFFORTS ADDRESSED SUCH AREAS AS CONTAINMENT AND RECOVERY SYSTEMS; CLEANUP METHODS; DISPOSAL AND INTERIM STORAGE OF RECOVERED OIL; RESPONSE LOGISTICS, TRANSPORTATION, AND PLANNING; OIL SENSING, MONITORING, AND IDENTIFICATION; FATE AND EFFECTS OF SPILLED OIL; ARCTIC RESPONSE; AND FAST CURRENT RESPONSE.

IMPORTANT DEVELOPMENTS FROM COAST GUARD RESEARCH AND DEVELOPMENT INCLUDE A HIGH SEAS OIL RECOVERY SYSTEM; PUMPS FOR LIGHTERING TANK VESSELS; PUMPS FOR USE WITH VISCOUS OILS; FAST SURFACE DELIVERY SLEDS FOR FERRYING AND DEPLOYING EQUIPMENT TO OFFSHORE OR REMOTE SITES; POLLUTION RESPONSE VEHICLES, VESSELS, AND COMMAND POSTS; AN AIRBORNE IDENTIFICATION AND MAPPING SYSTEM CALLED AIREYE; THE CENTRAL OIL IDENTIFICATION LABORATORY; AND DEVELOPMENT OF RUBBER BLADDERS FOR STORAGE OF OIL REMOVED FROM A SPILL. THERE WERE MANY SUCCESSES MIXED WITH SOME FAILURES. HOWEVER, IT IS JUST AS IMPORTANT TO KNOW WHAT WILL NOT WORK AS IT IS TO KNOW WHAT WILL.

MANY OF OUR SUCCESSES RESULTED IN THE EQUIPMENT CURRENTLY OPERATED BY OUR STRIKE TEAMS. THESE INCLUDE THE HIGH SEAS OIL RECOVERY SYSTEM WHICH IS AN OPEN OCEAN CONTAINMENT BOOM WITH OIL SKIMMING AND RECOVERY CAPABILITY; THE AIR DELIVERABLE, ANTIPOLLUTION TRANSFER SYSTEM (ADAPTS) WHICH IS THE PUMP AND HOSE SYSTEM USED TO OFF-LOAD TANK VESSELS OUT OF THE TOPS OF THE TANKS; AND OUR VISCOUS OIL PUMPING SYSTEMS. THESE SYSTEMS ARE AIR DELIVERABLE BY COAST GUARD AIRCRAFT AND ARE RECOGNIZED TO BE STATE OF THE ART. THE AIREYE REMOTE SENSING PACKAGE WAS DEVELOPED FOR COAST GUARD HU-25 INTERCEPTORS. THIS SYSTEM WAS USED EXTENSIVELY IN VALDEZ. THE CENTRAL OIL IDENTIFICATION LABORATORY WAS DEVELOPED TO USE COMPLEMENTARY SAMPLE ANALYSIS TECHNIQUES TO IDENTIFY THE SOURCE OF DISCHARGED OIL. THIS SYSTEM HAS BEEN ACCEPTED IN THE JUDICIAL SYSTEM AND HAS BEEN USED SUCCESSFULLY IN HUNDREDS OF CASES.

THE COAST GUARD'S OIL SPILL RESEARCH DID NOT COMPLETELY STOP DURING THESE PAST FEW YEARS. WE HAVE CONTINUED TO FUND THE MAPPING OF THE U.S. COASTLINE'S ENVIRONMENTALLY SENSITIVE AREAS IN ORDER TO PROVIDE DEFINITIVE MAPS FOR THE ON-SCENE COORDINATORS' DECISION MAKING. WE HAVE ALSO BEEN WORKING CLOSELY WITH NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION IN THE DEVELOPMENT OF A COMPUTERIZED SPILL RESPONSE INFORMATION SYSTEM THAT WILL ASSIST ON-SCENE COORDINATORS IN DECISION SUPPORT AND CONTINGENCY PLANNING FOR RESPONSES TO SPILLS OF BOTH OIL AND HAZARDOUS SUBSTANCES. THIS SYSTEM INCLUDES NOAA'S WELL RECOGNIZED CAMEO SYSTEM (COMPUTER AIDED MANAGEMENT OF EMERGENCY OPERATION) THAT IS WIDELY USED BY FIRE DEPARTMENTS AND EMERGENCY RESPONSE PERSONNEL THROUGHOUT THE UNITED STATES.

I SHOULD POINT OUT THAT OUR FORMAL R&D EFFORTS ARE AUGMENTED BY THE EXCHANGE OF INFORMATION ON THIS SUBJECT AT THE INTERNATIONAL OIL SPILL CONFERENCE, WHICH IS HELD EVERY TWO YEARS. THE CONFERENCE IS CO-HOSTED BY THE COAST GUARD, ENVIRONMENTAL PROTECTION AGENCY, AND THE AMERICAN PETROLEUM INSTITUTE. THE TWELFTH INTERNATIONAL CONFERENCE WILL BE HELD IN MARCH 1991 AND IT WILL INCLUDE REPRESENTATIVES OF OIL IMPORTING AND EXPORTING NATIONS, ENVIRONMENTALISTS, SHIPPERS, AND OIL INDUSTRY REPRESENTATIVES. WE WILL DISCUSS WHAT HAS BEEN LEARNED FROM RECENT INCIDENTS, ASSESS THE WORLD'S CAPABILITY FOR OIL SPILL RESPONSE, AND IDENTIFY WAYS TO ADVANCE THE TECHNOLOGY IN THIS FIELD.

EARLIER THIS YEAR, THE COAST GUARD RECOGNIZED THE NEED TO REEVALUATE ITS RESEARCH AND DEVELOPMENT PROGRAM RELATED ESPECIALLY TO DISCHARGES OF OIL INTO THE MARINE ENVIRONMENT. THE VALDEZ SPILL AND THE THREE RECENT MAJOR SPILLS BROUGHT THIS INTO THE NATIONAL SPOTLIGHT AND TIGHTENED THE TIME FRAME ON THE EVALUATION. WE HAVE COMPLETED THE FIRST PHASE OF THAT EFFORT. THE APPROACH TAKEN WAS TO LOOK AT THE OIL SPILL RESPONSE MECHANISM AS A SYSTEM AND TO EXAMINE OUR CAPABILITIES AND NEEDS ACROSS A VARIETY OF ENVIRONMENTAL CONDITIONS. WE THEN DIVIDED THE IDENTIFIED NEEDS INTO THOSE WHICH MIGHT BE ADDRESSED BY FUTURE RESEARCH AND DEVELOPMENT AND THOSE WHICH WERE MORE APPROPRIATELY ADMINISTRATIVE IN NATURE. THE NEXT STEP IN THE PROCESS WILL BE TO EVALUATE THE STATE OF THE ART AS IT EXISTS CONCERNING SPECIFIC PROJECT AREAS. AREAS WHICH APPEAR TO WARRANT CONSIDERATION FOR FUTURE RESEARCH INCLUDE BUT ARE NOT LIMITED TO:

1) IN-SITU BURNING,

2) DEVELOPMENT OF AN AIRBORNE OIL SLICK THICKNESS SENSOR,

3) DEVELOPMENT OF INNOVATIVE CONTAINMENT BARRIERS FOR HIGH CURRENT/ICE AREAS,

4) DEVELOPMENT AND EVALUATION OF NONDAMAGING SHORELINE CLEANUP TECHNIQUES,

5) CHEMICAL TREATING AGENTS OTHER THAN DISPERSANTS,

6) EVALUATE THE TECHNOLOGIES USED IN VALDEZ,

7) FATE OF DISPERSED OIL,

8) DISPERSANT EFFECTIVENESS,

9) DISPERSING THICK OILS,

10) BIOREMEDIATION,

11) SPILL RESPONSE INFORMATION AND DECISION SUPPORT SYSTEMS.

AFTER THE RESEARCH AND DEVELOPMENT NEEDS ARE IDENTIFIED, A COMPREHENSIVE PLAN CAN BE DEVELOPED.

THE COAST GUARD RECOGNIZES THAT THE OIL INDUSTRY AND OTHER FEDERAL DEPARTMENTS AND AGENCIES, SUCH AS THE ENVIRONMENTAL PROTECTION AGENCY, DEPARTMENT OF THE INTERIOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND DEPARTMENT OF ENERGY, HAVE THEIR OWN OIL SPILL TECHNOLOGY RESEARCH AND DEVELOPMENT NEEDS AND PLANS. BECAUSE OF THIS WIDE AND VARIED INTEREST, FEDERAL RESEARCH AND DEVELOPMENT IN THE FUTURE MUST BE COORDINATED TO PREVENT DUPLICATION OF EFFORT. THE COAST GUARD, AS THE AGENCY RESPONSIBLE AND ACCOUNTABLE FOR RESPONSE IN THE COASTAL ZONE, IS PREPARED TO TAKE THE LEAD, UNDER SECRETARY SKINNER'S DIRECTION, IN COORDINATING RESEARCH AND DEVELOPMENT EFFORTS IN OIL SPILL RESPONSE.

TOWARD THAT END, SECRETARY SKINNER HAS ASKED THE COAST GUARD TO HOST A TWO-DAY R&D PLANNING SESSION, SEPTEMBER 26 AND 27, AT OUR R&D CENTER IN GROTON, CONNECTICUT. THE PURPOSE OF THE MEETING WILL BE TO REVIEW ADMINISTRATION NEEDS CONCERNING OIL SPILL RESPONSE DETERMINE WHICH MIGHT APPROPRIATELY BE DEALT WITH BY RESEARCH AND DEVELOPMENT. THERE IS HIGH INTEREST IN A VARIETY OF AGENCIES IN THE R&D AREA AND WE FEEL THAT A COORDINATED APPROACH EARLY ON WILL MINIMIZE REDUNDANT EFFORTS AND MAXIMIZE THE UTILITY OF OUR EFFORTS.

IN CLOSING, I WANT TO EMPHASIZE THAT A COORDINATED ADMINISTRATION RESEARCH AND DEVELOPMENT PLAN UNDOUBTEDLY WILL CONSIST OF NEW INITIATIVES WHICH ARE NOT NOW INCLUDED IN RECENT BUDGET CONSIDERATIONS. ADDITIONAL RESOURCES WILL BE NECESSARY TO DEVELOP AND IMPLEMENT A SUCCESSFUL PROGRAM.

THANK YOU, MR. CHAIRMAN, I WILL BE HAPPY TO ANSWER ANY QUESTIONS THAT YOU OR THE OTHER MEMBERS OF THE SUBCOMMITTEE MAY HAVE.

TABLE 1

COAST GUARD OIL SPILL R&D

FUNDING HISTORY
(DOLLARS IN THOUSANDS)

1969	$1,855
1970	$4,450
1971	$3,500
1972	$4,200
1973	$5,300
1974	$3,610
1975	$3,125
1976	$5,635
1977	$4,125
1978	$5,500
1979	$5,500
1980	$6,000
1981	$3,190
1982	$3,900
1983	$3,000
1984	$2,600
1985	$200
1986	$300
1987	-
1988	$300
1989	$300

Rear Admiral Joel D. Sipes
Chief, Office of Marine Safety, Security and Environmental Protection
United States Coast Guard

Rear Admiral Joel D. Sipes became Chief, Office of Marine Safety, Security and Environmental Protection in Washington, D.C., in May 1988. He directs a coordinated federal port safety and security program; an active marine environmental protection program; a program for the construction, inspection and certification of merchant vessels; the development of comprehensive marine safety standards; the licensing and certificating of U.S. merchant marine personnel; and represents the U.S. in various related international maritime forums.

Since graduating from the Coast Guard Academy in 1959, RADM Sipes has served in a variety of assignments including the All-Coast Guard Rifle and Pistol Detachment; Deck Watch Officer and Student Engineer on the icebreaker *Eastwind*, Assistant Engineer on the *USCGC Bibb*, and Tactics Officer at the Coast Guard Academy. He compiled and published the text on military leadership used for a number of years in Coast Guard officer training programs.

With more than 29 years of commissioned service, RADM Sipes assignments in the marine safety field included Engineering Inspector at Marine Inspection Office, Baltimore, Maryland, Commanding Officer, Marine Inspection Detachment, Lake Charles, Louisiana, Branch Chief in the Marine Environmental Protection Division at Coast Guard Headquarters, Washington, D.C.; Officer in Charge, Marine Inspection and Captain of the Port, Corpus Christi, Texas; and Captain of the Port, Houston, Texas. For the past three years, RADM Sipes served on the Eighth Coast Guard District staff as Chief of Operations and Chief of Staff.

RADM Sipes was Executive Assistant to the Commandant from 1981 to 1983. Prior to this, he was graduated from Industrial College of the Armed Forces (ICAF) and later served on the Commandant's staff as Special Assistant.

RADM Sipes earned a Masters of Public Administration degree from the University of Rhode Island and was elected to Pi Sigma Alpha, the National Political Science Honor Society. His decorations include two Meritorious Service Medals, five Coast Guard Commendation Medals, and the Distinguished Marksman Badge.

RADM Sipes was born in Pennsylvania, reared in Alexandria, Virginia. He is married to the former Ruth Ann Gilbert of Wahoo, Nebraska. She is a graduate of the University of Nebraska. They have two children. Stephanie and Jeffrey. In his spare time, RADM Sipes enjoys hunting, fishing, racquetball, jogging and furniture restoration.

Mr. McMILLEN. Thank you, Admiral, for your statement.

I'll now recognize Mr. Bretthauer for his statement.

Mr. BRETTHAUER. I'd like to introduce Jim Makris, who accompanies me, who is the Director of EPA's Emergency Preparedness and Prevention Office. He's also Chairman of the National Response Team. I'll also abbreviate my statement, Mr. Chairman.

The Exxon Valdez oil spill in Alaska earlier this year and other recent spills across the country have heightened concern over the adequacy of current technology to prevent, mitigate, and clean up spills—particularly in the marine environment.

I'd like to discuss specific areas of research that EPA believes are needed to improve the Nation's ability to prevent and respond to oil spills.

EPA interest and responsibility in oil spill research is derived from the Agency's mission of overall environmental protection and its major responsibilities for oil spill cleanup. Although other agencies have specific responsibilities for certain programmatic areas relating to oil spills—such as damage assessment responsibilities of the natural resource trustee agencies—EPA has unique Federal responsibility for overall environmental protection.

EPA and the Coast Guard share Federal oversight of oil spill prevention and response activities in the United States. Depending on the location of the spill, either an EPA or Coast Guard employee assumes the role of On-Scene Coordinator—OSC.

In concert with these shared program responsibilities, EPA and the Coast Guard have jointly coordinated Federal research efforts. In terms of specific research topics, EPA contributes specialized expertise in chemical, biological, and thermal areas and in environmental assessment.

Before I discuss current priorities for research, let me briefly review EPA oil spill research efforts over the last 20 years. When EPA was established in 1970, a small oil spill research group was transferred into the Agency, and shortly thereafter, Congress passed a special $20 million appropriation to greatly accelerate this research.

The feasibility of many different technologies has been evaluated, followed by developmental work of more promising approaches. In fact, much of the oil spill prevention, containment and recovery, shoreline cleanup and debris disposal technologies used today were identified and often improved under this program.

A major element of the EPA oil spill research program was the Oil and Hazardous Material Simulated Environmental Test Tank, which we call OHMSETT, which is located in Leonardo, New Jersey. This tank was used to simulate spills. An Interagency Technical Committee, composed of all the Federal agencies with spill prevention, cleanup, or R&D missions, was created to share technical information, coordinate research programs, and jointly fund evaluations of technologies at the facility.

Participating U.S. agencies included EPA, the Coast Guard, the Marine Management Service, the Navy, and the Department of Energy. Environment Canada was also an important participant, and the Soviet Union was even involved in one set of tests.

By the mid-1980s, a significant body of work had been compiled on oil spill technology. At that time, the OHMSETT facility was re-

turned to the Navy, on whose land it is located, in accordance with the terms of our real estate agreement.

However, the facility may reopen as a government-owned, contractor-operated facility under the terms of the Federal Technology Transfer Act of 1986. This would permit continued testing and evaluation of oil spill technology.

Most recently, EPA researchers were able to take advantage of the unfortunate Valdez spill to evaluate the potential application of bioremediation as a shoreline cleanup and restoration technology.

A technology agreement with Exxon, in which the company agreed to cover two-thirds of the expenses of the progress—of the project—has allowed large-scale field testing of nutrient addition to stimulate degradation of oil that can not be removed from the beaches with conventional technology.

Results to date have been encouraging. In areas treated by these tests, the beach surfaces are visibly cleaner and increased microbial activity in the subsurface is occurring.

Careful environmental monitoring has not detected any adverse environmental effects, such as increase in nutrient concentrations in adjacent waters or the presence of metabolic breakdown products that may be toxic.

Although it is premature to raise expectations about bioremediation quickly emerging as a new tool for cleaning up of oil spills, this joint industry-government project underscores the possibility of developing a new generation of cleanup techniques that can replace the primitive and sometimes ineffective technologies that are currently used.

EPA is currently reevaluating oil spill research needs. We have met with representatives from the American Petroleum Institute and other Federal agencies. Our preliminary assessment concludes that the state-of-the-art containment and cleanup technologies such as booms, skimmers and chemical agents are inadequate for certain types of spills; that response and cleanup decisions are slowed by a lack of information on alternatives and the potential environmental effects to the spill; and, that improved technical decisionmaking requires substantial additional technical information on ecological impacts, and the risks, costs, and benefits of available response and cleanup alternatives.

From an EPA perspective, the top three research priorities are in the areas of prevention of oil spills, improved cleanup technologies, and environmental risk assessment. A research, development and technology evaluation and demonstration effort in these areas, with contributions from a number of Federal and industry organizations is being explored.

EPA is one of many government and industry organizations that have a role in oil spill research. The Coast Guard has provided considerable leadership through an active oil spill research program during the '70s that was completed—and I understand—fully completed in the '80s.

Other Federal agencies with research expertise and programmatic responsibilities related to oil spills include the Minerals Management Service, NOAA, and the Department of Energy.

Industry also plays an important—a major role in oil spill research. The API, which has funded multidisciplinary oil spill research since the early '70s, recently released a Task Force Report on Oil Spills that recommends significant new spills-related research. An overall program of 30 to $35 million has been identified for the next five years with emphasis on oil recovery and treatment, preventing and mitigating shoreline impact, and fate and effects of oil in environment.

The need for additional research on oil spill prevention and cleanup, including engineering and environmental aspects is clear. In many situations, gaps in information and technology exist.

EPA recognizes the oil industry and other Federal agencies have their own spill research and development needs and plans. Because of the wide and varied interests, future Federal research must be coordinated to prevent duplication of effort. Mechanisms such as the National Response Team should be considered to ensure that research findings reach the ultimate users.

Legislation in this area should not be prescriptive and mandate specific programs and responsibilities. We believe this is best left to a coordinating planning effort that includes all relevant Federal agencies and the private sector.

We find no objection to the research provision proposed in H.R. 3027. Section 211 is broadly written and, in general, gives authority to the President to conduct oil spill research without limiting discretion in actual agency implementation.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Bretthauer follows:]

STATEMENT OF ERICH W. BRETTHAUER
ACTING ASSISTANT ADMINISTRATOR
FOR RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES,
AGRICULTURAL RESEARCH, AND ENVIRONMENT
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U. S. HOUSE OF REPRESENTATIVES

SEPTEMBER 7, 1989

Good morning. I am Erich W. Bretthauer, Acting Assistant Administrator for Research and Development at the Environmental Protection Agency. Thank you for the opportunity to appear before you today to discuss oil spill research and development. With me is Jim Makris, Director of the EPA's Chemical Emergency Preparedness and Prevention Office and Chairman of the National Response Team -- the interagency coordinating body for oil and chemical accidents.

Need for Oil Spill Research

The Exxon Valdez oil spill in Alaska earlier this year and other recent spills across the country have heightened concern over the adequacy of current technology to prevent, mitigate, and clean up spills, particularly in the marine environment. Questions have been raised about the performance of technology, institutional capability to prepare for and respond to spills, and long-term ecological consequences of oil spills. Both marine and inland oil spills are a significant environmental concern, and EPA is working to upgrade both programmatic and research efforts in these areas.

I would like to discuss specific areas of research that EPA believes are needed to improve the Nation's ability to prevent and respond to oil spills. I will also touch on the need for close interagency and government-industry cooperation.

The Report to the President on the Exxon Valdez oil spill submitted last May by the Transportation Secretary Samuel Skinner and EPA Administrator William Reilly highlighted several key points related to oil spill research. First, that oil spills -- even small ones -- are difficult to clean up. Thus, even though prevention of accidents is the best way to assure the quality of the environment, additional research is needed to improve cleanup technology in cases where preventive measures fail. The report recommends research on mechanical, physical and chemical technology, as well as establishing decisionmaking processes to

ensure that the best technology is employed at specific incidents. Secondly, the report concludes that to ensure environmentally-sensitive cleanup operations and subsequent restoration of impacts, long-term ecological studies are needed.

EPA Oil Spill Research Since 1970

EPA interest and responsibility in oil spill research is derived from the Agency's mission of overall environmental protection and its major responsibilities for oil spill cleanup. Although other agencies have specific responsibilities for certain programmatic areas relating to oil spills -- such as damage assessment responsibilities of the natural resource trustee agencies -- EPA has unique Federal responsibility for overall environmental protection.

EPA and the Coast Guard share Federal oversight of oil spill prevention and response activities in the United States. Depending of the location of a spill, either an EPA or Coast Guard employee assumes the role of On-Scene Coordinator (OSC). The Coast Guard has jurisdiction for the coastal zone and tidal waters, and also for the Great Lakes and major river ports, while EPA jurisdiction is generally over waters above the tidal zone. The OSC is responsible for monitoring the cleanup, as is the case in the Exxon Valdez incident, or actually conducting the response action when the responsible party is not capable of responding, or is not responding adequately, or when the incident is beyond the capability of State or local resources. The OSC has complete Federal responsibility for on-scene actions to prevent, contain, assure cleanup of, or otherwise mitigate spills of oil or hazardous substances.

In concert with these shared program responsibilities, EPA and the Coast Guard have jointly coordinated Federal research efforts. In terms of specific research topics, EPA contributes specialized expertise in chemical, biological, and thermal areas and in environmental assessment. EPA will be an active participant in the meeting of Federal agencies later this month at the Coast Guard Research and Development Center in Groton, Connecticut to discuss oil spill research needs.

Before I discuss current priorities for research, let me briefly review EPA oil spill research efforts over the last twenty years. When EPA was established in 1970, a small oil spill research group was transferred into the Agency, and shortly thereafter, Congress passed a special $20 million appropriation to greatly accelerate this research. The feasibility of many different technologies has been evaluated, followed by development work on the more promising approaches. In fact, much of oil spill prevention, containment and recovery, shoreline cleanup and debris disposal technologies used today were identified and often improved under this program.

A major element in the EPA oil spill research program was the Oil & Hazardous Material Simulated Environmental Test Tank (OHMSETT) Facility, located in Leonardo, NJ, which was used to simulate spills in a controlled tank. An Interagency Technical Committee, composed of all the Federal agencies with spill prevention, cleanup or R&D missions, was created to share technical information, coordinate research programs, and jointly fund evaluations of technologies at the facility. Participating U.S. agencies included EPA, the Coast Guard, the Minerals Management Service, the Navy, and the Department of Energy. Environment Canada was also an important participant and the Soviet Union was even involved in one set of tests.

By the mid-1980's, a significant body of work had been compiled on oil spill technology. At that time, the OHMSETT facility was returned to the Navy, on whose land it is located, in accordance with the terms of the EPA real estate agreement. However, the facility may reopen as a government-owned, contractor-operated facility under terms of the Federal Technology Transfer Act Agreement of 1986. This would permit continued testing and evaluation of oil spill technology.

Most recently, EPA researchers were able to take advantage of the unfortunate Exxon Valdez spill to evaluate the potential application of bioremediation as a shoreline cleanup and restoration technology. Bioremediation -- the controlled use of naturally-occurring microorganisms to degrade oil -- is a significant advance over the physical and chemical methods that are now employed. A technology transfer agreement with Exxon, in which the company agreed to cover two-thirds of the expenses of the project, has allowed large-scale field testing of nutrient addition to stimulate degradation of oil that can not be recovered from the beaches with conventional technology.

Results to date have been quite encouraging. In areas treated by these tests, the beach surfaces are visibly cleaner and increased microbial activity in the subsurface is occurring. Careful environmental monitoring has not detected any adverse environmental impacts, such as increase in nutrient concentrations in adjacent waters or the presence of metabolic breakdown products that may be toxic. Based on the positive results of this field experiment, Exxon and the Coast Guard have decided to try bioremediation on a much larger scale in the Prince William Sound area. EPA will continue to monitor and evaluate this field study over several years to fully understand the performance of bioremediation.

Although it is premature to raise expectations about bioremediation quickly emerging as a new tool for cleaning up oil spills, this joint industry-government project underscores the

possibilities of developing a new generation of cleanup techniques that can replace the primitive and sometimes ineffective technologies that are currently used.

Current Research Priorities

EPA is currently reevaluating oil spill research needs. We have met with representatives from the American Petroleum Institute (API) and other Federal agencies. Our preliminary assessment concludes that state-of-the-art containment and cleanup technologies such as booms, skimmers and chemical agents are inadequate for certain types of spills; that response and cleanup decisions are slowed by lack of information on alternatives and the potential environmental effects of a spill; and, that improved technical decisionmaking requires substantial additional technical information on ecological impacts, and the risks, costs, and benefits of available response and cleanup alternatives.

From the EPA perspective, the top three research priorities are in the areas of prevention of oil spills, improved cleanup technologies, and environmental risk assessment. A research, development and technology evaluation and demonstration effort in these areas, with contributions from a number of Federal and industry organizations is being explored. EPA has adapted its current research program to include development and evaluation of information related to human health and environmental risk assessments, evaluation of cleanup and restoration techniques for shorelines including bioremediation approaches, and packaging of information on oil prevention, cleanup, and mitigation for improved contingency planning.

Role of Other Federal Agencies and Industry

EPA is one of many government and industry organizations that have a role in oil spill research. The U. S. Coast Guard has also provided considerable leadership through an active oil spill research program during the 1970's that was completed in the mid-1980's. Other Federal agencies with research expertise and programmatic responsibilities related to oil spills include the Minerals Management Service, National Oceanic and Atmospheric Administration, and the Department of Energy.

Industry also plays a major role in oil spill research. The API, which has funded multidisciplinary oil spill research since the early 1970's, recently released a Task Force Report on Oil Spills that recommends significant new spills-related research. The needs identified from the industry perspective range from science issues, such as better understanding of the chemistry and biological effects of spilled oil in the environment, to operational questions, such as use of containment booms in high seas. An overall program of $30-35 million has been identified for

the next five years with emphasis on oil recovery and treatment, preventing and mitigating shoreline impact, and fate and effects of oil in the environment.

H.R. 3027 -- Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989

The need for additional research on spill prevention and cleanup, including engineering and environmental aspects is clear. In many situations, gaps in information and technology exist.

EPA recognizes that the oil industry and other Federal agencies have their own oil spill research and development needs and plans. Because of the wide and varied interest, future Federal research must be coordinated to prevent duplication of effort. Mechanisms such as the National Response Team can be used to ensure that research findings reach the appropriate users.

Legislation in this area should not be prescriptive and mandate specific programs and responsibilities. This is best left to a coordinated planning effort that includes all relevant Federal agencies and private industry. We find no objection to the research provision proposed in H. R. 3027. Section 211 is broadly written and, in general, gives authority to the President to conduct oil spill research without limiting discretion in actual agency implementation.

Thank you, Mr. Chairman. I will be happy to answer any questions that you or other members of the Subcommittee may have.

Mr. McMILLEN. Thank you for your statement.

I now recognize John Robinson for your statement.

Mr. ROBINSON. Mr. Chairman, I'm John Robinson, Chief of NOAA's Hazardous Materials Response Branch. Since March 24th, I've been one of the two NOAA scientific coordinators supporting Admiral Robbins during the Exxon Valdez oil spill.

Our organization has been providing scientific assistance to the Coast Guard in oil spills and hazardous chemical spills for the past 10 years. During that time, we've responded to over—it's about a thousand spills.

Throughout the Exxon Valdez, we've had a staff of about 15 scientists and technicians located in Valdez, Seward, Homer, Anchorage, and Kodiak, supporting the various Coast Guard offices in those towns.

I'd like to briefly summarize what I think are some of the major deficiencies in research and development that have affected our response to the Exxon Valdez.

In the area of spill control, it's been apparent that we have—that we lack the capability to contain and remove major oil spills from the ocean surface. While most of the criticism during the Exxon Valdez centered on the lack of sufficient equipment and personnel to deal with the spill, I think that if we conducted a more thorough analysis we would uncover more fundamental technological weaknesses.

The chain of events—containment, transfer, storage, and disposal—suffers from several uniformly weak links. The need for equipment that can be deployed with great speed and agility seems almost inconsistent with the requirement that we—that the equipment be designed to withstand oceanic forces.

I don't have a great deal of confidence that a limited R&D program in this area can be effective in finding the technology to control large spills such as the Exxon Valdez. Any improvements, however, in current containment technology will reduce environmental losses from large spills. I think in the Exxon Valdez, in fact, if we'd been able to control a sizeable fraction of that oil, we would not have suffered the wildlife losses in the Kodiak region several hundred miles removed from the spill that—that were suffered.

Dispersants may be be an effective countermeasure, but questions regarding the effectiveness and environmental impact of this technology continue to impede their acceptance as part of the On-Scene Coordinator's arsenal of spill control options. Dispersants must be used quickly if they're to be effective.

During the Exxon Valdez spill, delays incurred while tests were conducted essentially ruled out, I think, the effective use of that technology. We had a series of about 10 tests that were—that were conducted, of dispersants, in that case and by the time the tests were completed, we really didn't have the option any longer to use those agents.

The National Research Council has outlined a program of research that would resolve, I believe, most of the remaining questions regarding the effectiveness and environmental effects of dispersants. The program certainly provides a starting point to assess the usefulness of this technology.

With the Exxon Valdez spill out of control and dispersants effectively ruled out, we were faced with hundreds of miles of oily shoreline to clean up. And without the benefit of innovative cleanup technology, response forces fell back on unsophisticated washing methods using high pressure hot water to flush the oil from the contaminated beaches.

During the past five months, we've struggled to accomplish some of the R&D that might improve the cleanup methodology used on the Exxon. Some projects, such as EPA's research and bioremediation were highly successful and completed in time to be of use in the late stages of this summer's work.

Other research efforts, however, such as those aimed at finding a chemical to assist in removing oil from the shoreline, were mired in operational and other difficulties and were unsuccessful.

One of the key points I'd like to make in my remarks is that a hastily conceived and executed research program can contribute little to resolve operational problems. I don't believe we can generally expect to carry out an effective R&D program while we're in the middle of trying to deal with a large spill.

However, many of the solutions being sought for oil spills are amenable to research that can be undertaken in small controlled spills. Small scale experiments can be carefully designed to answer most of the questions that were likely to be posed. And I think many of the questions that were raised in the Exxon Valdez could have been dealt with had we had small-scale research experiments conducted prior to the spill.

It's really essential that these—that these experiments be accomplished before the fact, and not after, to be of value.

I'd also like to highlight in my summary that the importance of further investigating the importance of natural forces in dealing with oil spills. I believe we may find that natural—natural physical and biological forces are by far more important in the removal and detoxification of petroleum than actions taken by man in response to a spill. In fact, human activity in the cleanup of spills may impede natural recovery in certain instances.

Next spring in Alaska the question of natural versus human cleanup will become even more critical as the question of removing subsurface oil is considered. By spring, the viscosity of the oil on the shoreline will be such that I—it will require intense chemical or physical means to remove it.

Admiral Robbins has assigned NOAA the responsibility of following the situation throughout the winter to provide an early forecast of oil conditions to be encountered next spring. We will attempt to thoroughly assess all the technological and natural solutions to the cleanup of residual oil contamination of the Alaska shoreline.

In my remarks I've attempted to briefly summarize some of the problems related to R&D that we've encountered in dealing with the Exxon Valdez, most of which are typical of oil spills in general.

I believe there are solutions to many of these problems through a carefully constructed program of research and development if such programs are conducted separate and apart from major spill responses.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Robinson follows:]

Statement of

John H. Robinson
Chief, Hazardous Materials Response Branch
Office of Oceanography and Marine Assessment
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Before the

Subcommittee on Natural Resources, Agriculture
Research, and Environment
Committee on Science, Space, and Technology
House of Representatives

September 7, 1989

Mr. Chairman and Members of the Subcommittee:

I am John H. Robinson, Chief of the Hazardous Materials Response Branch of the National Oceanic and Atmospheric Administration (NOAA) within the U.S. Department of Commerce. Since March 24, I have also been the Scientific Support Coordinator to the Federal On-Scene Coordinator in Valdez. Thank you for the opportunity to discuss research and development needs related to oil spills. Before I discuss these needs in some detail, I would like to describe briefly the organization and function of the Hazardous Materials Response Branch, which is NOAA's primary spill response unit.

Federal On-Scene Coordinators (FOSC's), who for spills in coastal and marine areas are representatives of the U.S. Coast Guard, have a number of "special forces," specified in the National Contingency Plan, that they can draw on during a spill response. One of these is provided by NOAA through its

Hazardous Materials Response Branch, which maintains a team of nine highly-trained Scientific Support Coordinators (SSC's) located in Coast Guard District Offices around the country to facilitate rapid response. The SSC's are backed up by an interdisciplinary group of chemists, ecologists, meteorologists, geologists, and oceanographers that uses a nationwide communications network to provide timely, expert advice that includes (1) micro-computer trajectory models that show the predicted movements of pollutants in water or air, (2) identification of sensitive environments and recommended protective measures, and (3) automated data management to speed the flow of information to all responders. SSC's coordinate scientific information from all sources to the FOSC, including universities and other private entities, and assist the FOSC by briefing affected communities on scientific issues that arise during spill response. When not working at a spill, SSC's provide scientific assistance to Regional Response Teams (RRT's) and FOSC's in contingency planning and response training.

Over the last decade, NOAA scientific support teams have responded to over 1,000 spills. NOAA's goal is to provide the best available scientific information on any technical question in a timely and useful form to enhance substantially the effectiveness of response operations.

When the EXXON VALDEZ grounded on Bligh Reef in the early morning hours of March 24, NOAA was quickly at the scene. By the end of the day, NOAA had a team of six people with aircraft support in Valdez to assist the FOSC. The NOAA team, averaging 15 individuals, continues to be active around-the-clock, seven days a week, during the response operation.

In light of our recent experience with the EXXON VALDEZ, it is timely to discuss the adequacy of research and development efforts supporting the response effort. It is our opinion, in general, that there was the lack of sufficient information from research and development to underpin many of the operational decisions that were required of the response forces throughout the EXXON VALDEZ incident. It may be helpful to review some of the major decision areas that would have benefitted from more thorough research and development.

Spill Control

The EXXON VALDEZ incident once again demonstrated our collective inability to control large oil spills. Some speculation attributes the failure merely to a lack of sufficient equipment and trained personnel on-scene to deal with a spill of this magnitude. However, a more thorough analysis of the EXXON VALDEZ and similar spills in the past would most certainly uncover more fundamental technological weaknesses.

The chain of events that must proceed smoothly in oil spill control -- containment, transfer, storage, and disposal -- suffers from several uniformly weak links. Oil spill containment operations are often hampered by poor visibility, high winds, moderate currents, and elevated sea state. Transfer operations frequently break down when oil viscosity increases beyond the design capability of available pumps. Emulsification can readily increase the volume of spilled oil beyond the capacity of available tankage. The need for equipment that can be deployed with great speed and agility seems almost inconsistent with the requirement that it be designed to withstand oceanic forces.

Because there are so many weak links, one could question whether a research and development program of any reasonable scale would have much effect. However, any improvement in oil spill control equipment will lessen the overall impact of large spills. A major reduction in oil escaping the immediate vicinity of the EXXON VALDEZ perhaps would have spared a sizeable fraction of the wildlife losses suffered in areas hundreds of miles from Bligh Reef in Prince William Sound. Equipment could be developed which would be capable of dealing with highly-viscous, debris-laden oil which seems to resist all current technological means of containment and removal.

Dispersants

Lack of agreement on the effectiveness and ecological impact of dispersants has essentially removed this technology from practical application for spills in U.S. waters. The issue has been contentious; opposing viewpoints have been widely aired in the media and subject to lengthy deliberations among the petroleum industry, state and Federal agencies, and other interest groups. During the EXXON VALDEZ spill, delays in using dispersants resulted in foregoing any possibility of effective applications of chemicals. Numerous field tests of dispersants during the EXXON VALDEZ were constructed to resolve opposing viewpoints. However, few tests accomplished that objective.

The National Research Council, in its 1989 publication, "Using Oil Dispersants on the Sea," outlined research needed to resolve many of the remaining questions on the effectiveness and ecological implications of dispersant use. The Council recommended research on the effects of dispersed oil in shall-water environments, mechanisms of dispersion, effects on birds and other surface-dwelling organisms, and ecosystem recovery from the effects of dispersed vs. undispersed oil. A research program would be needed if dispersants were to become a viable alternative to existing methods of mechanical containment and recovery..

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Trajectory Modeling

NOAA has prepared forecasts of oil spill movement for most of the major spills in the United States over the past 10 years. The forecasts are based on "trajectory models" generally constructed in NOAA computers in Seattle and transmitted via "electronic mail" to the scene of the spill. The models are based on circulation data drawn from the scientific litcrature, hydrodynamic flow models, and wind forecasts prepared by NOAA Weather Service offices in affected areas. The models also consider the bathymetry of the area and weathering characteristics of the oil.

In the EXXON VALDEZ incident, the modeling effort went smoothly for the period of time the oil remained under the influence of rather calm, predictable weather and a weak current regime. However, as the oil moved into reaches of Prince William Sound where the dynamics of the ocean surface are governed by drainage winds from nearby mountains, the level of model accuracy suffered appreciably. Lack of wind and current measurements in these areas created blind spots where forecasting was impossible.

Computer models can form the basis for the training of oil spill response forces in the dynamics of spill movement. Various scenarios, related to, for example, oil type and weather conditions, can be simulated to increase the appreciation of response time considerations. Models can be

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used to determine the threat to highly sensitive resources from a variety of accident locations, under a variety of weather and tide conditions. All of these latter uses are best employed in Coast Guard offices where control of the model is in the hands of those who are familiar with local conditions and aware of local response capabilities. Computer programs would be updated to meet the needs of non-specialists in this technology.

Identification and Mapping of Sensitive Resources

NOAA has prepared maps of most of the coastline of the United States indicating the relative sensitivity of the shoreline to the effects of oil pollution. Many of these maps were prepared up to ten years ago and have served their purpose well, providing a basis for establishing priorities for protection during many spills. Maps of Prince William Sound were available immediately for the EXXON VALDEZ response and were used to assist in initial planning of secondary lines of defense in case primary contain-containment efforts failed. For major spills, conventional paper maps have proven difficult to work with, distribute, and revise as new information becomes available that has bearing on the response. This was the case with the EXXON VALDEZ spill as decisions became more complex with the simultaneous spread of the oil into many sensitive areas requiring complex containment and clean-up planning.

Identification of Clean-up Options

Considerable time has been spent over this past spring and summer to analyze the clean-up options available in dealing with the EXXON VALDEZ spill. NOAA chairs two committees in Valdez, the Inter-agency Shoreline Clean-up Committee and the Research and Development (R&D) Committee, that deal with clean-up options. Several thousand hours have been devoted to this topic thus far by representatives of the various state and Federal agencies involved in the response. Sessions of these committees are occasionally contentious, with debate typically centered on factual matters that are not clearly resolved in the scientific literature.

The R&D Committee, in particular, has attempted to identify chemical methods that might prove to be valuable in shoreline clean-up. After exhaustive tests that continued through the summer, no chemical emerged that appeared in testing to hold much promise of producing results commensurate with the environmental costs associated with its use. However, testing continues on a short section of Smith Island in Prince William Sound.

It has been clear during the EXXON VALDEZ event that hastily conceived and executed research can contribute little to resolution of operational problems. Samples are often gathered in less than optimum conditions, and lengthy intervals are generally required for both sample analysis and

interpretation. In many instances the data are late, inconclusive, and contentious.

Many of the solutions being sought in Valdez, as well as in other oil spills, are amenable to research solutions that can be obtained in small, controlled spills. Small-scale experiments can be carefully designed to answer most of the questions likely to be posed on the broad range of chemical and biological agents of potential use in oil spill response. The tests must be conducted by credible, independent investigators under a variety of biological and physical settings. This research cannot be effectively mounted in conjunction with large-scale response operations.

Evaluation of Natural Clean-up Alternatives

In almost all cases, natural physical and biological forces are by far more important than the human actions taken in the removal and detoxification of petroleum. Although the natural processes involved are reasonably well understood, the rate of removal and eventual restoration of ecological communities in various environmental settings is unclear. Also unclear is the degree to which human activity in the clean-up of spills may serve to enhance or impede natural recovery.

In the EXXON VALDEZ spill, the use of increasingly aggressive measures to remove weathered oil is currently a subject of great concern. Few biological communities can withstand the high temperature and pressure of the "Omni-barge" washing

system. Questions center on whether treatment of this intensity will delay recovery of shoreline communities.

Next spring the issue will become even more critical as questions associated with removal of sub-surface oil are considered. By spring, the viscosity of the oil imbedded in subsurface sediments will be such that intense chemical and physical measures will be required to remove it. The Federal On-Scene Coordinator has assigned NOAA the responsibility of following the situation throughout the winter to provide an early forecast of oil conditions to be encountered next spring.

Little follow-up of past spills is available to answer the questions posed by the EXXON VALDEZ clean-up. Certainly this area should be a high priority for future research.

Decision Systems

Drawing research data into a form that they can be readily manipulated and brought to bear on operational questions is a constant challenge to NOAA scientists serving the Federal On-Scene Coordinator during major spills. During the EXXON VALDEZ incident, the Computer-Aided Management of Emergency Operations (CAMEO) system, developed by NOAA to assist emergency responders in dealing with hazardous chemical spills, was adapted to manage the vast amount of information flowing into Valdez from aerial overflights, ground-based

shoreline assessment teams, and Coast Guard oversight teams supervising the clean-up operations. Progress reports were produced daily to assist the FOSC in evaluating the rate of progress being made by Exxon.

As complex as current technology such as CAMEO may appear, better information management could allow us to cope with the myriad of details that may well spell the difference in effective management of an oil spill emergency. Computer systems that merge data on the state of the spill, the environmental resources at risk, and the weather and currents, with a knowledge base that reflects the cumulative research experience on technical questions under consideration would enhance operational decision making.

Advances in this area will require better computer science and technology, as well as a significant effort to codify the collective knowledge of scientists and engineers throughout the world on spill response issues.

Seafood Quality

The quality of seafood products harvested in the vicinity of an oil spill is often the subject of considerable concern to buyers and consumers. While there is little evidence of petroleum contamination of seafood harvests from most oil spills, maintaining consumer confidence demands that stringent measures be taken to protect the perceived quality of seafood

products. In the absence of data to the contrary, major fisheries have been closed or severely restricted in the interest of assuring the consumer that there is no probability of a contaminated product reaching the market. For subsistence users of seafood products, self-imposed restrictions on fishing driven by a concern for the potential contamination, may have serious cultural and economic effects.

Most fisheries in the vicinity of the EXXON VALDEZ remain closed three months after oil was, for the most part, removed from, or widely dispersed in, the waters of Prince William Sound and the Gulf of Alaska. Native subsistence users remain alarmed by the potential for contamination, despite assurances from public health officials to the contrary. Precise chemical analysis of many seafood products is proceeding in NOAA laboratories in Seattle, and we hope the results will help allay concerns over the wholesomeness of seafood.

There is little in the way of concrete research data from past spills to provide much insight into the pathways and mechanisms of oil contamination of seafood.

The EXXON VALDEZ spill represents an opportunity to conduct definitive research on this important topic. In no other spill context have baseline levels of contamination been so low that the effects of a single incident could be as readily

isolated. Short-term studies are currently underway by NOAA and Exxon to take advantage of this important opportunity.

Damage Assessment and Long-term Monitoring

Research on the subtle, long-term effects of oil spills on human health or on ecological processes necessarily involves detailed observation and analysis over an extended period of time. For example, the effects of elevated, but still low-level exposure to polynuclear aromatic hydrocarbons in the human diet may be manifested in slight increases in the risk of cancer decades after the initiation of exposure. Careful, long-term epidemiological studies are required to document such effects. Because of the high degree of natural variability associated with natural populations of free-swimming fishery resources, research on previous spills has generally not demonstrated long-term effects on these populations. A considerable body of information now exists, however, from laboratory results and field observations in contaminated areas, to suggest that exposure to low levels of polynuclear aromatic hydrocarbons can lead to neoplasms, genetic anomalies, and reproductive failure in fishery organisms. Further research and modeling would be required to establish the effects of these sublethal disturbances on resource populations, or to document the significance of losses due to mortality in a single year class of fish or

shellfish that may be exposed to massive amounts of oil during the initial phases of a spill.

To identify and assess the effects of an oil spill effectively, three different categories of field effort are required: (1) a spill response system for initial containment of the spill and mitigation of its most serious immediate effects; (2) an intensive assessment and monitoring program to identify and quantify in detail the various effects of the spill over their effective time frames (most likely 2-5 years duration); and (3) a continuing, large-scale (nationwide), low-resolution monitoring and assessment of environmental quality.

I have already mentioned NOAA's spill response activities and their present limitations in some detail. Through its National Status and Trends (NS&T) Program and Strategic Assessment Program, NOAA's Office of Oceanography and Marine Assessment is currently developing information on the general status of environmental quality nationwide, to provide a practical framework for evaluating the effects of spills and other human activities. Our NS&T Program makes annual measurements of toxic organic and metals in marine fish, shellfish, and sediments at approximately 200 coastal sites around the country. NOAA's Strategic Assessment Program is assembling information on many facets of environmental quality, including distribution and abundance of biological

resources, status of shellfish-harvesting areas, and local contaminant discharges to the coastal environments.

In each of the above areas, further research and developmentis needed to improve our response capability and state-of-preparedness for future spills. We realize the needs are numerous, and priorities must be set to undertake only that research which shows definite promise in minimizing spill effects. However, legislation in this area should not be prescriptive and mandate specific programs and responsibilities. This is best left to a coordinated planning effort that includes all relevant Federal agencies and private industries. We do not object to Section 211 of H.R. 3027, which gives authority to the President to conduct oil spill research without limiting discretion in program administration. NOAA expects to be an active contributor to future discussions of these important issues.

Thank you, Mr. Chairman. I will be glad to respond to any questions you may have.

Mr. McMILLEN. Thank you.

Our last panelist is Mr. Tennyson.

Mr. TENNYSON. Thank you, Mr. Chairman.

For the last 11 years, I've been involved in managing—for the last 9 years—been involved in managing the oil spill response research studies for Minerals Management Service.

Minerals Management Service has the responsibility for a safe and orderly resource development for the OCS, specifically oil and gas. As part of that, we've been an ongoing program since 1979, with initially Coast Guard, EPA, Navy, Environment Canada , and ourselves to review and assess and develop better tools for response to open ocean spills.

In 1986, Minerals Management Service, along with Environment Canada, accelerated our program—this is unfortunate at the same time that we lost the support from EPA and from Coast Guard, as mentioned earlier. But specifically, that allowed us a series of additional research avenues available.

In the written testimony we have very briefly described some 14 program objectives that were accomplished both with the cooperation with the Coast Guard and EPA, and more subsequently with—primarily with Canada.

I'd like to just take a few minutes and go through the Interior's assessment of the state of the art and where we are proceeding with the ongoing program.

We have accelerated the existing research program funded by Interior as a result of the Exxon Valdez spill. But we have basically taken no new initiatives because we feel at this point the program is, given the funding restraints, on target.

Specifically, we've reviewed the state of the art for detection, run through what normally the chronology of the spill occurs, and must be able to detect it to start off with and get an idea of the size of what you're dealing with. Detection is a function of the eyeball, primarily, with responders on-scene 20 or 30 feet off the water looking at oil, they [illegible] whether they're in oil or not. But it's very difficult to determine that there is a patch of oil a hundred meters or 300 meters away which is thicker and more effective to try to respond to.

The Coast Guard provide—has provided an excellent platform in their Falcon jets for remote sensing. However, on major spills, these jets have not been routinely available. They were, I think, in Valdez, but that's more the exception than the rule.

As part of the concern we have for implementing increased detection capabilities, Interior, along with Canada, has been involved in the development of three new sensors—one specifically a thickness sensor which will allow a remote aircraft to give you a thickness reading over the oil, not just an aerial extent.

The second is detection capabilities either from vessels or from aircraft which will allow the detection of oil in broken ice situations, which presently is not—there's no capability for.

We're working specifically in detection and developing and evaluating drogues—surface drifters that move according—in accordance with the oil that can be satellite interrogated. And once a spill occurs there's a possibility to drop one of these drogues in the—in

the water and follow the spill over a period of time for planning purposes as well as being on-scene in terms of the actual response.

We've also—are looking at submerged oil. In several recent spills, we've had significant beach cleanup where there's been no oil seaward of the surf zone. The possibility is the oil sinks below the surface and therefore, it is not detectable by any given means that we have at this point. We are developing techniques for that.

The containment—I agree with Admiral Sipes that with winds much over 15 to 20 knots, the existing capabilities of equipment fall short. In tow speeds of anywhere between a half a knot and one knot, most all of the containment systems lose oil.

Interestingly enough, and we did this unaware of the Norwegian experience at the time, but in '87, in a joint intentional spill off the east coast of Canada, we took equipment which we considered state-of-the-art—three separate boom skimmer systems, and, in fact, proceeded to lose the oil in an intentional spill in winds of 15 to 20 knots.

We then turned around and went with the seas, with the wind. When the winds increased to 35 knots, we towed at a speed of up to 1.4 knots through the water. We were successful in containing the oil for several hours and successful in recovering a larger portion of that oil than we might have attempted.

The Norwegians did something very similar in the Ecofisk spill in the North Sea and we believe that downwind skimming—and containment in sea states above that which is normally considered capable with existing equipment, is possible if you go with the wind and with the seas rather than against it as has always been the case in the past.

At present, there are some 30 different kinds of booms—containment booms—for open ocean response in the hands of responders that in fact could be called "private sector" that could be called for a spill response.

We know precisely how to test those booms. We can spill 20,000 gallons of oil in the water—of light oil and heavy oil. We can do it in the light and a heavy sea state. And we can judge the effect of not only the oil type but the sea state on each and every one of these 30 booms. That costs about a—about a million dollars. Obviously, with 30 different booms, 2 different spills of 2 different kinds of oil and 2 different spills in 2 different sea states, we would become the world's leading polluter under the guise of environmental protection. This is not our intent.

We have since developed, in concert with the Coast Guard and EPA and Environment Canada, a test protocol which we're in the process of finalizing which allows the evaluation of the equipment performance of containment booms as a function of its ability to sea keep—that is, its ability to comply with the surface of the ocean. And this will obviate the necessity for spilling oil in future evaluations.

We are working to finalize that and, in fact, it is a high priority contract within Interior right now jointly with Canada to put that test protocol and subsequent standards for performance on the books.

With respect to recovery, we believe that in the OHMSETT facility, which we are actively trying to reopen, and within Interior and

hopefully with the—we have a letter of support from the Coast Guard and hopefully from EPA—we believe that most of the skimmers for offshore have been actively tested. There are some new techniques for broken ice and there are some additional European designs which are new, which we feel need to be reviewed.

We also feel, by the way, that there is considerable opportunity for increasing detection capabilities that are not part of the existing program.

With respect to disposal, there were some major problems identified in every major spill. What do you do with the oil once you recover it? You contain it, you bring it back to shore, and you have to somehow get rid of it. Land farming has been a standard technique. In the past, you've been able—sometimes we've been able to give the oil back to a refinery. But for a remote area such as Valdez, incineration shows to have promise. I think that needs—we feel that needs further evaluation.

With respect to chemical agents, our experience with the use of dispersants in the open ocean has been very controversial. They have not been routinely effective in those tests where we have information. But we are working with Environment Canada to reformulate dispersants. And, in fact, in the laboratory we have come up with several new reformulations that are several times more effective than existing dispersants. And in the last year we have published—jointly published—a paper that, for the first time, describes the mechanism by for—for which dispersants are known to have worked, and why they don't seem to work. We are proceeding with that.

More specifically, we have reviewed and evaluated in the tank and at sea two non-dispersant chemicals, one of which has the capability in—and at least in the laboratory and in test tank situations, of increasing recovery of oil by existing skimmers by an order of magnitude, that is, a factor of 10. We believe that those chemicals deserve further work and we're proceeding with it.

I think the major source of promise that we have at this point for new techniques is in-situ burning; that is, burning of the oil in-place on the water. We have worked with Prudhoe Bay crude for six years—first with the Coast Guard and EPA support, and then on our own, and with Environment Canada, working with the National Institutes of Standards and Technology. We have evaluated the ability to burn six different types of crude oils, which represent the major spectrum of oils that we produce and transport in bulk in the United States waters. And we feel that the potential is there to remove 50 to 95 percent of the oil safely with in-situ burn.

When you burn you create burn constituents, obviously, smoke and other chemicals as a result. We have worked very closely since 1985 with NIST to evaluate what are the chemist—chemical constituents generated, and what can be expected as the behavior of the plume as a result of the burn itself.

I might add, that Interior—specifically Minerals Management Service—over the last—since 1974, has spent over $500 million[1] in

[1]Amount changed from $600 million in correspondence from James F. Spagnole, Legislative Counsel, DOI, October 18, 1989.

environmental characterization, physical oceanographic studies, toxicity studies, and tests of sensitivities of individual organisms. That is, that the body of data generated by that multiyear effort is—is extensive and I think may have some bearing on the committee here.

I might also add that there has been, and continues to be, one mechanism for technology coordination between the agencies, which was what—quite active when more than just Interior was—was involved in this particular type of research, which was the OHMSETT Interagency Technical Committee mentioned by the representative of EPA. That is still in effect and, in fact, the next meeting is in Herndon on Monday, which we're chairing.

The concern is—okay, we have also submitted for the record two additional documents. One is a public forum testimony—or, excuse me—forum symposium, which MMS hosted, or contracted NIST to host—in Anchorage, November-December of 1988, looking specifically at oil spill response needs for marine and cold water. That has been submitted for your consideration.

In addition, we have submitted the $6 million 3-year program which we are funding—$6 million plus—with participation from American Petroleum Institute.

Specifically, we're looking at in-situ burn, detection sensors, specific technologies for containing in high—in high current areas above that which we normally see.

We started three years ago in conjunction with Canada to do beachline cleanup. The Valdez situation has certainly covered that. We anticipate continuing looking at innovative beachline techniques.

Specifically, we're modeling the fate and recovery of oil—or the fate of the oil so that we can better recover it, looking at the various constituents of weathering, and what it does to the physical and chemical behavior of oil.

We're looking specifically at chemical treatments; that is, the dispersant and non-dispersant additives, trying to improve their effectiveness and the effectiveness of the application techniques.

We're looking at standard test procedures for evaluation of open ocean equipment in a non-polluting and cost-effective manner. And we're looking specifically again at the physical behavior of oil and the development of an oil analysis kit in conjunction with Canada, which will allow a responder on-scene to very quickly get an idea of specific characteristics of the oil in which he's dealing.

This is somewhat of an abbreviated statement from the written testimony, and I thank you for the opportunity to participate in this hearing.

[The prepared statement of Mr. Tennyson follows:]

Testimony

Presented by Ed Tennyson, Research Scientist
Minerals Management Service
Technology Assessment and Research Branch

Before the Committee on Science, Space and Technology
Subcommittee on Natural Resources, Agriculture Research and Environment

U.S. House of Representatives
Washington, D.C.

September 7, 1989

Mr. Chairman, I appreciate the opportunity to testify about the research and technology program on oil spill containment and cleanup being conducted by the Minerals Management Service (MMS) of the United States Department of the Interior.

MMS has been supporting oil spill technology research and development for over a decade. For the past 12 years, MMS has maintained a formal program conducting applied research on the technology needed to support safe and clean OCS activities (this program was begun by the Conservation Division of the U.S. Geological Survey (USGS); now part of MMS). These activities include: permitting and regulating offshore oil and gas operations; reviewing and approving industry exploration, development and production, and oil spill contingency plans; conducting OCS facility accident investigations; inspecting and taking enforcement actions; and prescribing well-control training for industry personnel. Strong technological support also is required for such activities as reviewing and verifying the integrity of OCS structures and pipelines, preventing oil well blowouts, and preventing and mitigating water and air pollution.

In 1979, the USGS (now MMS) joined the U.S. Coast Guard, the U.S. Navy, the Environmental Protection Agency (EPA), and the Canadian Department of the Environment (Environment Canada), in an interagency and international oil spill response evaluation program run primarily at EPA's Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT) facility in Leonardo, New Jersey. OHMSETT provides a very large open tank facility capable of generating waves, testing cleanup techniques, and

burning oil on water and in floating ice. Since 1979, USGS and later MMS has spent $100,000 per year evaluating spill response equipment and procedures.

Since 1986, MMS has invested approximately $250,000 per year in research to improve oil spill response technologies and procedures. In 1986, MMS and Environment Canada executed a Memorandum of Understanding and began a fruitful joint research program. This program was established, in part, as a consequence of the closing of the OHMSETT facility by EPA and the cessation of oil spill response studies by the other agencies. The program with Environmental Canada has been mutually advantageous because of the shared concerns for oil spill mitigation and the complementary scientific work undertaken by each agency.

This working relationship greatly broadened the MMS program and furthered its research efforts by, for example, providing the funding, ships, aircraft, and technical support for conducting two at-sea experiments on the standardization of procedures for evaluating containment booms and the effective use of chemical treating agents. This combined program has:

- Developed the capability of using shipboard navigational radar to detect and track open ocean oil spills.
- Developed and verified a nonpolluting and cost effective test procedure to evaluate the performance of offshore oil spill containment booms.
- Initiated a program to evaluate the capabilities for burning spilled oil in-place in broken ice fields.
- Initiated a program to quantify and model the behavior and fate of burn products from in-place burning of spilled oil.
- Developed the technique of containing oil by sweeping downwind when rough weather conditions preclude effective operations in the normal upwind mode.
- Evaluated innovative containment and collection techniques for broken ice conditions.
- Performed engineering and cost studies based on the use of converted tankers to tow containment booms on each side and to suspend subsea collection devices over

blowing wellheads. The tankers could store the oil, separate the water from it, and remain at sea for extended periods.

- Evaluated the capabilities of two oil spill chemical additives to significantly improve the recovery capabilities of existing equipment.
- Conducted research and engineering design of airborne laser ignition systems to ignite spilled oil in the open ocean.
- Evaluated and optimized the design of a high pressure water jet barrier for containing oil in high current areas and in broken ice conditions.
- Initiated investigations into the behavior of heavy oils, such as some of those on the California OCS. These oils tend to sink below the ocean surface but wash up in the surf zone contaminating beaches.
- Initiated investigations into improved airborne remote sensing of oil spills to determine the thickness and extensiveness of slicks.

MMS also has cooperated in the exchange of technological information with Japan, Norway, the United Kingdom, and France, through informal contacts, workshops, and technical meetings, such as the biennial Oil Spill Conference.

Consistent with its policy of conducting broad synthesis meetings on topics of concern, MMS arranged with the National Institute of Standards and Technology (NIST) (formerly the Bureau of Standards) to conduct a technical workshop in Alaska in November 1988, to present the state-of-the-art, recent research results, and to seek consensus on future research needs for oil spill responses in cold and seasonally ice-covered waters. Recognized experts submitted papers and served as session chairmen. Many of the research areas discussed at the workshop were already being addressed by the MMS research program; others will be considered in future studies. Clear opportunities for cooperative support for additional research are identified in the proceedings.

Additionally, MMS conducts research on oil spill risk analysis, reduction of hydrocarbon emissions from OCS facilities, improved blowout prevention, and the physical forces that act on oil and

gas facilities in deeper waters, areas of ice and earthquake activity, high currents, and periodic extreme weather conditions.

The MMS research program brings together expertise through cooperative research arrangements and contracts in all areas of oil spill response. Environment Canada is recognized for its expertise in chemical treating agents and detection. The National Institute of Standards and Technology, our U.S. research partner, possesses expertise on in situ burning. MMS itself maintains recognized expertise in detection, mechanical containment and recovery of spilled oil, and oil spill preparedness.

Total USGS and MMS funding for oil spill response technology investigations and for evaluating equipment and procedures amounts to $3.2 million since 1979. This sum has been substantially leveraged since 1986 because Environment Canada, in effect, has matched MMS funding.

To our knowledge, since 1987, MMS and Environment Canada have been the only government agencies in North America conducting significant oil spill research and technology development programs. We believe that significant gains have been made in detecting spills, quantifying and improving the performance of open-ocean response equipment, developing new chemical treating agents, and developing the capability to burn spilled oil on the surface of the ocean.

Additional budgetary resources for oil spill technology research and development will be one of the areas given priority consideration by DOI and the Administration as part of FY 1991 budget process. We also would welcome cooperative support from other organizations in expanding this research effort. Secretary Lujan, in April, announced such support from the American Petroleum Institute, which has offered $3 million in direct financial assistance over the next 3 years.

A Review of the State-of-the-Art in Oil Spill Response Technology

Several factors should be considered when evaluating the adequacy of oil spill responses, including: sea state, weather, type of oil, size of spill, elapsed time from spill to response, presence of ice, and the level of response readiness. Adequate readiness, in turn, involves the siting of sufficient equipment and trained personnel to deal effectively with predictable spills. A major aspect of oil spill preparedness is the state-of-the-art of

existing equipment and procedures, including capabilities for detection, containment, recovery, disposal, and alternative response strategies, e.g., chemical treating agents and in situ burning.

The current state of knowledge in the field and the potential for practical short-term gains may be summarized as follows:

Detection

- Oil spill detection is limited largely to visual observations which, in turn, are restricted to favorable sea and atmospheric conditions; they are totally ineffective in rain, fog, or darkness. Airborne remote sensing packages have been developed using side-looking radar, infrared, and ultraviolet technology. However, airborne sensing instruments are unable to discriminate between areas of an oil slick which are thick enough for efficient recovery and areas that are not. MMS and Environment Canada have started research on remote measurement of oil thickness from aircraft. Such a capability would allow response teams to direct collection efforts to areas that would permit the most effective and efficient oil recovery.

- MMS research has devised a method of specially tuning shipboard navigational radar and thereby permitting oil spills to be tracked in all but extremely severe sea conditions. This technique was used on three successive oil spills. Before it can be considered a reliable operational tool, however, additional research is needed to correlate oil thickness, other oil slick characteristics, and sea state with the radar presentation.

- Methods for detecting oil in ice, under conditions commonly associated with the Bering, Chukchi, and Beaufort Seas, also are being investigated. The joint MMS-Environment Canada program is evaluating applicable technologies and has identified a laser-flurosensor that can detect oil in broken ice.

- Improved understanding is needed by spill response teams to project the transport of oil on the surface as it is driven by winds and currents. In this respect, oil spill trajectory models have been developed and drifting buoys, tracked by satellites, are being evaluated to determine their ability to follow a spill.

- During several recent spills, some oil has submerged and reappeared in surf zones and on beaches. We believe that fish-finding sonar can be used successfully to track submerged oil so that effective countermeasures can be taken before the oil washes ashore. This and other techniques for tracking subsurface oil should be evaluated and may be incorporated into MMS's on going research effort.

Containment

- The effectiveness of open ocean booms for containing oil in waves over 2 to 3 feet is not well documented. Yet such wave heights are often exceeded on the OCS. The conventional wisdom is that containment booms will not effectively operate in wind speeds over 15-20 knots or at towing speeds greater than 0.5-0.75 knots. During MMS/Environment Canada experimental oil spill operations conducted in 1987 off St. John's, Newfoundland, oil was successfully contained by booms towed with, rather than against, the wind in contravention of conventional practice. This new technique resulted in successful containment in winds up to 35 knots and at towing speeds up to 1.4 knots. Further evaluation of experimental spill or spill-of-opportunity is required for operational acceptance.

- Currently, there are more than 30 different boom designs for use on the OCS. For lack of a standardized testing techniques or protocol, the relative capabilities of these booms have not been adequately quantified. MMS, together with Environment Canada, the U.S. Coast Guard, and EPA, has initiated development of an extensive test protocol that would rate the performance of containment booms without requiring the intentional spilling of thousands of gallons of oil, as in the current international practice. This protocol was evaluated and conditionally verified off Newfoundland in 1987; however, further analysis and tests are necessary. When completed, standard nonpolluting test procedures can be devised to evaluate each containment boom's performance in a range of sea states.

Recovery

- Most available offshore skimmers have been evaluated at the OHMSETT facility and elsewhere under realistic conditions. Results have shown that the skimmers operate within a range of effectiveness, i.e., oil-to-water ratio, of 50 to 98 percent.

Additional testing would be of minimal value. However, new and innovated designs for operating in ice should be evaluated and improved. MMS and Environment Canada have undertaken a joint research project to evaluate a barrier skimmer designed for ice operation.

- Evaluation of beachline cleanup procedures is planned to develop effective procedures that do not adversely affect the types of beaches found in Alaska, British Columbia, Washington, Oregon, and northern and central California.

Disposal

- Enhancement of existing techniques is required to dispose of large volumes of recovered fluids normally associated with a major oil spill. Disposal methods include on-scene storage, transportation to an acceptable disposal site, and ultimate destruction techniques. Incineration is a technique that merits accelerated research beyond current levels. Disposal techniques in cold regions also require further research.

Chemical Agents

- Chemical agents include broad categories of dispersants and nondispersants. Dispersants are intended to speed the breakup of oil slicks into droplets small enough to be acted upon by natural microbial action. Dispersants routinely have not proven effective offshore, but recent MMS/Environment Canada research indicates that dispersant effectiveness can be significantly increased by reformulating existing dispersants.

- On-going MMS/Environment Canada research has identified several nondispersing chemicals that inhibit the formation of emulsions (known as mousse), retard slick spreading, and change the physical properties of spilled oil to improve its burnability or recoverability, and thus, significantly increase oil recovery rates with existing cleanup equipment.

In Situ Burning

- The major advance in spill response in recent years has resulted from joint MMS/Environment Canada research begun in 1983, in which the limiting conditions for burning oil in the surface of the open ocean have been studied. Prudhoe Bay, Amuligak, and several other oils were evaluated to determine the effects of several physical variables--oil slick

thickness, weather, sea state, wind, temperature, degrees of emulsification, and extent of ice coverage--on the percent of the oil that could be removed from the water column. The oils tested burned with 50-90 percent removal ratios, provided emulsification had not occurred. This phase of the research is completed.

- These results strongly supported the notion that in situ burning may offer the best potential for combating major oil spills and for mitigating spills in remote areas. Of utmost concern is the effect that the burning of major oil spills would have on air quality. A joint MMS/Environment Canada research effort was begun in 1985 to quantify burn products and to model the behavior of the products as a function of time and temperature.

Mr. Chairman, as I mentioned before, the reason MMS is involved in oil spill containment and cleanup research is that we are charged by Congress to assure that the Nation's OCS resources are developed economically and effectively, and done so in a manner that protects the marine, coastal and human environments. It is appropriate to note the exemplary environmental record of OCS development related to oil spills.

Compared to oil tankers, other vessels, and even natural sources of oil, offshore oil exploration, development, and production activities contribute very little of the oil found in the world's oceans and seas. A 1985 study by the National Academy of Sciences determined that transportation sources--including ship bilge discharges, normal tanker operations, and tanker accidents--accounted for about 45 percent of all the oil in the sea. Municipal and industrial wastes and runoff from bordering lands accounted for about 36 percent, and natural sources, such as seepage from ocean bottom, contributed roughly 8 percent. By comparison, offshore oil production accounted for only 2 percent.

Safety and Oil Spill Prevention are Top Priorities in the OCS Oil and Gas Program

Three serious incidents--the Santa Barbara blowout (Note 1) and two major blowouts and associated fires in the Gulf of Mexico, occurred sequentially in 1969 and 1970--heightened public interest in the conduct of offshore oil and gas operations.

This led to an expanded Federal role in the regulation of OCS activities. New regulatory requirements pertaining to drilling

procedures, subsurface safety valves, platform safety devices, and oil and gas pipelines were instituted. The Federal Government's offshore inspection force was increased tenfold; a detailed review and approval process was established for operational plans; and training requirements, including those for oil spill responses, were implemented for drilling and production personnel.

The OCS oil spill record improved significantly once these policies were in place. Since 1970, there have been only 10 oil spills in excess of 1,000 barrels on the OCS and none is known to have reached shore or to have caused any significant environmental damage. There has not been a single spill of that size from loss of well control during this period. We believe that this is due to strong regulations, careful plan reviews, and followup inspection requirements.

Six of these spills were from pipelines, including four that were damaged by anchors or trawls; two resulted from storage tank ruptures on platforms; one occurred while fuel was being transferred from a barge to a drilling rig; and one resulted from a barge sinking.

OCS Oil Spills Typically are Smaller, More Readily Contained, and More Quickly Cleaned up than Tanker Spills

It is important to distinguish between oil spills resulting from tanker accidents and spills resulting from offshore oil and gas operations. Although tanker loading and unloading operations are concentrated in port areas, tankers travel worldwide and carry a wide variety of hydrocarbons. Tanker spills, thus, can occur almost anywhere--harbors, rivers, estuaries, new coastlines, and on the high seas--and can, and unfortunately sometimes do, involve large volumes of oil spilled within a relatively brief time. In the Exxon Valdez accident, about 260,000 barrels (11 million gallons) of crude oil were spilled within several hours. By comparison, a major 5,000 barrels per day blowout would require over 50 days to release the same amount of oil.

Many different types of petroleum commodities may be carried on tankers, including crude oil, heavy and light fuel oils, diesel fuel, jet fuel, gasoline, and lubricating oils. Some carry a single product, while others may carry several different products in separate compartments. Tankers or barges may drift after rupture, causing the oil to be spread over an even larger area. And because tanker and barge spills can occur almost anywhere, it

is more likely that spills will occur far from staged cleanup equipment and that there will be insufficient information available about air and water currents.

OCS spills, by contrast, are confined to fixed locations where ocean currents, wind patterns, and for production operations, oil characteristics, are well known. Thus, oil spill response systems can be tailored to accommodate maximum anticipated spill rates from a particular facility, and required response times can be established consistent with predicted oil slick drift rates toward the shore or other sensitive resources. Prior knowledge of the specific hydrocarbons stored on an offshore facility (typically lube oil and diesel fuel) and the characteristic of the crude oil being processed there facilitate the choice of correct equipment and other resources to respond to spills.

There have been eight spills of more than 100,000 barrels in U.S. waters: seven were from tankers, and one was from an OCS facility. The lone OCS spill on that list occurred in 1967, before Federal oversight of the OCS was strengthened by promulgation of a comprehensive set of safety regulations in 1971, and provisions of the National Environmental Policy Act and the Outer Continental Shelf Lands Act Amendments of 1978.

Geological Characteristics of Most OCS Wells Militate Against a Major, Prolonged Oil Well Blowout

Currently, the Nation's OCS oil and gas production is confined to the Gulf of Mexico and the Pacific Ocean offshore California. There are only seven OCS platforms with at least one well producing more than 3,000 barrels per day. The overall average flow rate from OCS wells is about 180 barrels per day, ranging from 10 to more than 8,000 barrels per day. As I stated before, a major 5,000 barrels per day blowout, for example, would require over 50 days to release the amount of oil released by the Exxon Valdez in a few hours. With longer times and lower flow rates, substantially more oil could be recovered following an OCS spill than from a typical tanker spill, and much more time would be available to mobilize for an extended cleanup.

Two major OCS producing areas have geologic properties that militate against a major prolonged oil blowout.

- The Western Gulf of Mexico is predominantly a natural gas producing area, and gas blowouts, while extremely dangerous, produce little or no ocean pollution.

- Southern California reservoirs are characteristically low pressure and produce high-viscosity crude oils. In the absence of faults and fractures that communicate with the surface, as in the Santa Barbara spill, this combination would lead to little or no sustained flow following a blowout. About 90 percent of the 266 producing wells off the California coast normally require gas lift or hydraulic or electric pumps to maintain flow; systems that can be shut off immediately in the event of a spill.

OCS Activities Are Not Only Safe, They Are Clean

Between 1971 and 1988, oil production from OCS wells was nearly 6.2 billion barrels, or more than 940,000 barrels per day. During this same period, 1,768 oil spills of one barrel or more were recorded on the OCS, resulting in a discharge of 92,656 barrels, or 114.1 barrels per day. The amount of oil spilled compared to the amount produced was about 15 parts per million--roughly equivalent to spilling a quarter of a teaspoon of gasoline from a 20-gallon automobile fuel tank.

Yet, as commendable as the record may be, we cannot afford--and will not tolerate--complacency.

MMS Emphasizes Oil Spill Prevention

MMS activities on the OCS are aimed at assuring operational safety and preventing pollution, with major emphasis on preventing oil spills. To this end, MMS inspects all OCS oil and gas operations at least once each year, and more if necessary, for compliance with stringent safety and pollution prevention regulations. During a recent 3-year period, MMS conducted nearly 31,000 separate inspections of offshore platforms, drilling rigs, and other facilities. Each production or drilling inspection checked between 50 and 300 different safety and pollution prevention items, depending upon the type and size of the operation. This amounted to inspecting more than 1,548,000 separate items.

Of the more than a million-and half items inspected, over 99 percent were in compliance. There were 11,398 incidents of noncompliance for which MMS issued citations. Most noncomplying items were corrected quickly, usually within a few days. In those relatively few instances where the violations posed "a treat of serious, irreparable, or immediate harm or damage to

life (including fish and other aquatic life), property, and mineral deposit, or the marine, coastal, or human environment", (Note 2), MMS ordered suspension of operations on individual components, such as separate compressors or valves, or suspension of drilling or production operations.

During this 3-year period, MMS ordered over 4,300 individual components shut down. In more serious cases, drilling operations were stopped 407 times, and production was halted 320 occasions. Current estimates indicate that offshore drilling operations typically cost the operator between $100,000 and $150,000 per day. The costs associated with shutting down an offshore production platform depend in large part on the level of production.

There are other situations, however, where MMS inspectors may detect violations that are of such significance as to warrant harsh penalty, but not as harsh as suspension of operations. For such cases, the OCS Lands Act provides the authority to impose substantial civil penalties. MMS's ability to impose such penalties was impaired, however, by a 1983 Federal District Court decision. Under the rulings, the Government is required to give the offending operator notice of failure to comply and reasonable time for corrective action before imposing a civil penalty. A review of this situation is underway.

However, even with this limitation, there have been no instances where an operator has failed to correct a violation within the allotted time, hence, with two notable exceptions, no civil or criminal penalties have been sought. In 1988, Texaco was fined $750,000 in a criminal case that involved Texaco's knowing failure to perform a required test of a blowout preventer and falsification of records. Earlier this year, Tenneco settled a civil suit for $5 million after MMS detected unlawful flaring of natural gas from a Tenneco offshore platform. The settlement covers royalties and interest due the Government, as well as payments in lieu of further prosecution of administrative, civil, or criminal sanctions.

As you can see, MMS has done a great deal to see that its programs are part of the solution and not part of the problem relating to oil spills.

Mr. Chairman, that concludes my prepared statement. I would be happy to respond to any questions that you or Members of the Subcommittee may have.

Notes:

1. The Santa Barbara blowout, which occurred in 1969, released about 77,000 barrels (3.2 million gallons) of crude oil over a period of several months. (A blowout is an uncontrolled release of oil or gas from a well.)

2. 30 CFR 250.1(b)(2).

Mr. McMILLEN. Thank you very much. I'd like to thank all the panelists.

Let me just start out by asking kind of a broad, general question that I'm curious about.

When there is a major spill like the Valdez and a tanker empties its oil and there's a significant amount of oil still left in the tanker.

How do you go about getting the—the rest of the oil out of the tanker? And the follow-up on that is, are these tankers compartmentalized in any way so that damage is contained to that part of the tanker that is broken?

I'm just—I don't know that much about this area. I just wanted to start out by having you give me an overview on that.

Admiral SIPES. Let me take the first shot at that, Congressman; perhaps some of my colleagues here could add to it.

The Exxon Valdez—and I'll use that for an example—had 16 cargo tanks. The vessel was compartmented to 16 tanks. Damage occurred to 11 of those tanks in the process of the grounding. And within the first day or two, there was approximately 11 million gallons of oil spilled. There were, by our estimate, another 42 million vessel—gallons—that remained in the vessel that was eventually pumped off into other tankers. And in that way that threat was removed.

That was done with—with portable pumping systems that were developed in the '70s under our research and development plan—the acronym is ADAPTS pumping systems. They're in the hands of the National Strike Force which we operate available for any spill, whether the EPA or the Coast Guard is on the On-Scene Coordinator. And those pumping systems were delivered to Valdez by aircraft, placed on board the Exxon Valdez by helicopter with the crews to operate them. They're completely a stand-alone system, and they were used to pump the 42 million gallons off the Valdez. And that is a gross example of the kind of thing that happened.

Mr. McMILLEN. All right. I appreciate your overview on that.

The question that I might add also is, it seems to me when you read the history of the oil spills, more and more of these are occurring by foreign registered tankers.

I notice in your testimony, Admiral Sipes, that you talked about that our formal R&D efforts have to be augmented by this exchange of information on an international level.

Admiral SIPES. Yes, sir.

Mr. McMILLEN. You know, if we're operating with one set of standards and, you know, the rest of the world's operating with a different one, doesn't that pose problems? And kind of what is being done? I might ask you to elaborate on your comment in your testimony on that.

Admiral SIPES. Good.

You may know that the President, when the Economic Summit recently met, proposed that the other six countries support us in going forward through the International Maritime Organization to develop an international agreement on cleanup and response.

There are certain aspects of that that we're particularly interested in, and one is, joined in cooperative R&D with foreign countries.

The second is, to know what their capabilities are and how we might take advantage of some of their equipment if we have another catastrophic spill.

And the third is to begin to discuss with them the contingency plans for vessels that come to the United States, or that apply—that work and trade in any part of the world where they may, at least among the crew, understand what needs to be done if there is an accident.

So those are the three aspects that we're particularly interested in in that agreement, and we are going forward with that.

Mr. McMILLEN. Why don't I recognize my colleagues for their questions. Ms. Schneider?

Ms. SCHNEIDER. I thank the witnesses for their very able testimony but I couldn't help but conclude that each of you have very diligently pursued very small programs in each of your respective agencies. And I can't help but wonder that if we were to pool those resources and have a focused game plan with a timeline, that specifically targeted what it was we were after—I mean, it sounds to me like we're in pretty good shape in terms of detection, but I really didn't feel that we had any definitive proposals for containment. You know, burning to me does not appear to be one of the—the technological solutions that we ought to consider.

I'm just wondering if—if our energies might not be better spent if we were to pool some of the resources that the four of your agencies are now expending.

Admiral SIPES. Congresswoman, I mentioned in my testimony that Secretary Skinner has invited a number of other people to—to a meeting in Groton later this month. And the purpose of that conference is to discuss the R&D initiatives of each of the agencies.

And that the things they have planned, to develop a method of coordinating the work of the agencies.

The goal is first to develop sort of a national needs list of work that needs to be done and then to talk about how we might coordinate that work and take the—the maximum advantage of the—the work of everyone.

Ms. SCHNEIDER. Being one who is very sensitive to time, you did mention that it was September 26th and 27th.

Admiral SIPES. Yes.

Ms. SCHNEIDER. And that will be after we have already gone to the floor with whatever it is we're going to do in this committee on oil spill research monies. So for our purposes, it will probably be too late. That's why we were anxious to hold the hearing now—which, you know, once again, detains us from coming forward with some speedy action on this.

So I don't know if there is some way that we can, you know, work that out logistically later on or not, but I'd like you to be aware of the timing of it all.

The other thing I wanted to mention is that there is a constituent of mine—a Rhode Island boat builder who has developed a very simple mechanism that's based on a 17th century principle of Pascale about air pressure and vacuums—and if you would pass that out to them.

I'm going to give you a newspaper article that was printed about this proposed idea that he has. It's a simple valve mechanism that

reduces the air pressure within the oil compartment of a vessel so that it would slow down the flow of oil from a rupture to barely a trickle.

And I wonder if any of you are familiar with discussions of this kind of technology or not.

Yes, Rear Admiral, you seem to be knowledgeable about it.

Admiral SIPES. I have to repeat, Congresswoman.

Ms. SCHNEIDER. Yes.

Admiral SIPES. We have been—we have been talking about that method in the International Maritime Organization. The Swedes brought it to the table, interestingly enough, probably two years ago. And we have been looking at the technical ramifications of such a process, and we're very interested in—in the idea. Now I don't mean to take anything away from your constituent, but—

Ms. SCHNEIDER. No, absolutely not. But if we did—

Admiral SIPES. It's an idea—

Ms. SCHNEIDER. —decide to pursue it, let's keep in mind—

Admiral SIPES. Yes.

Ms. SCHNEIDER. —buy American, buy Rhode Island, buy Mr. Blount, whatever, rather than the Swedish product.

[Laughter]

Ms. SCHNEIDER. But I would be very interested in being kept abreast of your progress in this area.

And the only other thing that I might ask is that—or mention—that at least for the part of Rhode Island, the coordination on the part of the Coast Guard was exceptional, and there was a comment earlier by one of the witnesses about coordinating. I think it was you, Admiral Sipes.

But it seems to me that at least in the Rhode Island example, there was no question as to who was in charge. And we also had the pleasure of having the Secretary of the Interior on the scene immediately. We also had Mr. Reilly from the Environmental Protection Agency appear. But it was the Coast Guard that clearly was in charge and took control.

And at this point I'd like to commend you and all the agencies here for your very good response for Rhode Island.

The other thing that I wanted to ask of NOAA—there's a concern about whether we have the resources to adequately monitor some of the spills that have already occurred. And also in my State of Rhode Island, we do have the good fortune of having a NOAA laboratory and EPA research laboratory. And with all due respect to Mr. Teal, one of the best oceanographic institutions in the United States in Rhode Island.

But the exciting thing was, was that all of the scientists from the two agencies and from the university were on the scene immediately taking samples and had begun to devise their monitoring—long-term monitoring—plan right at the outset.

And I'm just wondering for NOAA's part what kind of commitment do you see your agency making for long-term monitoring of these spills?

Mr. ROBINSON. Well, I'm afraid that we have never been able to do a very good job with that. We have—

Ms. SCHNEIDER. That's precisely why I was seeing if you have some proposals as to how you could do a better job.

Mr. ROBINSON. We, in fact, after the Ixtoc blowout in the Gulf of Mexico we had proposed a program that would have followed that spill for a length of time. We were unable to do that, and consequently, you know, we lost the information that might have been bearing these days on the Exxon Valdez and on your spill in Rhode Island.

We face a similar situation, perhaps, with the Exxon Valdez. However, we're hoping that through the National—through the Damage Assessment Program that there will be long-term follow-up studies there.

Ms. SCHNEIDER. Are the parties that are responsible for the spill at all responsible for some of the funding for monitoring?

Mr. ROBINSON. It's generally, of course, at their discretion. And Exxon has been very forthcoming with funding and with information. The studies that—Exxon had been conducting a very extensive program in Alaska and appears to be interested in conducting it over the long-term; although the data is being made public—thus far, anyway. And so it appears that there may be a funding source there for at least—

Ms. SCHNEIDER. So it really is on a case-by-case arbitrary basis as to whether or not the—the party liable is truly responsible for the monitoring.

Mr. ROBINSON. Yes, that's true. And the Exxon case, I might add, is—is not the usual situation. It's not—usually the case that the spiller will conduct such research, or if he does, that he will make the information publicly available.

Ms. SCHNEIDER. Okay.

Mr. ROBINSON. And I think Exxon is to be congratulated for the work that they've done in that area.

Ms. SCHNEIDER. Has NOAA identified some of the sensitive areas where oil spills might be likely to occur and then obtained any baseline data so that if and when a spill does occur you would have some kind of comparative analysis?

Mr. ROBINSON. Yes, we have good information, I think, for most of the coast of the United States on where spills are likely to occur. We've looked at all the major port areas in terms of where there is high accident potential. We have identified sensitive resources that are at risk and have mapped those resources. And the Coast Guard in those—in those ports has copies of these maps as well as the State governments.

But in terms of baseline data, we do not have baseline data that would be of value.

Ms. SCHNEIDER. Not on those—those specific areas?

Mr. ROBINSON. Very, very few cases.

Ms. SCHNEIDER. To what degree do you share that information as to where those areas that are sensitive to oil spills might be? Do the pilots of these vessels know—have that information? Or who has that information? Where are the hot spots?

Mr. ROBINSON. Generally they're—it's fairly widely distributed. The—there's a what we call a "Port Study," a study that's been done for most of the major ports in the United States and has been broadly available to the industry as well as State government and to the other Federal agencies involved.

Ms. SCHNEIDER. And you think that information has been adequately disseminated?

Mr. ROBINSON. As far as I know, it has. There may be cases where it is—where it has not been, but in all the cases that I'm aware of, it has been widely disseminated.

Ms. SCHNEIDER. Do you think that EPA's EMAP program would be useful in helping us to collect some of that baseline data?

Mr. ROBINSON. I'm not familiar with that program, I'm afraid.

Ms. SCHNEIDER. Mr. Bretthauer, do you think it would be helpful?

Mr. BRETTHAUER. I believe it would. EMAP is a proposed system to collect baseline ecological data and publish it on a regular basis on critical ecosystems in the U.S.

Ms. SCHNEIDER. And what else do you feel that EPA could be doing along those lines?

Mr. BRETTHAUER. Along the lines of monitoring assessment—

Ms. SCHNEIDER. Yes.

Mr. BRETTHAUER. or along the lines of—

Ms. SCHNEIDER. Yes.

Mr. BRETTHAUER. I believe we need a critical collection of baseline data on the critical ecosystems in the United States, not only coastal ecosystems but other critical and sensitive ecosystems from which we can judge damage. At the present time, we don't have a system in place to really determine the extent of damage from any major environmental insult.

Ms. SCHNEIDER. Well, I'd like to throw this question out to all the witnesses. One of you had mentioned earlier that natural forces had a great capability in minimizing the effects of the oil spills. And clearly, that was the case in Rhode Island. Due to the bright sunlight, the kind of oil that did spill, and the water currents, much of it evaporated.

However, I still cannot help but wonder to what degree has some of the oil affected not necessarily the bottom fish—the shellfish—but some of the other fish that might feed upon the plankton and, you know, the surface fish.

So, we have people catching those fish, eating it, feeding it to other folks in our restaurants. To what degree is there a health threat?

And at one time, I guess EPA had a program where you were monitoring the consumability, I guess it is, of fish. Is that ongoing now or no longer in existence. What's the story there?

Mr. BRETTHAUER. At the present time, we don't have any system in place to look at the levels of various types of pollutants in—in fish.

One of the proposals, in terms of EPA, is to do some of those pollutant measurements in—in critical ecosystems. So it is a recognized need, and it's not being met at the present time.

Mr. ROBINSON. In Alaska, of course, we have very similar concerns—the quality of fish. And in my written statement, I go into that problem at great length. We are monitoring the quality of seafood there, especially with respect to the native subsistence fishery, which the natives are—are very concerned about the quality of the—because they consume so much fish from that area every year. So NOAA has a program going on where we are analyzing a

great number of samples of—of seafood products from the—especially from the native subsistence areas there to determine the healthfulness of the—of the seafood.

Ms. SCHNEIDER. Given the frequency of the spills, whether it be oil or various hazardous substances, there is growing interest, I believe, on the part of the consumers to have some type of monitoring of the quality of the fish that we're eating to take place. And the rationale is that we do inspect our meat, we do inspect our poultry, but we do not inspect our fish at all.

I'd like to have some feedback from all of you as to the appropriateness of such a monitoring system, or inspection system.

Admiral SIPES. I would like to mention in a simple way because I—and I say that because I don't know everything about it—but I do know that the Food and Drug Administration came into Alaska and did some testing along the lines that you're suggesting. I just say that on their behalf because they're not here.

Ms. SCHNEIDER. Okay, all right. Good. Thank you.

Any other? Yes, Mr. Tennyson.

Mr. TENNYSON. That is a concern in Interior for oil and gas activities, and routinely we take samples around our activities for body burdens of shellfish that stay in the area, and not necessarily the ones that swim through.

Ms. SCHNEIDER. Okay.

Mr. ROBINSON. From NOAA's side, I might mention that the—we have a National Status and Trends Program, which is currently monitoring 200 coastal sites for the—looking at trace levels of contaminants. And that program has been going on for the past six years and—

Ms. SCHNEIDER. What is the name of the program?

Mr. ROBINSON. It's called the National Status and Trends Program.

Ms. SCHNEIDER. Okay. All right.

Well, I thank you very much, Mr. Chairman. Thank you.

Mr. MCMILLEN. Thank you. And I would like to ask some questions for the record.

Admiral Sipes, assuming an interagency task force formed to prepare a national research plan for addressing prevention, mitigation, and effects of oil spills, and the Coast Guard were to lead such a task force, how long do you believe it would take to put such a plan together?

Admiral SIPES. I—I think we had—I think we have, Congressman, a running start on such a plan. We have within our agency—and I—and I will only attempt to speak for the others—have put such a plan together for our own purposes, and I believe they have as well. We each have our own R&D programs. And we have a good confederation of agencies, if you will, that have been what—worked well together over the years.

My interest, or our interest, is specifically in the area of oil spill response and in support of the On-Scene Coordinator. I believe the meeting that I referred to—even though it's not timely in terms of legislation—is—is going to go a long way to bringing us to an agreement of who will do what, and how we'll share information.

Mr. MCMILLEN. Could you put a timeline on that, or what would you estimate?

Admiral SIPES. We believe we'll have a report of that—of that meeting and some idea where we're going within 60 to 90 days after we're done.

Mr. TENNYSON. Mr. Chairman, if I might?

Mr. MCMILLEN. I'd like—yeah, go ahead.

Mr. TENNYSON. There has been, as I mentioned in testimony, a continuing series of meetings—amongst the various agencies represented here as well as Navy and Environment Canada, to talk specifically about projects, not necessarily jointly funded, but individual.

I think I'd have to agree with Admiral Sipes that there is a basis for a running start there. Interior is pursuing the program that we've submitted for the record. There's certainly more work to be done. There's room for other projects. We certainly don't hold a—the handle on that one.

But basically, I feel that the potential is there for a cooperative research effort amongst the agencies because that's the way we have worked up until 1986.

Mr. BRETTHAUER. I might add, Mr. Chairman, that EPA has developed a detailed research plan for discussion and consultation at that particular series of meetings that the Coast Guard is sponsoring later this month.

Mr. MCMILLEN. Mr. Robinson, would you care to comment, or give me your—

Mr. ROBINSON. I think we agree with—with the Coast Guard's proposal and we intend to work actively with them.

Mr. MCMILLEN. So you're saying 60 to 90 days?

Mr. ROBINSON. Yes, I believe that's certainly reasonable.

Mr. MCMILLEN. Admiral, how would—how could the petroleum industry's experience, resources, and research needs be incorporated into such a national oil spill research plan?

Admiral SIPES. We plan to invite them to the meeting, certainly to listen to what the Federal agencies are doing. And that is—that is one of the things that we hope to discuss—how they might best complement the work that's going to go on.

I might add to the other point I made, Congressman, one of the various essential elements in all of this is that we need over the long-term some dependable source of funding for the R&D work, and then we need to consider going not only from oil but on into hazardous materials.

Mr. MCMILLEN. I'd like to ask this of anybody on the panel. Currently, no formal mechanism for evaluating new technologies for mitigating oil spills exists and we have not established standards for measuring the effectiveness of technologies.

How best could we configure such a technology evaluation system?

Mr. TENNYSON. We're about nine months away from adopting a standard test procedure for offshore equipment, specifically containment booms. The final writing—we've done the statistical verification. Again, this was research jointly funded by EPA, and Coast Guard, Navy and ourselves. And Environment Canada specifically made a major contribution to that. Specific standards for performance of offshore containment booms is—is a matter of crossing the "t's" and dotting the "i's" at this point.

Mr. McMILLEN. Anybody else want to comment?

[No response]

Mr. McMILLEN. Are you—are you working with NIST?

Mr. TENNYSON. I'm sorry, sir, I couldn't hear you.

Mr. McMILLEN. Are you working with the National Institute of Standards and Technology?

Mr. TENNYSON. I believe very closely with the National Institute of Standards and Technology as well as Environment Canada. NIST is not involved in the development of standard test procedures for the offshore containment, however.

Mr. McMILLEN. Any other comments?

Mr. BRETTHAUER. I might add that we've been working with the Coast Guard to screen various types of technologies that are being proposed by a number of—number of companies, and academic institutions, throughout the U.S. It's a screening procedure in which we hope to—hope to improve the capability to really look at new innovative type of technologies.

It's our view that innovative technologies have not received the full attention that they might have over the past years.

Mr. TENNYSON. We are actively doing the same. In fact, some of that work is described in the symposium of the November-December Anchorage, Alaska workshop that was conducted by NIST for us.

Mr. McMILLEN. Any comment?

Admiral SIPES. No.

Mr. McMILLEN. Okay.

Mr. Robinson, as the primary agency which provides scientific support to the On-Scene Coordinator, NOAA has gained valuable experience.

How has that knowledge and experience currently been shared with other agencies with regards to meetings or workshops or whatever?

And the other question: How can this information—how can the information and dissemination among the agencies be improved? Obviously that is one of the major concerns.

Mr. ROBINSON. Yeah. I think that's a major area that—that needs additional work. We, of course, work most closely with the Coast Guard. And—and in our information gathering sharing we perhaps could work more closely with other agencies in the—and sharing the experience that we gain—have gained from oil spills.

I think probably the best mechanism that we have currently at the moment is the—the every other year Oil Spill Conference that is sponsored by the Coast Guard, EPA, and API. That probably is the best mechanism that we currently have in this country for sharing the range of information that comes from past oil spills.

Mr. McMILLEN. Just a couple more questions for the record.

How can coordination be improved, and is a formalized coordination mechanism called for? Is that—is that what's needed?

Admiral SIPES. I don't believe so, sir, and I said that in my statement. I believe that we—we have—we have used several mechanisms and have had the advantage of several opportunities in the past to do our coordination. And as Mr. Robinson said, the Oil Spill Conference is one. The NRT has for years had an R&D Committee—a subcommittee—that is sort of in limbo right now. The OHM-

SETT Technical Advisory Group was another mechanism. And I don't think that a formalized organization is necessary.

Mr. McMILLEN. Mr. Tennyson?

Mr. TENNYSON. I'd like to amplify or second, at least, what Admiral Sipes says—I do not think we need another layer of bureaucracy to try to get the job done.

Mr. McMILLEN. Mr. Bretthauer, you know that the EPA plans become increasingly involved in oil spill research. Which research areas does EPA plan to expand within the Agency and which of these areas are already being conducted by other agencies such as NOAA?

Mr. BRETTHAUER. Our particular—the focus of our particular research is going to be on shoreline cleanup technology. It doesn't mean to be—this doesn't mean to say we'll be exclusively limited in that area but that will be the primary focus of our work.

Looking at technologies like bioremediation, the technology we're currently looking at of Valdez, and looking at other types of shoreline cleanup technologies. So our activity is not in the open water. Our primary focus of activity is not in the open water, but more restricted to the shoreline.

We believe very little of this work is going on in—in other Federal agencies at the present time. What little there is we would hope that EPA would be the focal point of coordination.

Mr. McMILLEN. Mr. Tennyson, you talked about burning of oil as a promising mitigation method.

Has there been any collaboration with the EPA with regards to the—

Mr. TENNYSON. EPA has been involved in several planning meetings. Discussions occurred back when we were all cooperatively researching this effort in '83.

You mentioned earlier, Mr. Chairman, that the percentage of oil recovered by conventional means is usually quite small. We have routinely, as long as the oil starts at a thickness of about 3 millimeters, it is not mulsified, irrespective of whether it's weathered or not, and with all the oil types we've tried and we burned 50 to 99 plus percent without creating adverse public—I mean airborne constituents. That which is in the air is—is something considerably less toxic than that which is in the water. For remote areas where significant amounts of mechanical equipment are not necessarily available in early—in the early phases of the spill, I still believe that has a very worthwhile operation.

We have identified some 2600 chemicals involved in—in the burn constituents, which is the state of the art. We're working with EPA now to look at field verification of this technique, hopefully in the United States. And we will—we do intend several burns—several field trials with this in remote areas. So we have have had contact with EPA, yes, sir.

Mr. McMILLEN. Admiral Sipes, is it accurate to say that the Coast Guard does not require the standard pilot or ship officer to demonstrate proficiency by performance, and should we require pilots to come in for a periodic review and evaluation? And should we make greater use of simulation base training?

Admiral SIPES. Congressman, the pilot system in the U.S. is—is an interesting thing, and it goes back to—the development of it

goes all the way back to the Constitution in the early arguments about States' rights. There are State pilot organizations and there are Federal pilot organizations.

The State pilots typically bring vessels in that are—that are operating in foreign trade, and the Federal pilots bring vessels in that are operating in coastal trade under the Jones Act.

The States regulate the State pilots and the Federal Government regulates the Federal pilots. The difficulty comes when there's an accident and we believe some sanctions should be taken against the pilot and we then have to turn to the States to ask them to conduct an investigation, and have you done what needs to be done? And that does happen occasionally. Then we end up disappointed that that the action was not adequate.

I think that we need to tighten up the piloting system both with the States and with the Federal system as they currently exist. And you may know, we have a study under way that should be in its final form and ready for the Commandant within the next two weeks that will make recommendations of possible legislative changes and regulatory changes that are necessary.

Mr. McMILLEN. So you are urging a preemption if you—if you will?

Admiral SIPES. I don't want—I would not urge total preemption. There's no reason the States can't control the State piloting system.

What I would like to have is investigatory authority over State pilots when there's an accident.

Mr. McMILLEN. Thank you.

Any further questions?

Ms. SCHNEIDER. No.

Mr. McMILLEN. I want to thank the first panel for their testimony and responding to questions. And we thank you for appearing here today and we will move on to the second panel. Thank you very much.

The panel—let me introduce Michael Kinworthy, Repesentative of the American Petroleum Institute and the Manager of the Environmental Programs of UNOCAL, Dr. John Teal, Senior Scientist, Woods Hole Oceanographic Institute; Dr. Eugene Guest, Director, MarineSafety International, National Maritime Research Center, and Dr. Bruce Rosendahl, Dean of the Rosenstiel School of Marine and Atmospheric Sciences, University of Miami.

We thank you for coming today. We ask unanimous consent to include your statement in its entirety in the record. And we ask, if you would, to try and summarize your statement in five minutes or so, so that we'll have time to ask some questions.

I'd like to recognize my distinguished colleague from Rhode Island.

Ms. SCHNEIDER. I'd just like to also welcome the witnesses that we have here this morning, and regrettably, I must leave for a—an 11 o'clock meeting, but the testimony that you do offer today we will certainly review and we look forward to your constructive suggestions because we are very anxious to move ahead on some remedial actions in dealing with oil spills. So thank you for taking the time out of your own busy schedules to be with us today.

Mr. McMILLEN. Thank you.

Mr. Kinworthy?

STATEMENTS OF MICHAEL KINWORTHY, MANAGER OF ENVIRONMENTAL PROGRAMS, UNOCAL, ON BEHALF OF THE AMERICAN PETROLEUM INSTITUTE; JOHN M. TEAL, SENIOR SCIENTIST, WOODS HOLE OCEANOGRAPHIC INSTITUTION, WOODS HOLE, MASSACHUSETTS; F. EUGENE GUEST, DIRECTOR, COMPUTER AIDED OPERATIONS RESEARCH FACILITY/MARINESAFETY INTERNATIONAL, NATIONAL MARITIME RESEARCH FACILITY, AND BRUCE R. ROSENDAHL, DEAN AND WEEKS PROFESSOR, ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FLORIDA

Mr. KINWORTHY. Yes, good morning.

I'm Manager of the Environmental Programs for UNOCAL in Los Angeles, and today I am testifying on behalf of the API, a national trade organization representing over 200 companies involved in all aspects of the oil and gas industry, including the exploration, production, transportation, refining, and marketing.

We welcome this opportunity to comment on the proposed Federal oil spill research and development program, as described in section 211 of H.R. 3027. This section outlines a significant new government program with laudable research and development goals. Many of these goals are similar to those of the research programs of API and PIRO that I will discuss.

Together, industry and government can organize a significant effort toward better containment, improved methods of oil recovery, cleanup, and disposal, protection of public and worker health, natural resource rehabilitation and restoration, and assessment of long-term effects of oil spills.

As both government and industry develop new and extended research programs, we can draw upon the benefits of a large body of existing information, much of which has resulted over the last 20 years of oil spill research conducted by the API.

In 1969, API initiated a multidisciplinary research program which contributed significantly to the scientific community's knowledge of marine oil spills and in the means to respond to them.

Projects were conducted under API's Oil Spill Research Technology Program by a number of prominent university scientists and have been made part of over 300 peer review publications. The principal efforts in this program occurred in the following six categories:

1. Contingency planning and preparedness.
2. Control and cleanup equipment and methods.
3. Marine toxicology of oils.
4. Fate and effects of oils versus dispersed oils.
5. Chronic effects of oil pollution.

And, 6, information dissemination and exchange.

Time does not permit me to describe these categories in detail but I do want to underscore several points.

One of API's earliest activities was to promote development of oil spill cooperatives which have enhanced regional capabilities to respond to spills.

Another, an oil spill training school was established at Texas A&M University more than 10 years ago, which was and still is supported by scientists and engineers in the petroleum industry.

Also, API has contributed heavily to oil spill control technology in the development of methods for the application of dispersants by air. Our research has led us to believe that the use of chemical dispersants should be considered as a primary response option for major offshore oil spills. This position was supported by a 1989 National Academy of Sciences panel that recommended, quote: "Dispersants be considered as a potential first response option to oil spills along with other response options." End of quote.

API has been a leader in studies on the fate and effects of crude oil and refined products in the marine environment. In addition, we have compared effects of crude oil versus dispersed crude oil under actual spill conditions.

Chronic effects of oil spills have been evaluated whenever spills occurred, either naturally or accidentally. Most species do not appear to exhibit chronic effects from oil—from exposure to oil.

API has also sponsored, or cosponsored, a series of workshops, seminars, and conferences on topics related to oil spills . And together with the EPA and the Coast Guard, API has sponsored a biennial oil spill conference.

Recently, as you are aware, the petroleum industry created a task force consisting of chief executive officers of eight major oil companies. This task force issued a report in June calling for major efforts in three areas: prevention, response, and research.

In the area of prevention, the task force recommended restrictions on tanker movement in congested areas, tighter drug and alcohol regulations, and alarms on automatic pilots. They proposed research to investigate feasible and safe techniques for on-board response.

They also recommended that the National Academy of Sciences or some other independent body evaluate vessel configuration, ballast sides, double bottoms, et cetera.

With regard to response, the industry intends to establish a petroleum industry response organization, known as PIRO, with five regional response centers. Under the program, PIRO will provide equipment and skilled dedicated people to respond to major spills under the leadership of the Secretary of Transportation.

The proposed research program of PIRO had—the PIRO program has six objectives. The first one: preventing loss from the ship. The goals of minimizing oil loss and keeping oil near the ship are countered by practical considerations of large volumes of oil and the safety of the ship and its crew in the volatile vapors of the spilled crude oil.

The proposed program will focus on such questions as whether it's practical to store and deploy booms and/or chemicals from the stricken vessel.

A second objective is on-water recovery and treatment. This includes all treatment and recovery activities while the oil is on open water.

A third objective is preventing and mitigating shoreline impact. Since the impact of oil on the shoreline results in high levels of en-

vironmental damage, preventative and mitigation measures are appropriate.

The fourth objective is the fate and effects of oil in the environment. Once released to the environment, the physical, chemical, and biological transformation, and the ultimate fate of hydrocarbons are important in understanding their effect on the environment as well as designing appropriate cleanup and mitigation procedures.

The fifth objective of the research program is that of wildlife. Whenever oil is spilled, the potential to impact wildlife exists. More research is needed to deter animals from entering impacted areas and on minimizing stress and maximizing efficacy of capture and cleaning of affected animals.

The final objective is that of health and safety. In addition to the direct health effects of oil spills, better understanding of the exposure from air and water are also needed.

The industry has proposed to spend up to $35 million over a five-year period for this research. In addition, API has agreed to fund half of a $6 million joint research effort with the Department of Interior on the improvement of oil spill response technology.

This program could provide important advances in our oil spill cleanup capabilities. API is recommending to the Department of Interior that the scientific community be involved in this research program to obtain the widest possible consideration of innovative research concepts and to ensure scientific credibility.

In conclusion, I wish to express the desire and the intent of the petroleum industry to work with all Federal agencies and the scientific community to plan and initiate future research and development efforts to increase the Nation's ability both to prevent oil spills and to respond effectively to any which may occur.

Industry and government cooperation in this area would help us to avoid ill-considered programs and duplication of effort.

Secondly, in developing new technologies to deal with oil spills, it is important to assure that the new technologies will be acceptable to the regulatory agencies. It makes little sense to develop techniques if their subsequent use if not permitted.

Most important in such a joint commitment will be the creation of a rapid decision-making process at the site of any major spill. Regardless of the superiority of any containment and cleanup scheme which may result from R&D and from PIRO's projected increased capability to respond to catastrophic spills, delays caused by indecision when a spill does occur represent the major obstacle to successful containment and cleanup before the spill can reach the shorelines.

We look forward to working aggressively with Federal, State, and local governments toward achieving this important goal.

Thank you.

[The prepared statement of Mr. Kinworthy follows:]

Testimony of

Michael Kinworthy

Manager of Environmental Programs, UNOCAL

on behalf of the

American Petroleum Institute

on

an Oil Spill Clean Up Research and Development Program

before the

Subcommittee on Natural Resources,

Agriculture Research, and Environment

of the

House Committee on Science, Space & Technology

Washington, DC

September 7, 1989

Good morning. My name is Michael Kinworthy, and I am manager of environmental programs for UNOCAL. Today I am testifying on behalf of the API, a national trade organization representing over 200 companies involved in all aspects of the oil and natural gas industry including exploration, production, transportation, refining, and marketing.

I welcome this opportunity to comment on the proposed federal oil spill research and development program, as described in Section 211 of H.R. 3027. This section outlines a significant new government program with laudable research and development goals. Many of these goals are similar to those of the petroleum industry research programs outlined below. The industry endorces the proposed research program and looks forward to cooperating with the various government agencies in developing the program.

The goals listed in this proposal are desirable to both industry and government. The magnitude of research is similar for both programs. It is obvious that, together, industry and government can organize a significant effort toward better containment, improved methods of oil recovery, clean-up and disposal, protection of public and worker health, natural resource rehabilitation and restoration and assessment of long-term effects of oil spills. The API looks forward to close collaboration with our government counterparts in developing these research programs.

The importance of an expanded oil spill research program is well recognized in the petroleum industry. On June 14 the American Petroleum Institute Task Force on Oil Spills issued a final report announcing a comprehensive program for spill prevention and response, including an ambitious research program (Attachment A for the record).

There are many worthwhile oil spill research projects. Future research should draw upon a large body of existing information -- much of which resulted from 20 years of research conducted by the API.

In 1969, shortly following the well blow-out and resultant oil spill in the Santa Barbara Channel, API initiated an aggressive, multi-disciplinary research program which contributed significantly to the scientific community's knowledge of marine oil spills and in the means to respond to them. Projects were conducted under API's oil spill research/technology program by a number of prominent university scientists and have been made part of over 300 peer-reviewed publications. The principal efforts in this program occurred in the following six categories:

1. Contingency Planning/Preparedness
2. Control/Cleanup Equipment & Methods
3. Marine Toxicology of Oils
4. Fate/Effects of Oils versus Dispersed Oils
5. Chronic Effects of Oil Pollution
6. Information Dissemination/Exchange

CONTINGENCY PLANNING

One of API's earliest efforts was in the promotion of oil spill cooperatives throughout the country -- especially in locations where petroleum activities are concentrated and where spills are most likely to occur. Such cooperatives enhance regional capabilities to respond to spills, a concept which API now plans to build upon in order to provide effective response to "catastrophic" spills.

API has supported contingency planning not only for individual oil companies and spill cooperatives, but also for the Regional Response Teams (RRTs). Our technical task force has maintained an educational

program for RRTs over the years, to promote regional and site-specific pre-planning for spills. Such planning is based upon response options designed to be effective and to minimize adverse ecological impacts.

As a key element in contingency planning, we have sought the pre-approval of dispersant use at designated locations, so as to minimize the response delays which so often result in ineffective cleanup efforts. To assist in the decision-making process on the use of dispersants, we have engaged in sensitive area mapping -- an area of research which has been pursued as well by government agencies.

CONTROL/CLEANUP EQUIPMENT AND METHODS

To augment preparedness, an oil spill training school was designed and established at Texas A&M University over 10 years ago, and has continued to be supported by the industry's scientists and engineers. The school's curriculum is updated annually by an API technical task force made up of top experts in oil spill control technology. Because API is a trade association, we have been limited by law in our ability to develop and promote mechanical equipment for the control and cleanup of spilled oil. However, we did develop some concepts and designs for open-sea skimmers, and sponsored a project which demonstrated the capabilities of a promising skimmer design to perform effectively in the sea. This type of skimmer was subsequently acquired by some of our cooperatives and by many U.S. Navy facilities.

We sponsored design and performance studies on containment booms -- including a novel water-jet boom.

We conducted a field feasibility study on a concept for recovering oil-soaked absorbents from the surface of the sea. Based on this study, an engineering design for an absorbent recovery vessel was developed.

API's primary contribution to oil spill control technology was our sponsorship of the development of methods for the application of dispersants by air. Such methods are now commonly used in spill response procedures. Engineering field studies on optimum droplet size for delivery of dispersants by air were performed, using five different aircraft and four types of dispersants.

MARINE TOXICOLOGY OF OIL

API has been a leader in studies on the fate and effects of crude oils and refined products in the marine environment. Laboratory studies on the toxicity of oils and their components towards a wide variety of marine life commenced in 1970 and continued for about 10 years. The results of this work provided industry and academia with the first comprehensive data bank on the toxicology of hydrocarbons to marine organisms, and on the relative toxicities of dispersed versus undispersed oils.

Significantly, we found that, although petroleum hydrocarbons are absorbed rapidly by fish and shellfish, they are also rapidly eliminated in an oil-free environment. Based upon this data, there appears to be little or no food-chain bioaccumulation of oil in marine organisms.

FATE/EFFECT OF OILS VERSUS DISPERSED OILS

We have sponsored a series of controlled oil spill scientific studies at various coastal locations (New England, New Jersey, Southern California, and Panama) which have provided important data on the fate (behavior) and biological effects of dispersed versus undispersed crude oils under actual spill conditions in a variety of environments. Such information is the basis for decision-making on the deployment of dispersants at spill sites -- and the basis for API's advocacy of the use of dispersants as our first (and probably our best) response tool to combat major oil spills.

We have also sponsored interesting and valuable studies at the University of Washington on the effects of dispersed and undispersed Prudhoe Bay Crude oil on the homing abilities of salmon (their capability to return to their freshwater spawning grounds). These studies have shown that short-term (but realistic) exposure of salmon to either form of oil does not impede their homing ability. A copy of a peer-reviewed paper on these studies is attached for the record (Attachment B).

CHRONIC EFFECT OF OIL POLLUTION

We have taken advantage of two available natural field "laboratories" to study the effects of long-term (chronic) exposure of marine communities to crude oils. Field studies at Coal Oil Point (California), the site of natural seepage of petroleum over many centuries, revealed a great abundance and variety of sea life despite their perpetual exposure to tarry oils. Another study of the shores of Bermuda, which are impacted by tarry oil discharged from nearby tanker routes, revealed that most of the species were not affected by the tar. However, minor effects on the growth rates of two kinds of snails were detected.

The Subcommittee has expressed interest in the development of methodologies for assessing the effects of oil spills on natural resources. API has sponsored a number of workshops on this subject, and published detailed procedures for:

- Monitoring ecological effects and recovery.
- Monitoring chemical fate of spilled oil.
- Monitoring the impacts of oil spill cleanup procedures.

A copy of the API report, "Oil Spill Studies: Measurement of Environmental Effects and Recovery," is attached for the record (Attachment C).

We have also addressed the economics of measuring damages to natural resources. A copy of a recent report, "Measuring Natural Resource Damages: An Economic Appraisal," is attached for the record (Attachment D).

One of the more important studies performed by API was the identification of oil spill cleanup methods designed to minimize adverse ecological impacts in diverse environments. A field manual published by API, "Oil Spill Response - Options for Minimizing Adverse Ecological Impacts, is used world-wide as a guide to the design and execution of oil spill response plans.

INFORMATION DISSEMINATION

Over the years, API has sponsored or cosponsored a series of workshops, seminars and conferences on topics related to oil spill issues: effects of major spills, procedures for studying spill effects, natural resource damage assessments, ecological impacts of oil spill cleanup and oiled bird rehabilitation.

We have also been cosponsors of the important API-EPA-U.S. Coast Guard biennial oil spill conferences. These conferences commenced in December 1969 and have just completed 20 years of information dissemination activities. The 11 sets of Conference Proceedings provide the prime source of information on all oil spill-related issues and technology.

EFFECTIVENESS OF CLEANUP TECHNOLOGY

Traditionally, industry and government have relied primarily upon containment, physical recovery, and shoreline cleanup to respond to oil spills in the United States. Since the late 1960s, significant expansion of research and development have improved spill response, including response technology, such as the design of boom and skimmer systems, suitable sorbent materials, and response planning.

Speed and decisiveness are critical in limiting the damage when spills occur. Oil spill technology -- no matter how advanced -- becomes less effective the longer it takes to apply it to a spill.

Booms and skimmers are most effective in moderate seas and in moderate surface currents. Sorbents are most effective as a polishing method to remove small amounts of oil from quiet water surfaces or from shorelines. But even with ideal wind, wave and current conditions, mechanical control is, at present, most effective on spills in harbors and sheltered areas. For these types of spills, we believe that current technology has been shown to be adequate provided it is available to be deployed quickly and trained workers are available. For example, booms and skimmers were used very effectively during the response to the ARCO Anchorage oil spill in Port Angeles, Washington harbor in 1985. Fortunately, weather and sea conditions permitted effective use of the equipment and, of the 5,690 barrels spilled, 3,126 bbl were ultimately recovered.

Industry spill cooperatives, industry spill response resources and private contractors have a generally excellent record in handling the smaller, inshore spills which make up the overwhelming majority (95%) of all spill incidents.

A realistic appraisal of the U.S response to catastrophic spills recognizes that no effective containment of such spills has been

accomplished. Neither the industry nor the government has the equipment or response personnel in place and ready to deal with catastrophic tanker spills. By "catastrophic" we mean a spill of 200,000 barrels or more. Particular problems result from large spills in open water. The effectiveness of any available technology is dependent on a number of factors relating to the actual spill situation, including time of day, weather, sea conditions, physical properties of the oil, location, logistics and safety considerations. For example, as seas approach 6 to 8 feet, much of the currently-available equipment becomes ineffective and deployment becomes difficult and dangerous. Tides, currents, wind and wave action often cause the oil to move in unpredictable directions, thereby rendering use of booms difficult and ineffective.

For these reasons, API believes that the use of chemical dispersants should be a primary response option for major offshore oil spills. Dispersants offer a number of advantages over the use of mechanical treatment alone in many situations. In fact, a 1989 National Academy of Sciences study, (sponsored by 13 government agencies) recommends that "dispersants be considered as a potential first response option to oil spills along with other response options." However, hesitation in deploying dispersants after a major spill persists partly because of the adverse publicity received during the crude oil spill from the tanker Torrey Canyon in 1967. The misuse of improper chemicals (solvent-based cleaners) at that time caused adverse biological effects on intertidal organisms and delayed recovery from the spill.

Since that time, low-toxicity dispersant formulations have been developed specifically for oil spills, and much has been learned about proper application methods and the fate and effects of chemically dispersed oils.

Advantages of Dispersant Use. Chemical dispersion breaks a surface slick into small droplets which mix principally in the upper few meters of the water column. The following advantages result:

1. Accelerated removal of volatile hydrocarbons, thereby quickly reducing biological toxicity.

2. More rapid biodegradation than occurs with untreated oil, which can end up as tar balls and be washed above.

3. Rapid dilution of the oil; only dilute concentrations of dispersed oil can reach shorelines, in contrast to thick layers from untreated slicks.

4. Reductions in oil sedimentation, adhesion to organisms in surface waters, and toxicity to birds.

5. Prevention of water-in-oil emulsions ("mousse"), which would increase the volume of oil and the difficulty of mechanical cleanup.

6. Rapid aerial application, which can control much larger oil spills than can mechanical methods, and can be done when sea states impede the use of booms and skimmers.

Disadvantages of Dispersant Use. Treating oil slicks with dispersants also has some disadvantages that will result in:

- Temporary higher local concentrations of dispersants and dispersed oil in the water column and therefore,

- Increased short-term exposure of water-column organisms to dispersed oil.

When adverse effects occur, however, they appear to be less severe and affect a smaller percentage of the total population than when untreated surface oil concentrates on a shoreline or in a biologically sensitive area, such as a marsh. The decision to use or not use dispersants in a given spill situation always

involves environmental trade-offs. The relevant comparison is not between the effects of dispersed oil versus no oil at all. Rather, it is between the fate and effects of dispersed oil versus the fate and effects of untreated oil. In general, the trade-off is between the short-term effects of dispersed oil in the water column versus the longer-term effects of oil on shorelines and the nearsnore sea bottom.

Field studies conducted by API show that dispersed oil, even in nearshore shallow waters, caused fewer adverse effects than occurred if untreated oil reached shorelines. An API publication, The Role of Chemical Dispersants in Oil Spill Control, is included for the record (Attachment E).

Dispersant Effectiveness. Both laboratory and controlled oil spill field studies have demonstrated the effectiveness of modern dispersants and the rapid dilution of dispersed oil in the sea to non-toxic levels. Factors influencing dispersant effectiveness include oil properties, environmental conditions (water salinity, temperature, and sea state), and dispersant formulation, application method, and dosage. The most significant factor is the oil properties. For oil viscosities below 5000 centistokes, which includes most oils, laboratory and field studies indicate that dispersants are effective. Low water temperatures may increase oil viscosity. Viscosities also increase with the loss of volatile hydrocarbons and with the formation of "mousse". Slicks therefore should be dispersed as soon as possible -- before these changes occur.

In conclusion, dispersant use is subject to many of the same constraints as mechanical equipment and, to be effective, must be applied soon after the spill. However, with proper pre-planning and the availability of aircraft, we can respond to a large spill in much less time by using dispersants rather than by deploying booms and skimmers alone.

FUTURE OILSPILL RESEARCH AND DEVELOPMENT

Having outlined some of the past achievements and contributions of the API research program, and discussed the effectiveness of current cleanup technology, I shall now address some of the industry's plans for future research and development in this area.

Key industry recommendations which should assist in preventing spills from tankers through changes in tanker operations/management are given in the aforementioned API task force report issued in June 1989 (Attachment A).

Those items cited which call for future R&D efforts are:

- Development of a shipboard oil spill response capability; investigation of feasible and safe techniques.

- Study of potential changes in vessel configuration and construction, e.g. ballast sides, smaller tank sizes, double bottoms.

The frustrations inherent in trying to contain and recover oil at sea and, in attempting shoreline cleanup, show the need for new technology, which can be developed through more research and development on all aspects of oil spills.

API has agreed to fund half of a $6 million joint research effort with the Department of the Interior on oil spill technology. This program could provide important advances in our oil spill cleanup capabilities. API is recommending to the Department of Interior that the scientific community be involved in this

research program to obtain the widest possible consideration of innovative research concepts and to ensure scientific credibility.

In addition, under the new industry program proposed in June 1989, the Petroleum Industry Response Organization (PIRO) would administer an industry-funded, five-year research budget of $30 to $35 million to be used by industry, government and academia. The PIRO program concentrates on the following goals:

1. Preventing loss from/away from ship. Keeping oil losses to a minimum and keeping those losses close to the vessel is a logical way of limiting the overall spill size. However, dealing with a very large spill would also divert crew attention from saving the ship and its remaining cargo. And retaining volatile spilled oil close to a stricken vessel could endanger the crew, the cargo and the vessel. Keeping these risks in mind, the industry will sponsor research on mechanical boom deployment to allow greater initial oil recovery and to minimize environmental damage.

   The industry will also sponsor research in chemical booming using gels or other thickening agents at the edge of a spill and means to retard or halt the loss of oil from a ruptured tanker.

2. Offshore oil recovery and treatment. More research is needed in recovering and treating oil after it begins to spread but before it reaches shore. Dispersants that help oil slicks to biodegrade in the water are a way to reduce the environmental impact without themselves harming wildlife, fish or beaches. Further toxicity studies of marine life are needed as well as information programs to gain greater acceptance among the public and regulators for the use of dispersants. Studies

are also needed on the effectiveness of using sorbents, gels and elastomers for immobilizing or thickening oil to reduce spreading.

Booming and skimming also require further study. Making booms less vulnerable to strong currents, ice and natural vegetation (e.g. kelp), for example, would improve their effectiveness; and storage systems need to be improved on skimmers. Spill tracking and remote sensing of spill properties would also help in containing and cleaning up oil on water.

3. Preventing and reducing shoreline impact. Oil on shorelines causes the most environmental damage and is hardest to clean up. However, there are some promising research opportunities. Mechanical or adsorbent boom research is needed, as well as further study of chemical treatments that would be effective in removing viscous water-in-oil emulsions or "mousse" and inpreventing oil from coating the shore. "Mop-up" techniques, water washing and steam cleaning also need to be better researched.

A promising method of breaking down oil on the shoreline is to accelerate the natural biodegradation of nature. This technique, known as bioremediation, is already used in refinery and petrochemical wastewater treatment, and it could prove to be the least damaging and least costly way to restore shoreline biota following a spill. The industry will devote substantial funding to bioremediation studies, with emphasis on following up leads provided by current studies in Prince William Sound.

Handling and disposing of oily debris and waste oil/emulsion from a major spill is a large task. The industry recommends that contingency plans address which shoreline cleanup

techniques will be used for which types and sizes of spills, so that plans can be made to dispose of debris and waste oil by burning, landfilling or other means.

4. Fate and effects of oil in the environment. Once released into the environment, oil and other hydrocarbons undergo physical, chemical and biological changes. These changes help determine oil's environmental impacts and suggest ways for cleaning up spills and reducing their effects. What happens to oil when it evaporates is important, since evaporation typically removes 30 to 50 percent of a spill. The formation and behavior of viscous water-in-oil emulsions or "mousse," transport of oil droplets in the water column and transfer of oil to sediment are also important issues that research can help to illuminate.

   Oil's fate and biological effects also need further study. Although much is known about oil's fate and effects on adult wildlife, the industry plans to sponsor some additional research in selected areas, e.g. on lower life forms and larval stages. The impacts of oil on microorganisms, eggs and larval stages and plant life are important in assessing whether fish and wildlife populations will eventually suffer adverse effects. More data on arctic and tropical ecosystems need to be collected, especially in areas near petroleum operations or transportation routes.

5. Reducing spills' impact on wildlife. Whenever oil is spilled, it has the potential to affect wildlife, including birds and mammals such as sea otters and seals.

   In some cases it appears that attempts to capture and clean wildlife cause more damage than their exposure to the oil.

More information on capture, cleaning and handling of wildlife is needed, as well as study of the acute effects of oil ingestion or absorption through the skin.

6. Health and safety. People can be exposed to spills by breathing air, drinking water or eating food that contains hydrocarbons from a spill, or by direct exposure in cleaning up a spill. Public health issues connected with these exposures need to be identified, airborne exposures need to be quantified and worker hygiene guidelines need to be evaluated.

7. Additional Studies on Experimental Oil Spills. It is important to demonstrate the effectiveness of emerging oil spill control technology by means of field studies on experimental oil spills. Whether such new technology involves booms, skimmers, dispersants, other oil property modifiers, or in-situ burning, operational testing/ demonstrations under actual field conditions are essential prerequisites to their development and acceptance as response tools. Efforts will be made to obtain necessary permits, to design meaningful exercises, and to perform oil spill studies on promising control techniques. The federal government should facilitate such field studies by directly participating in them.

8. Dispersant Field Studies. API has identified a number of research needs related to the effectiveness of dispersants and the behavior (fate) and effects of dispersed oil. These include the following:

- Long term effects of dispersed vs. undispersed oil in nearshore sensitive habitats and ecosystems. Studies on this important subject have been performed but additional data are needed on effects for periods up to about 3 years after exposure.

- Measurement of dispersant effectiveness following use in actual oil spills. Whereas there are much laboratory data on the effectiveness of dispersants, data on their performance on actual spills are limited. Field effectiveness test methods are now available and should be used to seek correlations with actual effectiveness as measured at sea.

- Dispersibility of thick oil slicks. Prior studies and dispersant application guidelines have been limited to thin oil slicks (1 mm or less). Laboratory and test tank studies are needed on the stability of dispersing thick oil slicks which may result from rapid release of oil from ruptured tankers in calm seas.

- Physics and chemistry of dispersed oil. Data are needed on the rates of weathering, degradation, sedimentation and rising resuspension of dispersed oil.

- Use of surfactants for shoreline restoration/cleanup. There is a need to document the results of prior efforts to clean up oiled shorelines by use of dispersants surfactants, and to do additional laboratory and field studies on this subject.

I have only outlined the industry's plans to augment oil and spill response effectiveness through research. A more complete

program projection is given in the June 1989 API task force report. This is summarized in the table titled OUTLINED R&D PROGRAM FOR PIRO attached for the record (Attachment F).

In conclusion, I wish to express the desire and intent of the petroleum industry to work with all federal agencies and the scientific community to plan and initiate future research and development efforts to increase the nation's ability both to prevent oil spills and to respond effectively to any which may occur. Industry/government cooperation in this areas will help us to avoid ill-considered programs and duplication of effort.

Secondly, in developing new technologies to deal with oil spills, it is important to conduct parallel activities assuring that the new technologies will be acceptable to the regulatory agencies. It makes little sense to develop techniques if their subsequent use is not permitted.

Most important in such a joint commitment will be a major effort to achieve a rapid decision-making process at the site of any major spill. Regardless of the superiority of any containment/cleanup scheme which may result from R&D and from PIRO's projected increased capability to respond to catastrophic spills, delays caused by indecision when a spill does occur represent the major obstacle to successful containment and cleanup before the spill can reach the shorelines. We look forward to working aggressively with federal, state and local governments towards achieving this important goal.

Mr. McMILLEN. Thank you very much.

I will now go to Dr. Teal.

Mr. TEAL. Does that buzzer make any difference?

I'd like to concentrate on talking about how basic knowledge about the effects of oil spills, especially the long-term effects can guide our efforts in trying to mitigate damage from spills. And I will talk this morning about three categories of problems: the effect on normal ecosystem processes at the boundary between sediments and water; the effects on long-lived species, and the exchange of scientific information after an oil spill.

The boundary between the water and the bottom is the most critical area for understanding the long-term effects of oil on the marine environment. Oil is fairly rapidly degraded in the water column and in surface sediments containing oxygen. The organisms—microbes—that degrade hydrocarbons are present virtually everywhere in the oceans and I believe populations can develop quite rapidly to degrade oil after a spill without any seeding of microbes.

The addition of nitrogen and phosphorous fertilizers can speed up oil degradation under laboratory conditions but this result hasn't been demonstrated adequately in the field under conditions of a real spill.

But once oil gets down into a beach, into a marsh, into subtidal sediments below the depth to which oxygen is available to support degradation, it can persist for decades and can slowly leak back into the water.

The knowledge of the effects of this oil stored in sediments over long periods is poor, but it's essential for proper response to oil spills.

There are various mechanisms by which oil can get into sediments. Examples are mixing with sediments in shallow water followed by offshore transport or incorporation into fecal pellets through the feeding of small animals and the fecal pellets sinking to the bottom.

The circumstances and, therefore, the extent of incorporation into sediments are different for each spill. It should be a goal of research in oil spills to determine what we call a mass balance for the fate of the oil, that is, find out where it all goes rather than being able to account for a small percentage of it and wonder what happens to the rest of it.

We still do not have sufficient information about the mechanisms by which oil gets to and into the sediments and, therefore, how much oil from any given spill can be expected to reside in this persistent reservoir.

Once in the sediments, there are a whole series of questions that I feel need to be answered.

To what extent is the stored oil mobilized by the resident animals that burrow into the sediments and pump water through them?

What's the effect of higher plants that extend their roots into sediments and transport oxygen?

Are animals more effective in remobilizing oil or are their activities, by increasing oxygen supply to sediments, more important in stimulating degradation of oil and reducing its long-term effects?

Most of what we—of the little that we do know about the interaction between bottom animals and oil is for the more abundant small burrowers that live close to the surface.

What's the relative importance of the deep burrowers, the generally larger animals that can dig to depths of several feet?

Of what significance is the health of the animals and the plants living in the sediments to the rate of oil degradation? Another way of saying that—is the effect of the oil on the organisms more important than the effect of the organisms upon the oil?

Answers to these questions will help to distinguish between long-term effects which were due to the original acute effects at the time of the spill, and subsequent chronic exposure to spilled oil that was trapped in local sediments.

We know that as oil is degraded, the first intermediate stages in the change from hydrocarbon to carbon dioxide and water can frequently be more toxic than the original hydrocarbons were. There are indications that these intermediate stages themselves can be long-lived in sediments. We can do no more than speculate their—about their environmental consequences. Even the basic chemical methods for the analyses of these compounds are poorly developed.

Answers to all of these questions are necessary to tell us what the potential long-term effects of oil in these environments will be. They will also suggest the most appropriate ways to clean up those environments if they become contaminated and how important it is to protect them, possibly even at the expense of others.

We know a great deal about the immediate effects of oil on organisms in the water. What of the long-lasting but subtle effects whose results may not be apparent until the oil is gone?

We must be concerned about the relative importance of, and the ability to distinguish between long-term effects that result from a slow recovery from initial oiling, and a slow recovery exacerbated by continued exposure to low levels of residual oil still in the environment.

The problems of understanding the effects of oil spills on the population size of most species of commercial fishes are enormous because of the lack of understanding of what controls their population size under normal circumstances.

Detecting the effects of a spill upon such populations is so difficult, particularly considering sampling problems—that it is knowing how many fish are out there—but I feel this topic should be left principally in the hands of the agency devoted to this purpose, the National Marine Fisheries Service.

But there are a good many other questions about fish and oil that are more readily solvable and appropriate research topics for the entire research community. For example, fish develop biochemical mechanisms within their bodies to detoxify oil when they come in contact with it. And they thus—

Mr. McMILLEN. Dr. Teal, I don't mean to interrupt, but we have a vote on the Floor of the House right now. And I would ask that we recess the hearing for 10 minutes to allow me to go vote and I'll be right back.

Thank you. I'll be back in about 10 minutes.

[Recess.]

Mr. McMILLEN. I will call the hearing back to order. Just to remind the witnesses to try to condense your statements as much as possible so that we can finish up our questions in a timely fashion.

Dr. Teal, you were just finishing up your statement, and I will recognize you again.

Mr. TEAL. Thank you.

It would be very useful to note to what extent fish exposed to oil spills of various types and treated in various ways but apparently unaffected by the oil—that is, not coated or tainted—have actually contacted enough oil to activate their defenses against it. This information would, in turn, let us know how important it is to look for other long-term effects such as effects on breeding potential. In the case of other long-lived species, such as birds and mammals, we have a better understanding of the short-term effects of spills. We still have a very poor idea of the possible long-term effects of having contacted oil and recovered.

On their long-term breeding potential, for example, if contact with oil can reduce the fertility of an individual that otherwise seems completely recovered, then that individual could have a long-term deleterious effect on the population as a whole by preventing the breeding of potential replacements who are unaffected by the oil. Long-term effects would be especially great in animals which reproduce slowly or take a long time to grow to maturity.

Obviously, research into long-term effects takes a long time to achieve results. It's now difficult to conduct such research. Research funding for a project lasting for more than a few years is rare. Projects which take a long time to return results have reduced attractiveness to scientists who must contribute regularly to the scientific literature if they are to stay in business. This is especially true for bright young scientists at critical stages in their careers. These two aspects—difficult funding and long period of effort necessary before results can be published—discourage some of our better scientists from embarking on long-term studies. We badly need additional mechanisms to encourage long-term studies by our best scientists, studies in the ecosystems out where things are actually happening.

Finally, with regard to information exchange, consider the Exxon Valdez spill. A large amount of money has been spent on investigating the effects of this spill and assessing the damage. For the long-term studies that are to be done, it is essential that appropriate information gathered at the time of the spill be available so we can get the maximum amount of information from the results of the long-term studies. It also seems common sense that the best studies and the best damage assessment could be done with free exchange of all the information being gathered by all the scientists involved.

As things stand, the scientific results of studies have been jealously guarded by all sides in the controversy, with the result that I feel the public is not served as well as might be. Damage assessment studies must begin at the time of the spill. If a study is left out, if information is not gathered because scientists cannot talk to each other about their results, then that information will never be available. The long-term assessments may be reduced in value be-

cause of the lack of information about what occurred immediately after the spill.

I believe we do a serious disservice to ourselves by concentrating so much on placing blame and not enough on preventing and mitigating damage, which requires better knowledge of what the long-term effects of oil really are upon the ecosystems that they affect.

[The prepared statement of John M. Teal follows:]

Testimony of
John M. Teal
Senior Scientist
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

I would like to thank the subcommittee for this opportunity to testify concerning to H.R. 3027, the "Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989".

It is clear that the best way to prevent environmental damage from an oil spill is to prevent spills from occurring in the first place. But spills will occur in spite of our best efforts to prevent them. (Accidents occur in the airline industry where we spare no effort to make them as unlikely as possible.) When oil spills do occur, the results can be catastrophic in the immediate area of the spill. The way to minimize that damage is to have clean-up be as complete and rapid as possible and to recover and remove the oil from the water surface before it can reach other parts of the ecosystem, especially the shores and sediments. Our clean-up techniques have developed little in the last two decades and we need to invest considerable effort in improvement of these techniques, especially as suggested above in techniques for removing oil rapidly from the surface, ways of dispersing it into the water under favorable circumstances, environmentally safe ways of burning the oil before it can reach the shore or the bottom. I would like to emphasize as others have, that the most important aspect of cleanup to minimize environmental damage is to get the cleanup process moving as quickly as possible after the spill occurs. As oil weathers it rapidly becomes more difficult to remove, to disperse, and to burn. It also has just that much more time to contact the bottom, the shoreline, and organisms where it can do further damage.

I would now like to address how increases in basic knowledge about the effects of oil spills, especially their long-term effects can guide our efforts in trying to mitigate damage from spills. I will address several categories of problems:

1) the effects on normal ecosystem processes at the boundary between sediments and water,

2) the effects on long-lived species,

3) the use of dispersants, and

4) the exchange of scientific information after an oil spill.

1) Ecosystem processes at the boundary between water and the bottom.

The boundary between the water and the bottom is the most critical area for understanding the long term effects of oil upon the marine environment. Oil is fairly rapidly degraded in the water column and in surface sediments containing oxygen. The organisms that degrade hydrocarbons are present virtually everywhere in the oceans and I believe populations can develop quite rapidly to degrade oil after a spill without any seeding of microbes. The addition

of nitrogen and phosphorus fertilizers can speed up oil degradation under laboratory conditions but this result has not been demonstrated with sufficient degree of certainty in nature under conditions of a real spill.

But once oil gets down into beach, marsh or subtidal sediments below the depth to which oxygen is available to support degradation, it can persist for decades and slowly leak back into the water. Knowledge of the effects of this oil, stored in sediments over long periods, is very poor but is essential for proper response to oil spills. There are various mechanisms by which oil can get to and into sediments. Examples are mixing with sediments in shallow water followed by offshore transport and incorporation into fecal pellets through the feeding of small animals. Circumstances (therefore the extent of incorporation into sediments) are different for each spill. It should be a goal of research in spills to determine a mass balance for the fate of the oil, i.e. find out where it all goes. We have never achieved this but it would be a valuable piece of information for spill cleanup and damage assessment. We still do not have sufficient information about the mechanisms by which oil gets to and into sediments and therefore how much oil from any given spill can be expected to reside in this persistent reservoir.

Once in sediments, to what extent is the stored oil mobilized by resident animals which burrow into and pump water through the sediments? What is the effect of higher plants that extend their roots into the sediments and transport oxygen into the sediments? Are animals more effective in remobilizing oil or are their activities, by increasing oxygen supply to sediments, more important in stimulating degradation of oil and reducing its long term effects? Most of what little we do know about interactions between bottom animals and oil is for the more abundant burrowers that live close to the surface. What is the relative importance of deep burrowers, the generally larger animals that may dig burrows down to depths of several feet? Of what significance is the health of the animals and plants living in the sediments to the rate of oil degradation, i.e. is the effect of oil on the organisms more important than the effect of organisms upon the oil? Answers to these questions will help to distinguish between long term effects that were due to the original acute effects at the time of the spill, and subsequent chronic exposure to spilled oil that was trapped in local sediments.

We know that as oil is degraded, the first intermediate stages in the change from hydrocarbon to carbon dioxide and water can be more toxic than the original hydrocarbons. There are indications that these intermediate stages themselves can be long lived in sediments. We can do no more than speculate about their environmental consequences. Even the basic chemical methods for the analyses of these compounds are poorly developed.

Answers to these questions are necessary to tell us what the potential long term effects of oil in these environments will be. They will also suggest the most appropriate ways to clean up these environments if they become contaminated and how important it is to protect them, possibly even at the expense of others.

2) Long-lived species.

We know a great deal about the immediate effects of oil upon organisms in the water. What of long lasting but subtle effects whose results may not be apparent until the oil is gone? We must also be concerned with the relative importance of, and ability to distinguish between, long term affects that result from a slow recovery from the initial oiling, and slow recovery exacerbated by continued exposure to low levels of residual oil still in the environment.

Oil spills unquestionably affect growth and reproduction of the marine animals that contact the spilled oil but linking those effects with large scale impacts on fisheries or ecosystems is extremely difficult. The problems in understanding the effects of oil spills on the population size of most species of commercially valuable fish are enormous because of the lack of understanding of what controls their population size under normal circumstances. Detecting the effects of a spill upon such populations is so difficult, particularly considering sampling problems (knowing how many fish are out there), that I feel this topic should be left principally in the hands of the agency devoted to this purpose, the National Marine Fisheries Service. I have no doubt they will welcome any additional support for this task.

There are other questions about fish and oil that are more readily solvable and that are appropriate research problems for the entire research community. For example, fish develop biochemical mechanisms within their bodies to detoxify oil if they come into contact with it and they thus carry a signal or biomarker that show whether they have contacted spilled oil. It would be very useful to know to what extent fish exposed to oil spills of various types and treated in various ways, but apparently unaffected by the oil (not coated or tainted), have actually contacted enough oil to activate their defenses against oil. This information would in turn let us know how important it is to look for other long term effects such as effects on breeding potential.

In the case of other long-lived species, such as birds and mammals, we have a better understanding of the short term effects of spills. We still have a very poor idea of the possible long-term effects of having contacted oil and recovered, (either by themselves or with human help), on their long-term breeding potential. For example, if contact with oil can reduce the fertility of an individual that otherwise seems completely recovered, then that individual could have a long-term deleterious effect on the population as a whole by preventing the breeding of potential replacements who were unaffected by oil. Long-term effects would be especially great in animals which reproduce slowly and/or take a long time to grow to maturity.

3) Dispersants.

I feel it is important in talking about the tools we have to use for oil spills to emphasize the potential importance of dispersants to minimize damage. I must also state that our poor understanding and limited range of low-toxicity dispersant chemicals prevent our making the best use of these potentialities. First we need more effective dispersants whose toxicity remains at the low level of those now available. Other testimony will address that better than I can. I point out that there are definitely circumstances in which the efficient use of effective dispersants would minimize damage. If spilled oil can be rapidly diluted by chemically dispersing it into a large volume of water, its concentration will be reduced to low enough values that it will have minimal effects. It will also have a much larger surface area than it would have in a slick which should enhance its chances of being degraded by microorganisms in the water. But any decision to use dispersants is still inhibited by lack of understanding of the behavior of chemically dispersed oil, especially in relation to physically dispersed oil, i.e. oil that is dispersed by wave action and other natural processes. We need to know considerably more about the differences between chemically and physically dispersed oil concerning the likelihood of the particles of oil adhering to objects in the water such as planktonic organisms which include young fish and their food, and to sediments. In sediments spilled oil can be preserved for years or decades and thus could have damaging effects for long periods. We know that physically dispersed oil will stick to sediments but there is a little evidence that chemically dispersed oil does so to a lesser extent. But the evidence is not strong enough for managers to feel confident in deciding to use dispersants and many still believe that the use of dispersants will do more harm than good.

4) Support and information exchange

Obviously research into long term effects takes a long time to achieve results. It is now difficult to conduct such research. Research funding for a project lasting more than a few years is rare. Projects which take a long time to return results have reduced attractiveness to scientists who must contribute regularly to the scientific literature if they are to stay in business. This is especially true for bright, young scientists at critical stages in their careers. These two aspects, difficult funding and the long period of effort necessary before results can be published, discourage some of our better scientists from embarking on long term studies. We badly need additional mechanisms to encourage long term studies by our best scientists in the ecosystems out where things are actually happening.

With regard to information exchange consider the Exxon Valdez spill. A large amount of money has been spent on investigating the effects of this spill and assessing the damage. For the long term studies it is essential that appropriate information gathered at the time of the spill be available so that we can get the maximum amount of information from the results of the long term studies. It also seems just common sense that the best studies and the best damage assessment could be done with free exchanges of all the information being gathered by all the scientists involved. As things stand, the scientific results of studies have been jealously guarded by all sides in the controversy with the result that the public is not served as well as might be. I was told that it is the Congress that has, through legislation, required the restrictions on free exchange of information because of the Natural Resource Damage Assessment requirements under CERCLA. Damage assessment studies must begin at the time of the spill. If a study is left out, information not gathered, because scientists cannot talk to each other about their results, then that information will never be available. The long term assessments may be reduced in value because of the lack of information about what occurred immediately after the spill.

Mr. McMILLEN. Thank you very much.

Dr. Guest?

Mr. GUEST. Thank you, Mr. Chairman.

I represent MarineSafety International. We operate the computer-aided operations research facility, better known as CAORF, which is principally a maritime research simulator owned by the Maritime Administration, located at the U.S. Merchant Marine Academy in the district of the Honorable Congressman Scheuer, the Chairman of this subcommittee.

My statement this morning will be about simulator-based maritime training and research as they apply to oil spill prevention. It seems that there's much to be done in researching how oil spills can be cleaned up and how their negative effects can be mitigated, but no large spills have ever been completely cleaned. Some oil is recovered. The rest of the oil settles to the bottom, where it's in the rocks, in the sand, or in the ecosystem, as Dr. Teal pointed out, for years.

This hearing specifically addresses oil spill cleanup, but I submit that an ounce of prevention is worth a million gallons of cleanup, and we need to address the idea of oil spill prevention. My proposition is that oil spills resulting from tanker accidents can be prevented, and I have two points I would like to make which are in my written statement—that is, oil spill prevention can be greatly assisted by the rigorous application of simulator-based maritime training, and the second point, like the first, that oil spill prevention can be greatly assisted by the rigorous application of similator-based maritime research.

The first point, I would like to make a comment that ten years ago the Amoco Cadiz went aground on the north coast of France, spilled four times the oil that the Amoco—that the Exxon Valdez spilled when it went aground on Prince William Sound.

The media coverage of those events sound the same, as do the responses from the maritime and regulatory bodies, the Government agencies, and I had to ask myself, are things the same a decade later. They are not. I think there's at least two differences that I can point to.

First is that the number of tanker accidents worldwide has decreased over the last ten years, each year for the last ten years. In 1979, there was a post-World War II high in tanker accidents. There were at least 36 accidents worldwide that resulted in a spillage of oil of more than one-quarter million gallons each. In 1988, that had been reduced to 11 accidents. So the record for tanker accidents and the resulting large spills has gotten better over the decade.

The second thing I can point to is that the number of simulators and simulator-based training that has gone on in the world has increased dramatically over the last ten years. Now, it would be unscientific to say that there's a correlation between those two, except that there is an analogy that I can draw from the experience in the air industry.

Our parent company, Flight Safety International, that has been doing training—simulator-based training for 40 years, nearly 40 years, can show from its history that aircraft pilots, aviators who

train to proficiency on simulators, have fewer accidents than those who do not so train.

At issue, then, this first point is that in the maritime industry in the United States no ship's pilot, master or officer has to demonstrate proficiency to a regulatory agency in the task of ship handling or piloting, unlike aircraft pilots or truck drivers. Persons engaged in handling and piloting tankers have to give documented evidence of a minimum experience, and they have to take a pencil/paper exam, but they do not have to demonstrate proficiency by performance.

Research in the application of simulators to training and certifying of ships' officers was conducted at CAORF from 1978 to 1985. That was seven years of work. It was jointly funded by the Maritime Administration and U.S. Coast Guard. Each agency spent over a half-a-million dollars during that time. The research indicated a definite role for simulators in the training of ships' officers and pilots in the dynamic training for maneuvering decision-making. That research basically is unfinished and unapplied as of the time of the Exxon Valdez. MSI then, the operators of CAORF, what we propose is that the Coast Guard require present standard pilot and ships' officers training to be supplemented with simulator training which would culminate in a person being certified after he or she had demonstrated proficiency in ship handling and piloting. Along with that, we feel that there should be periodic refresher recurrent training and training for transition of pilots and masters and ships' officers from smaller ships to larger, new, or unwieldy ships.

Mr. Chairman, House Bill 3027, section 203, requires training and periodic drills to "demonstrate continued effectiveness and readiness of oil response teams." We agree with that concept. Having the response teams at the ready without having ships' personnel at their highest efficiency, however, is somewhat akin to requiring morgue employees to take refresher accounting courses in order to more efficiently count bodies, while not requiring doctors to have the knowledge of anything more modern than leeches. Oil prevention is really at the crux of—cleanup is the problem of oil prevention. So my second point is that we need rigorously applied, simulator-based research. And here there's two initiatives that I would point out.

The first is that I mentioned training research that was conducted at CAORF from '78 to '83. We think that that kind of research needs to be continued to establish valid measures of proficiency in those who are charged with the movement of large oil tankers.

The second initiative is that there's a need to develop and validate a pool of geographic simulator databases for U.S. ports and waterways, those waterways which are environmentally sensitive or have high ship traffic rates. Some areas which come to mind besides Valdez in the Prince William Sound area are Naragansett Bay, where the World Prodigy ran aground, Galveston Bay Channels, Puget Sound, Norfolk/Hampton Roads area, Long Island Sound. These are sensitive and highly trafficked areas.

These databases, which we recommend in our research program, would be used for the preparation and maintenance of oil spill response plans, training response teams, and most of all, for training

tanker personnel. Also, of course, these databases would assist in the execution of studies required by this bill 3027.

I could mention some of them. The vessel traffic service, evaluation study, vessel control of—vessel control by vessel traffic services—that's in section 205. Navigation risks in sensitive areas, mitigation, a study recommended by 3027. Qualification of bridge officers on tankers, and the study regarding tanker free zones around the country. Those would all be served by such a research project.

Although we're talking about oil spill cleanup, I think that oil spill prevention has to be addressed, and we sincerely believe what we discussed here will help prevent major oil spills. It's a sad lesson, but the lesson of the Valdez is that an action at sea can have as great or greater negative effect on our Nation's economy than air disasters. Ongoing training and testing of air pilots has been routine in order to ensure air safety. There's been lots of research done. We must make safety on our seas a priority, using technology of today and not rely on the policies of the past.

Thank you, Mr. Chairman.

[The prepared statement of F. Eugene Guest follows:]

THE USE OF SIMULATOR TECHNOLOGY AND RESEARCH IN THE PREVENTION OF OIL SPILLS

STATEMENT BY DR. F. EUGENE GUEST,
DIRECTOR
COMPUTER AIDED OPERATIONS RESEARCH FACILITY
MARINESAFETY INTERNATIONAL
NATIONAL MARITIME RESEARCH FACILITY

BEFORE THE SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

September 7, 1989

25-550 O - 90 - 8

Good morning, Mr. Chairman. I am Dr. Eugene Guest, Director of MarineSafety International, the company which operates the MARAD owned Computer Aided Operations Research Facility (CAORF). I am pleased to have the opportunity to testify on the applications of technology in oil spill prevention. My remarks will specifically address the use of simulator training and research as they relate to safety on the seas.

MarineSafety International (MSI) is a subsidiary of FlightSafety International (FSI). Since their inception, both companies have served the air and maritime industries with high technology training aimed at reducing human error.

MSI began simulator based training in late 1976, using training concepts and technology that its parent, FSI, had successfully employed in flight training for nearly 30 years. MSI now trains over 1,000 pilots, ships' officers and masters, and U.S. Navy surface warfare officers annually. This training is simulator based and provides for dynamic, decision-making practice for those who are charged with ship maneuvering, whether those maneuvers are close quarters shiphandling or coastal and channel piloting.

In addition, in 1987 MSI was selected by the Maritime Administration to become the privatized operator of the Computer Aided Operations Research Facility of the National Maritime Research Center located at the United States Merchant Marine

Academy. CAORF is well known for its past research, and MSI has continued that capability by maintaining the research staff, upgrading simulation capabilities and undertaking a number of port improvement simulations. We are ideally postured to resume a national maritime research role.

Based on our history of simulator training and on our on-going studies into ports and waterways, MSI believes that the use of simulator training and technology can greatly assist in the prevention of oil spills.

Of course, there is much to be done in researching how oil spills can be cleared. No large spill has ever been fully and completely cleared. There is a small amount of oil recovered, but authorities in the field will agree that most of the oil is evaporated into the air, dispersed by time and weather, or settles on the bottom. The environmental impact of the failure to recover spilled oil is serious and long term.

Clearly, the prevention of oil spills must be vigorously pursued, at least as much as the improvement of oil spill recovery technology. This hearing addresses oil spill clean-up. I would submit that an ounce of oil spill prevention is worth a million gallons of clean-up.

Oil spills can be prevented by preventing groundings and collisions of large oil tankers. Groundings and collisions are

in the majority of cases, the result of human operator error. It has been estimated that 85% of all ship casualties are due to human error. The probability of human error can be reduced by dynamic, simulator based training to proficiency.

Ten years ago the Amoco Cadiz grounded on the north coast of France. This year the Exxon Valdez went aground in Prince William Sound. The media coverage of these two events sound much the same. Response from maritime experts, regulatory authorities, and governmental agencies is seemingly the same a decade later.

However, there are some differences that can be pointed to which occurred in the ten intervening years. First, the number of tanker accidents each year, worldwide, has decreased. They were at a post World War II high in 1978-79 and have been fewer nearly every year since. Second, the use of simulation and simulator based training has increased worldwide over the last ten years.

Although we could not draw a direct correlation, there is some analogy with these trends to what can be correlated in the aviation industry. Forty years of aviation training experience has demonstrated to FSI that aviators who train to proficiency on simulators have considerably fewer accidents than aviators who do not use simulators. Our point is that the same could be true in the maritime industry if simulation were as widely used as it is in the aviation industry.

The distinguished Members present serve in the current One Hundred First Congress. Ironically, much of the groundwork legislation that created many of the rules governing sea traffic and personnel come from the First Congress -- fully 200 years ago. At that time, water vessel traffic was virtually the only form of commercial transportation available. There were no cars, railroads or air traffic. All states in the original Union were along the Eastern Seaboard and had active ports that were centers of local commerce.

The First Congress gave virtually all powers as they relate to vessel pilotage over to the States. This has remained as such for these two hundred years, despite the obvious changes in technology as to size, number and power of the vessels. Many tanker personnel serving now were trained and licensed when tankers the size of New York's World Trade Center were only a pipedream.

At issue right now is the fact that there are no proficiency tests for maritime pilots, ship captains, or ship officers as there are for aircraft pilots. Also, there is only a vague understanding as to what would constitute proficiency in the handling and piloting of ships.

The twin issues of proficiency training and testing and developing valid measures of proficiency can be addressed by simulation. Governmental agencies must resume training and

operations research and require formalized proficiency training and testing of pilots and bridge officers if oil spill prevention is to be a priority.

MarineSafety International began the privatized operation of MARAD's Computer-Aided Operations Research Facility (CAORF) in May 1987 under the terms of a Cooperative Agreement. For several years prior to that date MARAD and the U.S. Coast Guard had conducted jointly funded studies related to the certification and training of ships' officers and pilots.

The training and licensing project at CAORF began in 1978 with an investigation of the potential role of simulators in training and certifying deck officers, pilots and cadets. The Certification and Training (C&T) project progressed over the next seven years to cover functional specifications for each type of certification, criteria for evaluation training systems and operational guidelines. In all, MARAD and USCG each invested well over $500 thousand in that research.

We at MarineSafety believe that the time has come for the USCG to require that present standard pilot and ship officer training be supplemented with a formal simulator course and proficiency test. No pilot, master or officer now has <u>to demonstrate proficiency by performance</u>.

Other regulatory agencies require performance testing -- for example, airplane pilots and truck/bus drivers -- but present Coast Guard rules do not require similar testing for ships' officers and pilots. Showing evidence of experience (trips over a specified route) and taking a pencil-paper exam (including the drawing of a specific chart) are good requirements, but neither constitutes testing a pilot's proficiency since neither causes him/her to perform the job he/she will be doing.

The U.S. Coast Guard does require persons holding radar observer endorsements to demonstrate proficiency by performance by requiring them to take simulator based examinations. Our comment is that piloting and shiphandling, as well as radar observing, are tasks which ships' pilots and officers perform, and these should be similarly demonstrated.

Earlier it may have been too costly and time consuming to contemplate "check rides" with pilots and other ship's officers on actual ships. Now, however, ship simulators can make such performance testing possible. As with the examination for radar observer, we recommend that a simulator based course of instruction precede the performance testing. We would also recommend that the Coast Guard examine and qualify training centers which could administer the aforementioned training and testing.

Also, as is the case in the aviation community, periodic refresher training and testing of ships' officers should be

required. It is our opinion that each serving master, mate, or pilot should be required to attend a refresher training course and proficiency testing at regularly scheduled intervals (airline pilots are required to demonstrate proficiency twice a year).

We also recommend a short transition course be required for pilots who will be handling and docking new larger, especially unwieldy or dangerous cargo carrying vessels in their port. This requirement would be determined by the Regional Examination Office of the Coast Guard.

In Title II of S. 686 which recently passed the Senate on the subject of oil spill liability and clean-up, there is a section that calls for the regional oil spill response teams to undergo training and periodic drills to "demonstrate their continued effectiveness." While we would agree with the concept, having the response teams at the ready without having the ship personnel at their highest proficiency is somewhat akin to requiring the morgue employees to take refresher accounting courses in order to more efficiently count bodies while not requiring doctors to have knowledge of anything more modern than leeches.

In addition the active use of simulator based research should be sponsored by cognizant Federal agencies. At a minimum, we propose that the joint MARAD/USCG Training and Licensing Project be continued at CAORF in the following areas:

1. Develop and validate marine pilot proficiency test methods and measures.

2. Conduct initial programs for selected pilot groups on a cost-shared basis with MARAD and USCG to help educate the pilots regarding the cost effectiveness of adding a formal simulator course and proficiency check to their ongoing On Job Training program. Also, the courses could be used to optimize the training modules and simulator exercises selected for the various levels of pilots.

3. Research, develop and validate a bank of high-quality generic port data bases that contain representative critical characteristics of ports around the country. This data base will enable smaller pilot organizations to use the simulator training without the added expense of a port specific data base.

4. Research, develop and validate a bank of high quality data bases for U.S. ports and waterways which are environmentally sensitive or have extremely high usage rates. These data bases would be available to all USCG certified training simulators. There are a number that spring to mind that we at CAORF have initially explored. Among these would be Naragansett Bay, where the World Prodigy ran aground just this spring, Galveston Bay Ship Channels, Puget Sound Ship Channels and Port Harbors, the Norfolk/Hampton Roads Sea Channel, and

the area of Long Island Sound in the environs of Block Island. These data bases would greatly assist the execution of various studies required by HR 3027. For example, VTS improvement study [205 (h)(1)], vessel control by VTS [205 (g)(1)], study of navigation risks in sensitive areas and mitigation means [206 (a)], study related to qualifications of bridge officers on tankers [207], study of tanker free zones [210].

5. Research, develop and validate a bank of high-quality ship response models for unusually large difficult handling ships which use U.S. ports. These data bases would be available to all USCG certified training simulators. Funding for this could come from the foreign or U.S. Carriers operating the unique vessels.

Some of the Certification and Training activities mentioned such as generating geographic and ship response data bases could serve double duty by contributing to the preparation and maintenance of oil spill response plans. Geographic and ship data bases for designated response areas and vessels could be used for planning and developing response plans and for training response team and tanker personnel.

As mentioned earlier, the government-owned Computer Aided Operations Research Facility (CAORF) is ideally suited and ready to undertake the kind of initiatives described here. We sincerely believe that they will substantially contribute to the prevention

of major oil spills in the future. We will make our professional staff available to Members and staff of this Subcommittee to work on answers to the problems.

The sad lesson of Valdez is that an accident at sea can have as great or greater negative effects on the Nation's economy and ecology as an air disaster. Ongoing training and testing of air pilots has been routine in order to ensure air safety. We must make safety on our seas a priority using the technology of today and not rely on the policies of the past.

Thank you for your time. I'll be happy to answer any of your questions.

Mr. McMILLEN. Thank you.

We will turn to Dr. Rosendahl now.

Dr. ROSENDAHL. Thank you.

The Exxon Valdez has highlighted how woefully unprepared our Nation is for dealing with large oil spills. Such spills are a predictable by-product of the world's reliance on petroleum and it is inevitable that there will be more incidents.

In his book "Super Ship", Noel Mostert warned us 15 years ago of the eventuality of such a spill. We did not listen very carefully. The next major spill may occur in an even more ecologically and politically sensitive environment than Prince William Sound. Consider, for example, the case of a laden Soviet tanker that happened to rip open on the north coast of Cuba. The resulting oil spill probably would become entrained in the Gulf Stream and end up on beaches from the Florida Keys to Cape Hatteras.

It is encouraging that both private and governmental organizations are attempting to do something about establishing a national plan for oil spills in the marine environment. Understandably, the focus to date has been mainly on colder water environments such as those in Alaska. The proposal by Senator Stevens to establish an oil spill technology center at Prince William Sound is an example. The scientists at the University of Miami's Rosenstiel School of Marine and Atmospheric Science applaud these activities. However, we are deeply concerned that in the rush to address the oil spill problem in Alaska, vulnerable environments elsewhere are neglected. Our greatest concern, or our greatest worry, is the subtropic environment and Florida in particular.

I realize that this committee's concern must be national in scope, but the impact of a major oil spill could be overwhelming to the southeastern United States and catastrophic to Florida. We ask the members of this subcommittee to consider the following facts:

Florida has more coastline than any other State except for Alaska. Unlike Alaska, the Florida coast is largely an urban environment which is already under severe ecological stress. This means that it is more vulnerable to contaminants than many more hardy coastlines.

Florida's economy and culture are more intricately linked to her coastlines and surrounding seas than perhaps any other State.

Florida is the only State with significant live coral reefs, except for Hawaii. Live coral reefs are complicated and fragile ecosystems which are thought to be highly susceptible to pollutants.

The Florida Keys are a national treasure.

The amount of oil tanker traffic in and through the Caribbean is extensive and, unlike Alaska, much of the traffic is under foreign flag and not subject to U.S. regulatory control. We note that of the 34 largest oil spills worldwide, 23 have come from tankers and only two were re. ited to drilling activities. With the domestic oil-drilling moratoriums that are arising from the Exxon Valdez incident, the risk of a tanker spill will increase, concomitant with the increase in traffic.

The Gulf Stream essentially drains the Caribbean. The main current flows between the north coast of Cuba and the Florida Keys, with eddies looping through the Bahamas. From the lower Keys to

Palm Beach, the western edge of the Gulf Stream is essentially at the Florida shoreline.

These facts speak for themselves. A spill of the Exxon Valdez scale anywhere in the Caribbean or eastern Gulf of Mexico could result in an ecologic and economic disaster for Florida of unprecedented magnitude. The possibility of such a spill is real, and the odds will increase as tanker traffic increases. Not even the landfall of a major hurricane poses as great a threat for widespread, long-term disaster. At present, we have virtually no knowledge of the dynamics of a spill in this arena and our ability to cope with such an event is almost nonexistent.

Before sensible strategies can be developed for coping with a major oil spill in a subtropical marine environment, a host of baseline studies are needed. Most involve basic research. A partial listing of the questions that must be answered is provided below. The listing is intended to provide a feeling for the range of activities. It is not all-inclusive.

Where are the likely sources of spills and can we quantify geographic predictability?

What areas are particularly vulnerable, geographically, biologically, and economically?

What are the patterns and timing of a given spill's dispersal for the range of possible spill locations within the center's purview? How are these affected by size and rate of spill, time of year, and weather?

How well can we predict the dispersal and distribution of oil spills at various locations in the southeast?

How does the unique subtropical meteorology of the southeast modify the concentrations and distributions of oil pollutants?

What are the best techniques for monitoring spill dispersal? We are particularly interested here in monitoring by satellite imagery.

How do the waters and beaches of the subtropical southeastern U.S. respond to oil pollutants, and how does this differ from higher latitude situations that lack a tropical marine input?

What are the physio-chemical interactions between warm sea water and the distribution of oil pollutants?

What are the effects of oil on the subtropical flora and fauna and how dependent are these effects on spill location, dynamics, and type of oil spilled? Of particular concern here are the corals, mangroves, sea mammals, and commercial and sport fish.

What protocols should be developed to follow and quantify groundwater contamination associated with spills? Of special interest here are situations in which oil pollutants could reach the drinking water supplies of major southeastern metropolitan areas.

And finally, who are the entities that bear fiscal responsibility for cleaning up any given spill?

The legislation before this subcommittee does not specifically define the mechanisms by which the legislation is to be administered. We take this opportunity to ask the subcommittee to consider a regional centers approach, at least in regard to the research components of the legislation. We feel that three or more regional centers are needed which address problems specific to tropical and subtropical coastal environments, temperate coastal environments, and the Alaskan coastline respectively.

Obviously, my specific concern here is for a southeastern center for subtropical oil spill technology. The rationale for such a center is compelling. Firstly, oil behaves significantly differently in warm, tropical water than in cold water. We believe this property may not be receiving adequate recognition.

Secondly, the strong Gulf Stream currents will have a dominant effect on the dispersion of oil along the entire southeastern seaboard of the U.S. We are very worried that this oceanographic condition is not receiving the attention needed.

Thirdly, the Gulf and southeastern coasts contain unique, fragile ecosystems such as those associated with mangrove swamps and coral reefs, which respond very, very differently to oil spills than those ecosystems in other geographic areas.

These factors mean that baseline studies carried out in one geographic province may have little applicability in another. The resulting procedures, tactics, and strategies for dealing with major oil spills will have to be specifically tuned to natural geographic provinces.

Although the southeastern center we envision will focus specifically on oil spills that may pollute U.S. waters and coastlines, the center would clearly benefit other Caribbean and even South American countries. This is particularly true in regard to monitoring activities in the same sense that the National Hurricane Center in Miami services the entire Gulf of Mexico and Caribbean. Any pollutant studies undertaken by the center also could be beneficial to our neighbors. Hence, such a center would have international impact.

For half a century, our Nation has dealt with the marine oil spill problem by using "band-aids". The Exxon Valdez incident makes further avoidance of the problem politically untenable. However, the Valdez incident does not ensure that effective and cost-efficient strategies will be formulated. That is the task of this subcommittee and I hope that this testimony will help you in some way. My colleagues and I stand ready to assist the subcommittee in any manner whatsoever.

Thank you.

[The prepared statement of Dr. Rosendahl follows:]

Testimony on Oil Spill Technology for the Subtropical Southeastern United States

(Summary of Written Testimony of
Dr. Bruce R. Rosendahl
Before the Subcommittee on
Natural Resources, Agriculture Research, and
Environment in Regard to H.R. 3027)

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INTRODUCTION

The EXXON VALDEZ tragedy has highlighted how woefully unprepared our nation is for dealing with large oil spills. Such spills are a predictable byproduct of the world's reliance on petroleum and it is inevitable that there will be more incidents.

In his book "Super Ship", Noel Mostert warned us 15 years ago of the eventuality of such a spill. We did not listen very carefully. The next major spill may occur in an even more ecologically and politically sensitive environment than Prince William Sound. Consider, for example, the case of a laden Soviet tanker that happened to rip open on the north coast of Cuba. The resulting oil spill probably would become entrained in the Gulf Stream and end up on beaches from the Florida Keys to Cape Hatteras.

It is encouraging that both private and governmental organizations are attempting to do something about establishing a national plan for oil spills in the marine environment. Understandably, the focus to date has been mainly on colder water environments such as those in Alaska. The proposal by Senator Stevens to establish an oil spill technology center at Prince William Sound is an example. The scientists at the University of Miami's Rosenstiel School of Marine and Atmospheric Science applaud these activities; however, we are deeply concerned that in the rush to address the oil spill problem in Alaska, vulnerable environments elsewhere are neglected. Our greatest worry is the subtropical environment, and Florida in particular.

I realize that the Committee's concern must be national in scope, but the impact of a major oil spill could be overwhelming to the southeastern United States and catastrophic to Florida. We ask the members of the Subcommittee to consider the following facts:

1. Florida is a 400 mile-long peninsula that juts into the tropical Caribbean Sea, with more coastline than any other state except for Alaska.

2. Unlike Alaska, the Florida coast is largely an urban environment which is already under severe ecological stress. This means that it is more vulnerable to contaminants than more hearty coastlines.

3. Florida's economy and culture are more intricately linked to her coastlines and surrounding seas than perhaps any other state.

4. Florida is the only state with significant coral reefs, except for Hawaii. Live coral reefs are complicated and fragile ecosystems which are thought to be highly susceptible to pollutants.

5. The Florida Keys are a national treasure.

6. The amount of oil tanker traffic in and through the Caribbean is extensive and unlike Alaska, much of the traffic is under foreign flag and not subject to U.S. regulatory control. We note that of the 34 largest oil spills world-wide, 23 have come from tankers and only two were related to drilling activities. (Neither drilling incident was in U.S. waters.) With the domestic oil-drilling moratoriums that are arising from the EXXON VALDEZ incident, the risk of a tanker spill will increase, concommitant with the increase in traffic.

7. The Gulf Stream essentially "drains" the Caribbean. The main current flows between the north coast of Cuba and the Florida Keys, with eddies looping through the Bahamas. From the lower keys to Palm Beach, the western edge of the Gulf Stream is nearly at the Florida shoreline.

These facts speak for themselves...a spill of the EXXON VALDEZ scale anywhere in the Caribbean or eastern Gulf of Mexico could result in an ecologic and economic disaster for Florida of unprecendented magnitude. The possiblity of such a spill is real and the odds will increase as tanker traffic increases. Not even the landfall of a major hurricane poses as great a threat for widespread, long-term disaster. At present, we have virtually no knowledge of the dynamics of a spill in this arena and our ability to cope with such an event is almost non-existent.

TYPES OF BASELINE STUDIES NEEDED

Before sensible strategies can be developed for coping with a major oil spill in the subtropical marine environment, a host of baseline studies are needed. Most involve field research. A partial listing of the questions that must be answered is provided below. The listing is intended to provide a feeling for the range of research issues that will have to be addressed. It is not all-inclusive.

- Where are the likely sources of spills and can we quantify geographic predictability.
- What areas are particularly vulnerable, geographically, biologically, statistically, and economically.
- What are the patterns and timing of a given spill's dispersal for the range of possible spill locations within the center's purview. How are these affected by size and rate of spill, time of year, and weather.
- How well can we predict the dispersal and distribution of oil spills at various locations in the southeast.
- How does the unique subtropical meteorology of the southeast modify the concentrations and distributions of oil pollutants.
- What are the best techniques for monitoring spill dispersal. We are particularly interested here in monitoring by satellite imagery.
- How do the waters and beaches of the subtropical southeastern U.S. respond to oil pollutants and how does this differ from higher latitude situations that lack a tropical marine input.
- What are the physio-chemical interactions between warm seawater and the distribution of oil pollutants.
- What are the effects of oil on the subtropical flora and fauna and how dependent are these effects on spill location, dynamics, and type of oil spilled. Of particular concern here are the corals, mangroves, sea mammals, and commercial and sport fish.

- What protocols should be developed to follow and quantitate ground water contamination associated with spills. Of special concern here are situations in which oil pollutants could reach the drinking water supplies of major southeastern metropolitan areas.

- Who are the entities that bear fiscal responsibility for cleaning up any given spill.

A DECENTRALIZED, REGIONAL "CENTER" APPROACH

The legislation before this Committee does not specifically define the mechanisms by which it is to be administered. We take this opportunity to ask the Subcommittee on Natural Resources, Agriculture Research, and Environment to consider a regional "Centers" approach, at least in regard to the R&D components of the legislation. We feel that three or more regional centers are needed which address problems specific to tropical and subtropical coastal environments (mainly Florida and the Gulf Coast), temperate coastal environments, and the Alaskan coastline, respectively.

My specific concern is for a southeastern center for subtropical oil spill technology. The rationale for such a center is compelling. Firstly, oil behaves significantly differently in warm, tropical waters than in colder waters. We believe this property may not be receiving adequate recognition. Secondly, the strong Gulf Stream currents will have a dominant effect on the dispersion of oil along the entire southeastern seaboard of the U.S. We are very worried that this oceanographic condition is not receiving the attention needed. Thirdly, the Gulf and southeastern coasts contain unique, fragile ecosystems such as those associated with mangrove swamps and coral reefs, which respond very differently to oil spills than those ecosystems in other geographic areas.

These factors mean that baseline studies carried out in one geographic province may have little applicability in another. The resulting procedures, tactics, and strategies for dealing with major spills will have to be specifically tuned to natural geographic areas.

Although the southeastern center we envision will focus specifically on oil spills that may pollute U.S. waters and coastlines, the center would clearly benefit other Caribbean

and even South American countries. This is particularly true in regard to monitoring activities, in the same sense that the National Hurricane Center in Miami services the entire Gulf of Mexico and Caribbean. Any pollutant studies undertaken by the center also would be beneficial to our neighbors. Hence, such a center would have international impact.

COST PROJECTIONS

The minimum practical cost to establish and maintain a viable oil technology center in the southeast is estimated at $1,000,000 in Year 1 and about $750,000 thereafter. A large portion of the budget is allocated for experiments and field studies that have certain defined costs, below which the work cannot be carried out. Because many of the experiments that are needed require considerable lead-times and long observation windows, a minimum commitment of 4-5 years should be considered. If the cost seems high to some legislators, they are asked to consider the price of not establishing such a center.

For half a century our nation has dealt with the marine oil spill problem by not dealing with it. The EXXON VALDEZ incident makes further avoidance of the problem politically untenable. However, the VALDEZ incident does not ensure that effective and cost-efficient strategies will be formulated. That is the task of this Subcommittee and I hope that this testimony will help in some way. My colleagues and I stand ready to assist the Subcommittee in any manner whatsoever.

Mr. McMILLEN. Thank you, Dr. Rosendahl, for your testimony, and all the panel's testimony.

In listening to the two panels today, I must admit that typical of the gridlock that exists in these mediation strategies is a case in point involving dispersants. Dr. Kinworthy, I am struck by the difference of opinion about the utility of dispersants expressed by you and the prior panel. Yet, if dispersants are to be used, they must be used immediately after the spill and there's really no time to debate if the Government feels very skeptical about dispersants and how the industry feels, which are much more pro-dispersement in orientation.

I'm just curious what needs to be done to ensure objective, credible research that the industry and Government can both rely upon to make these decisions. Otherwise, we get the same kind of logjams that we saw in the Valdez incident. Would you like to respond to that?

Mr. KINWORTHY. Two aspects of it. The first one is, the main two questions are whether they are efficient in use, and second is, is there any long-term damage to the ecosystem? Addressing the first, industry typically now is going out and doing preapproval planning, which simply means that we go out and we check the type of crude we have with the type of dispersant we have, under the water conditions, et cetera, and do some basic lab testing to find out yes, it's efficient or not, and whether it's 60 percent efficient or whatever, depending on the timing and the weathering of the oil. That's one aspect.

That preapproval process is also going on with the Government agencies and their RRT's. They are trying to cope with how do we get preapproval so we can have immediate use.

The second aspect of it is the long-term potential to the ecosystem, and there has been ongoing research, and I think the National Academy of Science report addresses how best to attack that.

Mr. McMILLEN. I think we're missing the point here. The point here is not pros and cons of dispersants. The point is who's going to arbitrate between industry and Government. That's really the issue. If there is going to be continued differences of opinion and differences in direction of research, where is the coordination going to occur? And if there is not coordination, you'll have the same problems that we have seen in other spills.

My question specifically is how do we get this kind of coordination? That's what I'm interested in, not the pros and cons of dispersants.

Mr. KINWORTHY. I believe the obvious form for that would be the national response team and its appendages, the regional response teams. The Coast Guard and EPA have the final authority, along with the affected State, and they have to make a decision through that mechanism.

Mr. McMILLEN. I'm interested in the Nation's ability to evaluate cleanup technology, especially new technology. Is there an appropriate mechanism in place to evaluate what is effective, under what conditions, and should there be something in place?

I address this to Mr. Kinworthy.

Mr. KINWORTHY. The existing, or what has been in the past, is obviously the OHMSETT facility itself, and that interagency task

committee. They have been undertaking—I think Mr. Tennyson and the other members in the first panel addressed that. I believe that's the obvious one.

We, API, have participated in that, both in some cases by the funding, as well as by the use of our scientific expertise.

Mr. McMILLEN. Let me yield to my colleagues for their questions. Mr. Smith of Texas.

Mr. SMITH OF TEXAS. Thank you, Mr. Chairman.

Mr. Kinworthy, I have two questions I would like to address to you. The first is, more specifically, what is the industry planning to do to improve its record of preventing oil spills? That's an open-ended question.

Mr. KINWORTHY. Yeah. Obviously, from our standpoint, we do not want an oil spill to occur, both because of loss of product, second is because the publicity and the damages that we incur, both financially as well as through other means.

We have, in the PIRO program, have identified a number of concerns addressing the—from the tanker's standpoint—how to prevent the loss I think those are spelled out in my written testimony. If you would like, I could go into them.

Mr. SMITH OF TEXAS. You don't need to.

Let me ask the second question, which is, how would you recommend that the industry better coordinate with agency R&D efforts to prevent duplication?

Mr. KINWORTHY. That has been actually undergoing for about the last three years. I would say prior to that, typically, industry and the Government regulatory agencies went down parallel paths, not necessarily interfacing. About three years ago, we on the API spill committee had invited out the U.S. Coast Guard, the EPA, MMS, NOAA, to be active members on our committee. They have sat in on all our committee meetings for basically the last three years and have given us their advice and expertise. Again, it's our research program and we're going down it, but we're using their interface.

At the same time, through the OHMSETT interagency task committee, we have done the same on their behalf. So there has been more communication. I believe, under the PIRO structure, that that will even become more prominent.

Mr. SMITH OF TEXAS. Okay. It's my personal philosophy that about 90 percent of the problems in the world are solved by better communications. You picked up on that and I think that's a step in the right direction.

Dr. Teal, let me ask you a question—and let me say I notice you're from the Woods Hole Oceanographic Institute, which I had the privilege of touring a year ago in the summer. My question is, is present environmental monitoring and research sufficient to determine the long-term effects of oil spills, and what could be done to improve it?

Mr. TEAL. Well, at present there are very few spills that have been studied over a very long period at all. Usually, as I suggested, the funding runs out, people get interested in other problems, and nothing happens. The interest dies down and the funding goes to the current "in" problem, rather than going on looking at something that happened 10 or 20 years ago.

I wish I had a neat solution to recommend to you. I think something needs to be done. I don't have sufficient—

Mr. SMITH OF TEXAS. Basically, you're arguing for a sort of constant study, constant monitoring, constant improvement of the situation, rather than sort of this every time there's an oil spill we get excited and try to do something about it, and then—

Mr. TEAL. That's correct.

There are programs—for example, there's a program in the National Science Foundation that looks at—it's called long-term ecological research. They look at ecosystems over a long period of time, and there is some commitment there to looking over a period of many years. There isn't anything like that for looking at a disaster and following it up over a long period of time.

Mr. SMITH OF TEXAS. So those are solutions. I guess it's up to a lot of us to try to implement them, is the problem.

Mr. Chairman, I don't have any other questions. Thank you.

Mr. MCMILLEN. Thank you.

Mr. Price.

Mr. PRICE. I would first like to return to Mr. McMillen's question because I don't think it was fully answered, the question of how research priorities get set, how disputes get arbitrated. The bill before us, as I understand it, does not provide any kind of mechanism for those purposes in detail. It leaves a great deal of that to executive discretion. Yet it's clear that research priorities do differ among agencies. It's also clear that we have disputes as to the efficacy of clean-up techniques and that our efforts in a specific situation may be hampered by not having adjudicated those.

So I would like to return to that question because I don't think it was answered. I would like to know what your thoughts are on this, any of you who would like to respond, and to what extent we should make provision for that kind of coordination and adjudication in legislation. That, after all, is the specific task before us. We've got to mark up a bill next week.

Mr. KINWORTHY. I'll take a stab at it, and the others can follow.

The PIRO organization, as well as API, with its joint agreement with the Department of Interior, have spelled out basically the five areas—I'm sorry, the six areas that we see, and have dedicated certain or allocated certain moneys towards each of these means for the next five years. That is in the testimony I provided earlier. I believe that shows exactly where we feel, the industry feels, that the money should be spent.

The working together with the Government agencies is going to have to be addressed, and I believe with PIRO, that that will take place. I'm firmly convinced on that. We will have input from all the Government agencies. It's quite obvious in a DOI/API mutual agreement that that has to take place in that. We have met and will meet again in the future as to exactly which program should take place. I don't know what else to say.

Mr. PRICE. Would the rest of you like to respond?

Dr. ROSENDAHL. We have four or five world class oceanographic institutions around the country. I would hope that they would be allowed to play a major role in at least the research aspects of this legislation. I think if we write them out from the start, and centralize this around Washington, you're going to be losing a very

valuable component that otherwise could have been part of that legislation. That's why I spoke softly, but I spoke for a center approach and implying that those centers ought to be located around existing oceanographic institutions that have the expertise to do the research.

Mr. PRICE. I gather from your silence that you don't have any particular changes to recommend in this legislation in terms of the administrative structures that it anticipates; is that true?

You find the—you find the looseness a positive virtue?

Mr. KINWORTHY. When in our case, because we see a direction we are heading. So, yes.

Mr. PRICE. Mr. Kinworthy, let me pick up on your testimony and some additional particulars. I am interested by your outline of the efforts the industry's already made, particularly in the area of contingency planning—you talk about the oil spill cooperatives that have been established throughout the country, enhancing regional capabilities to respond to spills.

I take it you don't see the Alaska situation as a positive example of that—with that system at work.

To what extent was such a system supposedly in place in Alaska? And how would you evaluate the—the effect of the contingency planning the industry had done on that situation? To what extent did it work? Why didn't it work better?

Mr. KINWORTHY. Well, obviously, for Exxon's standpoint I can't directly address that, but—

Mr. PRICE. Yes, but there is an industry consortium there as well.

Mr. KINWORTHY. That's correct.

In that case, we did have a contingency plan in place. It had been written back several—a decade ago, approximately, whenever it was.

Mr. PRICE. Does that qualify as an oil spill cooperative as you describe it here, the Alyeska consortium, could you clarify?

Mr. KINWORTHY. That is not a true cooperative. A cooperative—that is almost an independent company just addressing spills itself, as if it was an independent company.

Mr. PRICE. Well, was such a cooperative in place in Alaska among the companies operating there?

Mr. KINWORTHY. No. Alyeska operated by itself. There's a cooperative such as Clean Gulf, which operates for the whole entire Gulf of Mexico area—Clean Seas off of Santa Barbara, et cetera. Those are where six or seven, whatever number of companies joined together and either cooperatively worked together in a mutual assistance agreement or basically created a brand-new industry group that just responds to oil spills, with its pieces of equipment or the member companies' pieces of equipment.

Mr. PRICE. So the generalizations you make about contingency planning, the claims you make for contingency planning in your statement, really don't apply to the Alaska situation?

Mr. KINWORTHY. No, they do. Alyeska had to have its own contingency plan. Every operator has to have its own contingency plan.

Mr. PRICE. All right. And what went wrong in this instance then?

Mr. KINWORTHY. In this instance, they were not capable of responding to that size of a spill at that distance away. Nobody had, obviously, expected that kind of a spill.

Mr. PRICE. Do you have any assessment of that? Any—any sense of in retrospect what should have been done differently and how—how this kind of contingency planning that you—that you do, after all, make some claims for, how—how this can be made more adequate?

Mr. KINWORTHY. Okay, I'll take off my API hat and talk about UNOCAL specifically right now because I can't address it from that standpoint.

In our case, what we have done is we have gone out and hired a consultant as well as people from our corporate group and the operating groups and are going out and reevaluating every contingency plan on the major operations that we have in the U.S. and we're about to undertake it for the international standpoints as well.

We're looking at, are they capable of responding or have a means of responding for the largest spill cap—credible spill that would happen there. So basically, a worst case. We're looking at it from that standpoint. Basically doing an audit.

Based upon that now we are giving our findings to our executive committee and they have already—already started allocating monies to increase our own individual capability of responding.

So, UNOCAL has done that. Now, others are doing similar efforts as well.

Mr. PRICE. Later in your statement you—you talk about the different areas in which research and development ought to be concentrated and you stress the prevention of spills. You name two specific areas that call for future R&D efforts. One is shipboard oil spill response capability. Secondly, changes in vessel configuration and construction. For example, ballast side, smaller tank sizes, double bottoms, and so forth.

Now, this isn't the first time, of course, that these areas have been—have been highlighted. How much of our problem is really needing more R&D and how much of our problem is—is implementing what we already know needs to be done?

We really need a lot more—really need a lot more research on shipboard oil spill response capability?

Mr. KINWORTHY. Well, the question there is, should we have, for example, the containment booms on a vessel and be able to deploy it from that? That's what we're looking at. From the normal operating standpoint, that's, generally speaking, impractical because of the high seas that some of these tankers operate in.

But there may be other mechanisms such as Ms. Schneider made a comment earlier about a solution that could occur as to taking the pressures out so it would not spill out as quickly. There's other avenues we can look it and it just simply has to be looked at.

Mr. PRICE. Double bottoms on vessels. A lot more research needed on that or do we just implement the standard?

Mr. KINWORTHY. Basically implementing a standard there if that's necessary.

Mr. PRICE. If that's necessary?

Mr. KINWORTHY. Right. I am not capable of making that statement. That's why we've asked for other bodies to look at and see, is that appropriate? Is it required?

Mr. PRICE. You—you mean we need a lot more research to determine the answer to that question? Hasn't this been pretty thoroughly examined over the years?

Mr. KINWORTHY. I'm sorry, I can't answer that because I don't know, I'm not a maritime person.

Mr. PRICE. The rest of the panelists have some response on that? I mean, to what extent do we—do we really know right now what we need to do? What kind of standards we need to implement. Is this mainly a research problem?

I know that's a general question, however, there are some specific references here. Could you—could you pick some areas and—and help us understand that?

Mr. GUEST. I—I would say that it's—it's more a problem of applied research rather than just general research into the damage caused by oil spills. It's difficult to understand why we need to research the—the damage of oil spills. We know that it's—that there's damage. What we need to do is to prevent oil spills.

There's a lot of research that's already been done to show how beneficial certain amounts of training applied to research can be in—in preventing accidents.

Most of the oil in the—in the waters of the world are caused by tanker accidents; and we need to prevent tanker accidents. So it's not really a matter of doing further research.

As far as double bottoms, I would say that there is some question that needs to be examined, and that is from the research side whether or not the double bottom would increase the danger of—of the loss of the ship and not so much spillage of oil. But in the case of the Exxon Valdez, there would be some question as to the damaged stability of the ship, maybe the ship would have been lost if there had been double bottoms. But that question has to be researched.

Mr. PRICE. Dr. Rosendahl, you indicated some disagreement?

Dr. ROSENDAHL. Well, I think there's plenty of room for basic research. I don't think we've solved any of the problems related to what oil—

Mr. PRICE. I'm sorry, I can't hear you. Could you speak into the mike?

Dr. ROSENDAHL. I don't think we've solved any of the problems related to what oil does in the environment, where it goes, how long it stays in the sediments. After it de-gases from the sediments and what it does coming back around the second time. And there are so many uncertainties.

Mr. PRICE. Yes.

Back to the question, though, of preventing skills—preventing spills, which is where we started.

Dr. ROSENDAHL. We can do all sorts of things like that but I doubt we'll ever fully prevent spills. We don't control all tanker traffic. We—much tanker traffic is foreign. We can't impose double bottoms on all ships worldwide, especially those that aren't going to be in our water—our territorial waters.

I'm worried about a spill in the gulfstream not by an American ship—by some other ship—that oil coming up to us by this gulfstream river.

So all—all the regulation in the world—U.S. regulation—wouldn't save me in terms of that problem.

Mr. PRICE. My question, though, is whether—whether there are major unsolved research questions in that area of prevention—the areas that Mr. Kinworthy, for example, identified in his testimony. Do we—

Dr. ROSENDAHL. In terms of—

Mr. PRICE. Admittedly, there—there are regulatory problems, regulatory dilemmas. I don't think anyone doubts that.

My question to you is more basic, do we really know what we need to do? Or what, in the best of circumstances, we would do to prevent spills effectively? Or—or is this a—is this a major area where there are lots of unanswered questions and where we need a major research investment?

Dr. ROSENDAHL. I think there are answers out there and I think you need to reach the right people that have those answers; and these two panels have not been composed of those kinds of persons.

We do know about double hulled ships. We do know of the good and the bad points about them. I don't. But there are a million architects that do.

Mr. PRICE. Well, about the—about the—the point you addressed earlier, the long-term effects of oil on the environment, how much do we really know about that? I mean the effects 10, 15 years hence? Is that—is that something that ought to be a research priority?

And based on what we now know, what—what's going to be the—what's going to be the long long-term of the Alaska spill? What can we anticipate?

Dr. ROSENDAHL. I think that the answer is we know damn little, if anything. In the longer term you talk about, the worse it becomes. We know some things over a two or three-year time frame, fewer things over six, and almost nothing over a decade.

Mr. PRICE. The major French spill, how long ago did that occur?

Dr. ROSENDAHL. The Amoco Cadiz, you mean?

Mr. PRICE. Yes.

Mr. KINWORTHY. '76—

Mr. GUEST. 1979.

Dr. ROSENDAHL. There was very little follow-up research done on that.

Mr. PRICE. I've seen journalistic accounts, but—but not—not really sustained research on—on that.

Dr. ROSENDAHL. Well, as Dr. Teal pointed out, the funding structure we have doesn't really allow scientists to par—to carry out these 5 and 10-year time frame studies.

Mr. PRICE. So we really can't say with any—any confidence what the long-term—10, 15, 20 years out—what the long-term effects of the Alaska spill or any other spill will be?

Dr. ROSENDAHL. No.

Mr. KINWORTHY. Mr. Price, there has been some obvious research done in the Santa Barbara channel with the natural seas. But again, you're not talking about refined products and various

other products as well. So I agree with the other panelists, that the long-term for every type of crude or refined product is not known.

Dr. ROSENDAHL. And that's the other thing you have to keep—keep in mind, is that different kinds of crude have very different effects on the same biological environment—or the same ecosystem. So, that just adds another complexity—a whole area of complexity to the problem.

Mr. PRICE. So you—the four of you agree with that—with that description of the situation, that this has not been an area of major research. The obvious follow-up is whether it should be and what the possible policy implications would be of—of knowing more about which effects endure, what the—what the longest term effects are.

Dr. ROSENDAHL. Yes. It would also have ramifications in terms of the kinds of things you might—you're wanting to transport around. It might be that one kind of crude, or a certain kind of crude with a certain kind of additive agent turns out to be much less—less toxic over a 10-year time frame than its companion. Those are the kinds of things we need to find out. And we don't have the answers.

Mr. PRICE. Mr. Guest?

Mr. GUEST. I would say, though, that if we're talking about research dollars as far as the answer to the Amoco Cadiz or the Exxon Valdez, we need to put those dollars into operational research rather than—than general research. And operational research being how do you mitigate the oil spill, how do you prevent the oil spill rather than what damage the oil spill is going to do.

Mr. PRICE. Thank you, Mr. Chairman.

Mr. MCMILLEN. Thank you.

I have a question. Obviously, there are meters on these tankers, but I read somewhere that on a number of these tankers the captain wouldn't know if the oil was leaving the vessel. Is that true? Is there a monitor meter on all tankers that would indicate if oil was seeping out of the vessel?

Mr. KINWORTHY. I think on most of our vessels there is a level meter that—a high level/low level alarm type of system, yes.

Mr. MCMILLEN. So there is an alarm?

Mr. KINWORTHY. Yes.

Mr. MCMILLEN. I guess that's what I'm asking.

Mr. KINWORTHY. If you had a very small leak that only went on for a very short period and it did not affect the level, obviously, it could go undetected. But—

Mr. MCMILLEN. But it was true in the Valdez situation that there was not a recognition—there have been situations where there have not been a recognition of a leak. Has that occurred?

Dr. ROSENDAHL. That has happened—

Mr. MCMILLEN. Yes.

Dr. ROSENDAHL. —historically, yes.

Mr. MCMILLEN. All right. Not in the case of Valdez—

Dr. ROSENDAHL. No.

Mr. MCMILLEN. —but in other cases, right.

I have a couple of questions for the record that if you would just give try and give an abbreviated response to, it would be appreciated.

Public education involvement is very important, particularly when chemical treatment is being considered as a treatment technology.

How can we reduce the chemical hysteria? What approaches should the Federal agencies and industry consider to better educate the public? Anybody?

Mr. KINWORTHY. We of API have sponsored workshops that have included academia, the industry as well as the government officials, and just communication—that's the extent we've gone.

Mr. MCMILLEN. Anybody else care to comment?

[No response.]

Mr. MCMILLEN. Dr. Guest, should the Coast Guard require the retesting of tanker pilots? And if so, how often would you suggest that they revisit the facility?

Mr. GUEST. I think the Coast Guard should do periodic proficiency testing of ships' pilots. It's hard to say without the basic research into the fall-off of skills what that period should be. The Coast Guard does require now proficiency examinations for radar observer certificates every five years.

I would submit that it's somewhere between one and five years that we'd be looking at.

Mr. MCMILLEN. With regards to the pilot training simulations, are they able to adjust for changes in ship design?

Mr. GUEST. For pilot training?

Mr. MCMILLEN. Uh-huh.

Mr. GUEST. Yes. The simulators are able to produce any displacement type ship and the pilots can get transition training in those simulators.

Mr. MCMILLEN. The establishment of several regional research facilities has been proposed.

Are regional research facilities necessary to better understand the effects of oil on the environment?

Dr. Rosendahl?

Dr. ROSENDAHL. I think absolutely—absolutely. I feel very strongly that that's the approach, the proper approach, particularly in the special cases. Alaska is a special case. Florida is definitely a special case.

I think not having centers of research there to look at the problem would be catastrophic in the long run.

Mr. MCMILLEN. Anybody else care to comment on that?

[No response.]

Mr. MCMILLEN. The—one of the proposals that we've heard to better our understanding of the long-term effects of the oil on the environment is to go back and revisit areas where oil was once spilled. Mr. Price was talking about this.

Would this research be of benefit to understanding of oil spill effects? What could we derive from this—what about the French spill? Is there anything to be derived to—to going back and doing some research after the fact several years?

Mr. TEAL. There's a great deal to be gained by doing that, particularly in cases where you know what the effects were and what the oil was like, and what happened initially. So the places to go back and look again 10 and 20 years after a spill are those cases where the initial studies of the spill were best.

Mr. McMILLEN. So your point is basically that's not been done, but hopefully with the new monies that some of that will be done? And you would consider that beneficial?

Mr. TEAL. But I think every bit of information you have about what the long-term effects of oil spills are can help—can't help but better your ability to prevent damage.

Mr. McMILLEN. Very good.

Mr. Price, do you have any more questions?

Mr. PRICE. No.

Mr. McMILLEN. If not, I think that concludes our questions for the record.

Are there any other questions?

[No response.]

Mr. McMILLEN. I want to thank the second panel for their testimony and response to the questions and certainly appreciate both panels' efforts in this regard in helping us understand oil spill research needs. As you know, we are kind of moving on an expeditious course there.

We thank you for coming today and the hearing is adjourned.

[Whereupon, at 12:15 p.m., the subcommittee was adjourned.]

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