SPILL

The Wreck of the *Exxon Valdez*

Appendix A-I

State of Alaska — February 1990

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App. A-I

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HCS CSSB 277 (FIN.)

LAWS OF ALASKA

1989

Source
HCS CSSB 277(Fin)

Chapter No.
42

AN ACT

Establishing a commission to investigate the Exxon Valdez oil spill disaster and to recommend changes needed to minimize the possibility and effects of similar oil spills; and providing for an effective date.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

THE ACT FOLLOWS ON PAGE 1, LINE 12

Approved by the Governor: May 12, 1989
Actual Effective Date: May 13, 1989

(e) Members of the commission serve without compensation, but are entitled to $150 a day while on commission business plus per diem and travel expenses authorized for boards and commissions under AS 39.20.180.

(f) The commission shall meet regularly to direct its investigation, hold hearings, review progress, and draft final recommendations.

* Sec. 2. DUTIES OF THE COMMISSION. (a) The commission shall gather information relating to

(1) the series of events that allowed the Exxon Valdez oil discharge on March 24, 1989, to occur; and

(2) the ensuing efforts to contain and clean up the oil discharged.

(b) By January 8, 1990, the commission shall submit a report to the governor and to the legislature containing its findings and recommendations on

(1) the containment and cleanup actions that were taken or not taken after the discharge, the extent to which current technology was available and used, and ways to improve oil spill response technology and procedures;

(2) steps that should be taken by all levels of government and by the oil industry to ensure proper management, handling, and transportation of crude and refined oil and to improve the statewide ability of industry and governmental agencies to respond to oil discharges;

(3) the extent to which oil industry practices and governmental practices or laws should be changed to minimize the potential for future events similar to the grounding of the Exxon Valdez; and

(4) legislative proposals to encourage and fund prevention, response, cleanup, and mitigation of all future discharges of oil.

* Sec. 3. INVESTIGATIONS; HEARINGS. (a) The commission may issue subpoenas, administer oaths, hold hearings, and conduct investigations

related to its duties.

(b) The commission may compel the attendance of witnesses and production of papers, books, records, accounts, documents, and testimony, and may have the deposition of witnesses taken in a manner prescribed by court rule or law for the taking of depositions in civil actions when consistent with the duties assigned to the commission.

(c) On a majority vote of the commission, subpoenas and subpoenas duces tecum may be issued and served in the manner prescribed by AS 44.62.-430(b) and (c) and court rule. The failure, refusal, or neglect to obey a subpoena is punishable as contempt in the manner prescribed by law or court rule. The superior court may compel obedience to the commission's subpoena in the same manner as prescribed for obedience to a subpoena issued by the court.

(d) State agencies shall, to the extent permitted by law, cooperate with the commission and provide it with information it requests for carrying out its duties.

(e) The commission is subject to AS 44.62.

* Sec. 4. This Act is repealed February 15, 1990.

* Sec. 5. This Act takes effect immediately under AS 01.10.070(c).

Chapter 42

AN ACT

Establishing a commission to investigate the Exxon Valdez oil spill disaster and to recommend changes needed to minimize the possibility and effects of similar oil spills; and providing for an effective date.

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* Section 1. EXXON VALDEZ OIL SPILL COMMISSION. (a) There is established in the Department of Administration the Exxon Valdez Oil Spill Commission consisting of seven distinguished members appointed by the governor.

(b) The members must include

(1) five state residents with broad experience or expertise in one or more of the following areas: physical or biological science, oil transportation, fisheries, economics, sociology, or law; these members may not be federal or state employees or employees of a political subdivision of the state or be employees or independent contractors of any corporation directly involved in the Exxon Valdez oil spill disaster;

(2) two persons who are recognized nationally for their expertise in science, technology, or management and are not employees of a governmental entity.

(c) The commission members shall elect from among themselves a chair and vice-chair.

(d) The commission may hire staff it considers necessary to perform its duties, including legal counsel.

APPENDIX B

COMMUNITIES VISITED, COMMISSION HEARINGS AND WITNESSES

COMMUNITIES VISITED BY THE ALASKA OIL SPILL COMMISSION OR STAFF

Akhiok
Chenega Bay
Cordova
English Bay
Homer
Karluk
Kenai
Kodiak
Larsen Bay
Ouzinkie
Seldovia
Seward
Tatitlek
Valdez

ALASKA OIL SPILL COMMISSION MEETING WITNESSES

June 6, 1989 - Anchorage

Kevin Brooks and Bob Link - DOA - Juneau
Mike Harmon - OSCO - Juneau
Paul Willman - Office of the Governor - Anchorage
Bob LeResche - APA - Juenau
Lyle Perrigo - Artic Science Commission - Anchorage
Sheila Gottherer - Alaska State Boards and Commissions
Bob Ellis - Anchorage
Tom Albert - North Slope Borough
Charles McKee - Anchorage
Sue Liberson - ACE - Anchorage
Denny DeGross - Alaska Native Health Board - Anchorage
Thom A. Fischer - Whitewater Engineering

June 7, 1989 - Anchorage

Kevin Brooks and Bob Link - DOA - Juneau
Mike Harmon - OSCO - Juneau
Paul Willman - Office of the Governor - Anchorage
Bob LeResche - APA - Juneau
Lyle Perrigo - Artic Science Commission - Anchorage
Bob Watkins - Bristol Bay Fishermen's Assoc.
Frank Fontinn - Atty from New Orleans representing a maker of a dispersant.

June 27, 1989 - Valdez

Admiral Kime - USCG
Steve Provant - DEC
Dave Kennedy - NOAA
John Beiler - OSCO
Mayor Braun - City of Whittier
Dr. Laurance Frauenhagen - Environmental Scientist Monterey Bay
Steve Eagleson - Prince William Sound Conservation Alliance
Kevin Casey - Paia Maui
Wendy Weidman - Valdez
Cathy Hauser - Eagle River

June 28, 1989 - Cordova

Kelly Weaverling - Cordova
Mead Treadwell - The Oil Spill Disaster Recovery Office - Anchorage
Marilyn Leond - CDFU

CORDOVA cont.

Jerry McCuen - CDFU
Ken Roemhildt - North Pacific Processors
Larry Cambronero - Chugach Alaska Fisheries
Marla Adkins - Cordova
Dennis Holan
Bob Armeston
Eugene Bird
Mark Hutton
Nancy Collin - Cordova Times
Erling Johansen - Mayor Cordova
John McMullen - PWSAC
Connie Taylor - Spill Response Office
Rick Steiner - U of A Marine Advisory Program
Marsha Hodson - ACE
Joann Thomas - PWS Setnetter
James Brady - DF&G
Nancy Bird - Cordova

June 29, 1989 - Anchorage

Bob Grogan - Provision of Governmental Coordination
Tom Albert - Department of Wildlife Management - North Slope Borough
Charles McGee - Anchorage
Sue Libenson - ACE
Ed Waugh
Denny DeGras - Alaska Native Health Board
Thomas Fisher
Bob Allison
Jerry Rusher

July 13, 1989 - Anchorage

Dennis Kelso - DEC
Vince O'Reilly - Oil Spill Economic Impact - Kenai
Jack Harrald - National Science Foundation - George Washington University
Charles McKee - Anchorage
Stan Jacobs - Homer
Tom Lakosh - Whittier
Stan Wolf - Girdwood
Marsha Hodson - ACE

July 14, 1989 - Seward

Darryl Shaffermeir - City Manager Seward
Ann Kastelina - Chairperson MAC
Admiral Robbins - USCG On site Coordinator
Lt. Cruz - USCG

SEWARD cont.

Dr. Richard Alpac - Seward Life Action Council
Don Gilman - Mayor Kenai Penisula Borough
Ann Kastelina - Supertindent Kenai Fjords National Park
Russ Kucinski - Science Coordinator National Park Service
Jack Sinclair - DNR
Doug Lockwood - DEC - Seward
Ann Rappaport - U.S. Fish & Wildlife Service
Rita Turner - Homer
Margaret Brenson - Ak Dept. of Labor Job Service
and President Cook Inlet Aquaculture Assoc.
Tina Brown
Anonymous VECO employee

July 15, 1989 - Homer

Mayor Calhoun - Homer
Mike Hedrick - MAC, U.S. Fish & Wldlife - Homer
Roger McCampbell - DNR - Homer
Admiral Robbins - USCG - Valdez
Commander Griswold - USCG - Homer
Lieutenant Wilson - USCG - Homer
Dave Horn - UCIDA - Kasilof
Cheryl Sutton - KPFA - Soldotna
Sonja Carazza - North Pacific Fisheries Assoc. and United Fishermen
of Alaska - Homer
Larry Smith - Katchemak Bay Subsistence Group - Fritz Creek
Dr. Brad Williams - Community Mental Health Director
Lester Leatherberry - DEC - Soldotna
Lee Glen - DF&G - Homer
Dave Young - OSCO - Homer
Dick McKeen - DEC - Homer
Jack Lentfer - Chugach Alaska Corp.
Dave Vanderbrink - MAC - Homer
John Mickelson - Seldovia
Mike O'Meara - Homer
Ben Levine
Mei Mei Evans - Homer
James Paine - Kasitsna Bay
Bryson Twidwell - DEC
Larry Jones - Homer

August 3, 1989 - Anchorage

Otto Harrison - Exxon
Admiral Robbins - USCG
Dennis Kelso - DEC

August 4, 1989 - Anchorage

Erv Martin - Alaska Division of Emergency Services
Dr. La Porte - Political Scientist - University of California, Berkely
Patrick S. Dixon - UCIDA - Kenai
Charles McKee - Anchorage
Rawls Williams - National Park Service Oil Spill Operation
Marcia Hodson - Oil Reform Alliance

August 11, 1989 - Kodiak

Fritz Brunhoff - Kodiak
Arnie Schram - DEC
Forest Gould - Kodiak
Mike Milligan - Kodiak
Pat McClain - Kodiak
Laura Hughes - Kodiak
Theodore Nyman - Kodiak Crewmembers Assoc.
Trisha Gartland - Kodiak
Robert McCarry - Kodiak
James Bolerud - Kodiak
Bryan Johnson - Kodiak
Dolly Reft - Kodiak
Michelle Savin - Kodiak
Lucy Burns - Kodiak
Lucia Avitabilia - Govis, NY
Darryl Short - Kodiak
Julianna Carlson - Kodiak

August 30, 1989 - Anchorage

Ron Dearborn
Zygmund Plater
Ralph Johnson
Allison Rizer
Harry Bader
(all from Sea Grant)
Commander Dennis Rome - USCG
Charles McKee - Anchorage
Ed Wow - Anchorage

August 31, 1989 - Anchorage

Dave Liebersbash - National Incident Team
Commanders Dennis Rome & Ed Thompson - USCG
Dennis Kelso - DEC
Theo Polask & Bill Howitt - Alyeska
Frank Iarossi - Exxon

September 1, 1989 - Anchorage

Frank Iarossi - Exxon
Roger Gale - BP
Jerry Asplund - ARCO
Charles Norz - Amerada Hess
Captain Pat Johnson - Mobil
Eric Rumley - Phillips
Capatain Earl Mealins - Unocal West Coast Shipping
Jim Hermiller, Mike Williams & Nick Mitchell - Alyeska

September 7, 1989 - Kenai

John Williams - Mayor Kenai
Don Gilman - Mayor Kenai Penisula Borough
Jim Butler - Kenai Penisula borough
Theo Matthews - UCIDA
Rich King - Upper Cook Inlet Drifter
Captain Murphy - SW Pilots Association
Vince O'Reilly - City of Kenai Economic Development Commission
Lt. Hutmacher - USCG
Bob Williams - Chevron
Dennis Kelso - DEC
Lynn Kent - DEC
Cheryl Sutton - KPFA
Tim Robertson - City of Seldovia
Joe Nord - Allied Processing
John Stephen - Soldotna
Paul Zimmerman - Kasilof

September 21, 1989 - Anchorage

Al Mackey - Exxon
Commander Myers - Rules of the Road - Teleconference
Depat. of Law
ACE
Professor Shaw & Peter McRoy - UAF - Institute of Marine Science
Dr. Matt Berman & Assoc. Professor Steve Colt - ISER
Ed Wow - Anchorage
Tom Lakosh - Whittier
Richard Rolland
Jim Sykes - Anchorage
Jonathan Jordan

September 22, 1989 - Anchorage

Dennis Kelso - DEC
Bob LeResche
Rod Swope - DNR
Myra Munson - DH&SS
Jake Lestenkof - DC&RA
Jim Sampson - Dept. Labor

ANCHORAGE cont.

Bob Brodie - Mayor City of Kodiak
Other Mayors
Jedediah Whitaker - Anchorage
Charles McKee - Anchorage
Jim Sanders - Anchorage
Tom Lakosh - Whittier
Don Ford

November 13, 1989 - Anchorage

Steve Duca - PIRO
Brian Dorsch - Chevron Shipping - API
Loren Flagg - KPFA
Captain Robert Elsensohn - Masters, Mates & Pilots
Mano Frey - AFL-CIO, Alaska
Ed Wenk
Charles McKee - Anchorage
ANCHORAGE cont.

Anna Young - Cordova
Ken Castner - Homer
Michael Bruner - Palmer
Michael Castro - Anchorage

November 14, 1989 - Anchorage

Alvin Ewing - EPA
Tom Hawkins - DNR
Frank Rue - DF&G
ECO
John Lathrop
Harry Bader - Sea Gran

APPENDIX C

OILED COMMUNITIES RESPONSE INVESTIGATION REPORT

ALASKA OIL SPILL COMMISSION

OILED COMMUNITIES RESPONSE INVESTIGATION REPORT

RESEARCHED BY

SHARON E. MCCLINTOCK

COMMUNITY COORDINATOR

NOVEMBER 30, 1989

BACKGROUND OF SPILL AND COMMUNITIES AFFECTED

On March 24, the 987 foot "Exxon Valdez" Oil Tanker loaded with North Slope crude oil ran aground on Bligh Reef eight miles from the village of Tatitlek and 24 miles from the community of Valdez. 10.8 million barrels of oil gushed out at the rate of 20,000 barrels per hour. The spill directly affected the communities of Ahkiok, Chenega Bay, Chignik, Cordova, English Bay, Homer, Karluk, Kenai, Kodiak, Larsen Bay, Ivanoff Bay, Old Harbor, Ouzinkie, Perryville, Port Lions, Port Graham, Seldovia, Seward, Tatitlek, Valdez, and Whittier.

COMMUNITIES

AKHIOK

Akhiok is a Koniag village of 93 people which is located on the west side of Alitak Bay on the south side of Kodiak Island. The predominately Native village is highly dependent on subsistence hunting, fishing, and gathering. Fish, clams, bidarkies and other seafood, seals, sea lions, and deer provide the main source of food to local residents year around, while commercial fishing provides the main source of cash income. Several families also depend on State public assistance benefits.

Akhiok was incorporated in 1972 as a second class city under Alaska law, and is also encompassed within the boundaries of the Kodiak Island Borough. The community is accessible only by air and water transportation. Peninsula Air and Mark Air have regularly scheduled flights from Kodiak into Akhiok every day, weather permitting. Most families have telephones, citizen band radios, and televisions. The City, which served as the lead organizer in the community for oil spill response, has a fax machine, which during the months after the spill, provided the most reliable source of updated information.

Akhiok has an active Tribal Government, a sisterhood organization, and a Village Corporation formed under the Alaska Native Claims Settlement Act. The Corporation, Akhiok-Kaguyak, Inc. is a consolidation of two villages, Ahkiok and Kaguyak. Kaguyak is a neighboring village which was destroyed by a tsunami generated by the 1964 earthquake. Following the quake, Kaguyak residents abandoned their village and relocated to Akhiok. The spill affected many miles of coastline owned by the Corporations. Their combined land holdings total over 138,240 acres. Community residents read the Kodiak Mirror, Tundra Times, Aleutian Eagle, and the Fishermen's Journal.

THE SPILL

Akhiok residents learned of the "Exxon Valdez" oil spill on March 24th over the Kodiak public radio station and on the 6:00 p.m. news on TV. Initially, local residents believed that the spill, which occurred over 300 miles away, would never reach their shores. When tides and winds from the northwest brought the oil into the Shelikof Strait in April, and hit Afognak Island on April 9th, everyone knew the tides would eventually carry the oil to Akhiok. As the oil neared, the fax machine became bombarded by reports, and sometimes ran all day long. "Scouts" sent out by the village to check out the beaches near Ahkiok in mid-April returned with reports that tarballs and dead birds were beginning to wash in. They said it had hit.

COMMUNITY REACTION TO INCIDENT

When the oil hit the beaches nearby, the community reaction was shock. Although, people knew the oil was coming their way, it still took everyone by surprise. Many people found it hard to believe that there was oil and sheen in the water, and oil, tarballs, and dead birds on the beaches. Some who walked the beach said it was like a dream to see oiled birds and feathers lying about. Emotionally, the spill was hard on these people who depended on the sea for their livelihood. The death of wildlife was especially hard on the elders. One elder said she cried when picking up dead birds, and wondered "what's coming of our world?"

When questioned about the short and long-term impacts, the consensus was that the short-term impacts were environmental, economical, and social devastation. The spill's disruption of subsistence activities was viewed as the most devastating. The long-term impacts are uncertain. Several people believed that the worst was probably yet to come.

IMPACT ON COMMUNITY

Environmental impact in terms of oil damaged areas were concentrated from Cape Ikliok to Alitak Bay. Heavy sheen and tarballs washed ashore on the beach from Cape Ikliok to Low Cape, while a stretch between Low Cape to the tip near Alitak Bay received a smaller concentration. The highest concentration of sheen and tarballs was located at the tip near Alitak Bay and on three small islands in front of Ahkiok, at the entrance of Olga Bay. The surf pushed the oil into the gravel in these areas. Oil, however, did not enter Olga Bay which later became designated as the only place open to subsistence fishing.

The impact on wildlife is not fully known. Over 250 dead oiled birds were picked up, many after Exxon demobilized on September 15, 1989. Following the spill's impact on Ahkiok, the Alaska Department of Fish and Game phoned Akhiok, but other than that "didn't deal much with the people there." Then, they were "all over the place" obtaining samples of fish, clams, and bidarkies. People commented on the unusual concentration of bears near town. One big bear hung out at the airstrip for a couple of days.

The economic impact is mixed. A total of 15 people (5 were women), two from outside of the community, one from Port Lions, and the remainder from Akhiok were hired for cleanup work around the vicinity of Akhiok which began May 15, 1989 and continued until September 15. However, not everyone who wanted to work and was available to work were hired. Competition for a handful of jobs which many people felt went to a privileged few, bred resentment and hard feelings. The employment was appreciated by a couple of people who previously depended on public assistance and by one who had never worked for wages before. People that worked earned over $25,000 in four months.

Most of the City employees went to work for VECO, causing such a disruption, that City functions almost ceased altogether. The City, which normally meets the second Tuesday of every month, only met in emergency sessions to take care of business that absolutely needed attention. The City Community Hall, two storage buildings, the City truck, and a 480 case loader, as well as accommodations in the City offices and clinic were rented by VECO. Expenditures by the City on spill related activities which were later reimbursed by Exxon totaled $34,000. The City is, however, still behind in its work. City elections were held on October 3, and a new Mayor was elected. The high level of pressure and increased demands on community leadership had taken its toll.

During the spill, the City was forced to pull workers off the spill to take care of pressing City business. VECO employment policy required that those who stopped working went to the bottom of VECO's employment list. This policy caused a dilemma for City people that desired continued employment. The City felt that VECO should have initiated a more flexible work policy which would keep people on the payroll, but allow them to work on City business, or at the least have VECO match funds from the City to give incentive for City employees to remain on the job.

Commercial fishing areas utilized by the Akhiok people were closed by Fish and Game. Mozier and Olga Bay were later opened to subsistence fishing. The upper station was the only place that Kodiak Gillnetters on the west side could fish.

Subsistence fishing, hunting, and gathering are activities which

provide the basis for the life, spirit, and culture of the Akhiok people. Subsistence not only provides sustenance, but is a time of teaching and sharing for the entire community. The oil spill severely curtailed spring and summer subsistence activities in Akhiok. Time that is usually devoted to fishing and preserving them for the winter was spent cleaning up oiled beaches or waiting to be hired. There was no time to get other subsistence foods. Although samples of seafood sent in to DEC received a clean bill of health, conflicting reports which followed left people afraid to eat anything.

People who were not hired to work in the cleanup, and were not able to participate fully in subsistence activities are the most severely impacted. Some residents who did go out fishing later shared their catch in the traditional way with those who were unable to fish. Instead of feeling the joy of sharing, there is resentment because the people with whom they shared had chosen to work instead of participating in the fishing activity. The confusion which reined through the summer interrupted the normal pattern of life, and the absence of the subsistence rituals caused a void in the economic and spiritual well-being of the entire community. The uncertainty of the impacts in the future is unsettling.

At the time of the field visit Exxon's barge carrying canned fish and food supplies to partially compensate for the near absence of traditional subsistence foods still had not arrived. It was scheduled to arrive on Saturday, the 14th of October.

Social Impacts

Akhiok is a close-knit community, which during the past two years made remarkable progress in combating an alcoholism problem which affected 90% of it's population. Before the spill, 85% of the people were involved in a successful sobriety movement. In mid-October with the influx of money and high stress factor resulting from the spill aftereffects, the sobriety rate had dropped to 55%, and families became disrupted. Prior to the spill, the community didn't need a VPSO, but with the increase of drinking, night calls and accidents, a VPSO was needed.

The social impacts began when the oil spill interrupted the everyday life of the people, including important activities such as subsistence activities and commercial fishing. When workers were mobilized only 15 people were hired. People who were not hired felt unfairly treated and became upset believing personal feelings against them caused them not to be employed. People who were wait-listed for employment were not able to harvest fish, or participate in other activities for fear of jeopardizing their prospects for a job.

Parents who went out to work left their children in care of others for long hours and returned home tired. There was a shortage of day care providers, and young kids of 11-13 sometimes had to pitch in to watch the children. Some said the biggest impact was on the children. Many people left the community, some who were now able to afford living in Kodiak.

The feelings of disparity go even further. When the oil spill occurred, people thought that oiled areas could be cleaned up. Local people told Exxon officials where the badly oiled areas were, but all Exxon did was fly over a 100 yard stretch of beach and said it wasn't bad out there. They didn't look at the areas local people identified and "didn't do anything about it." Their attitude was "Nature will clean it up." Everyone knew there was environmental damage and the beaches were not clean when Exxon demobilized. The general feeling was that "They don't care."

At the end of September, Kodiak Area Native Association and Rural Cap sent five people to facilitate a three-day healing workshop for the community. Healing workshops originate from talking circles practiced by American Indians. A group of people gather together in a circle, and encourage others to share their thoughts by offering them a talking stick. For the people that participated, the healing workshop succeeded in bringing the people closer together. However, many felt that the people that needed to participate were not present. Some said the workshop should have been held earlier when things began to get out of hand. The sense that everything was going wrong was detected early, but everyone was too busy to do anything about it. By the time Exxon demobilized, picking up the pieces was a little late.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORTS

Upon Exxon's directives men were told to survey the beaches for oil. An early reconnaissance by the men found oiled beaches in mid-April. Cleanup efforts in Akhiok began in early May before resources arrived. Local people picked up tarballs, dead birds, and dead ducks which were washing ashore on beaches. In the meantime, daily reports regularly filtered in on Radio Station KDXT from Kodiak. The local coordinator attended numerous meetings of Mayors in Kodiak and Anchorage, and coordinated efforts with the Kodiak Island Borough. Noting that some of the reports on the radio were not accurate, the community took the initiative to send in their own local reports. Sometimes the reports were not accurately given or were outdated by the time they were broadcast. The fax provided the most up to date information on all the spill aspects.

A boat from Kodiak arrived in May with containment boom, oil snares, shovels, bags, rain gear, boots, and goggles. The materials sent were sufficient for the community's cleanup efforts. Training sessions were held during the days for the benefit of people who were eligible for hire. This aspect was criticized by a few people because it eliminated some who were unable to make it to the day meetings.

Safety meetings were held everyday from 6:00 a.m. until 7-8:00 a.m. to acquaint workers mobilized on May 15th with oil effects, weather conditions, etc. When the supplies came, the male workers went out on beach cleanup. In June, the ladies worked with compounds and strung pom-poms. Because the workers had received no instruction on how to string the pom-poms, efforts for the first couple of days were tedious. By the fifth day everyone's hands had to be taped in order to continue stringing them together. By the second week, 500 bags (five fathoms per bag) of pom-poms were completed.

When the concentration of oil increased on the beaches, the women joined the men in working on the beach. The work continued until September 15, and despite the fact that the beaches were not clean, the workers were satisfied that they had put forth their best effort.

When Exxon demobilized, VECO arrived in the village unannounced and seized all documents relating to the spill: records, files, etc. from the cities cabinets, as well as the remainder of the cleanup equipment and two ATV's purchased from local people.

In preparation for future spills, the community would like to store cleanup materials, gear, and equipment locally. The city has a garage available for storage, but a bigger warehouse would be even better. By hiring local people who are familiar with the area, the cleanup process would be more effective. It is important that training be initiated for local people on all aspects of oil containment.

INVESTIGATION OF CAUSES FOR DIFFERENCE RESPONSES AND RESULTANT EFFECTS

Perhaps what sets Akhiok apart from communities located closest to the spill in terms of difference of response was that although they received a lesser comparative environmental impact and had time to prepare, the community lacked a predetermined response process. This situation left the city unprepared to deal with an unexpectedly heavy case load, and no mechanism to deal with various spill related administrative functions. Since Ahkiok also lacked professional facilities and staff to deal with social impacts, problems which got out of hand worsened, and individuals who needed counseling had to travel to Kodiak to obtain it.

RECOMMENDATIONS FOR IMPROVING RESPONSE

Federal

Prevention.

State

There should be an emergency fund which would provide the city with the resources it needs to implement its response capabilities in emergencies, thus enabling the city to reserve their budget for normal community operations.

Local

Store equipment for cleanup in the community. Akhiok needs the commercial type containment boom. Have boats available from Kodiak to transport the boom if it is not stored in the community.

Training should be provided in the most updated methods of oil cleanup.

Workers need to be apprised of contracts.

Industry

A good contingency plan.

Hire everyone that wanted to work, or rotate workers to enable everyone to have a chance to earn money. Hold training sessions during the evenings so people unable to make it during the day could attend and thus be eligible for work.

Have the spiller provide matching funds so that organizations such as the city would not have to compete for employees.

ENGLISH BAY

BACKGROUND

English Bay is located near the southwestern tip of the Kenai Peninsula on lower Cook Inlet. The village is situated at the base of a narrow spit of land at the head of English Bay. A large tidewater lagoon behind the spit forms the mouth of the English Bay river, whose system has the only significant natural run of sockeye salmon in the Southern District of the Lower Cook Inlet Area. The community is approximately 25 miles from Homer by air or boat, and four miles by foot trail from Port Graham.

English Bay is an unincorporated community whose boundaries are encompassed within the jurisdiction of the Kenai Peninsula Borough. Its population of over 205 people are predominately Aleut Natives who are highly dependent on subsistence resources. The English Bay Village Council is the governing body of the community and served as the lead coordinator in the oil spill response.

THE SPILL

Most English Bay residents never dreamed that an oil spill would affect them, with the exception of one person who "figured that maybe someday it could happen because of the tanker traffic in Cook Inlet." Most learned of the spill on March 24 over public radio station KWAV in Homer, and on TV. One individual who eventually went to work on the spill was in a retreat near Seldovia and did not hear about it until three days later. VECO mobilized workers in English Bay days before the oil spill brought mousse, sheen and tarballs into the community.

Heavy oil impacted Port Chatham, Anderson Beach, Pt. Bebe, Windy Bay, Chugach Bay, and Elizabeth Is. People believe that the oil which sunk into the gravel in front of the village will come up with the cold. The oil impacted almost all of the traditional hunting areas of the English Bay people in early April. The tides swung the oil around the point near Flat Island on April 17th. Ducks and otters were seen swimming in the oil near the Island. Some of the seagulls hovering around the dump had oil on their tails and bellies. Someone commented that it was unusual to see so many this time of the year. Mousse was collected in a coffee can that evening from the waters in front of English Bay. Throughout the months following, the beaches received continual oiling.

COMMUNITY REACTION TO INCIDENT

English Bay residents are deeply saddened by the spill's affect on everything associated with their everyday life. There is a tremendous sense of loss for the damage on the most heavily oiled beaches; Port Chatham, Elizabeth Island, and Anderson Beach. They know it "will never be the same." Other terms used to describe the reaction was "depressing, helplessness, hurt, anger, and hopelessness."

The consensus for both short and long term effects is that the spill has caused severe environmental, economical, and to a lesser extent, social damage. There is no doubt that the spill has affected subsistence the most. "It will be a long time before people could hunt." Since not everyone profited from money earned during the cleanup, there is concern for the welfare of people who were unable to work and who now cannot subsist.

IMPACT ON COMMUNITY

Environment

Environmental damage to the areas around English Bay is severe, and there is a considerable mortality rate to marine organisms in the oiled and intertidal areas. The hardest hit areas were identified as Port Chatham, Elizabeth Island, and Anderson Beach. A worker described those areas as "impossible to clean." The true extent of the damage has yet to be assessed, but in these places oil has sunk deep into the gravel and in the sand. The oil not only covers the rocks, but is under them, too. It coats the kelp and seafood and barnacles on the rocks. Reoiling has occurred in most of these impacted areas. The oil has also sunk into the gravel in front of the village where several local setnet sites are located.

On Elizabeth Island, an individual who worked in this area said that he wouldn't eat any seals or fish from here after seeing sea lions, seals, and "lots of wildlife oiled." Bears which returned to the beaches in spring were also observed eating oiled kelp and birds.

The community also experienced solid waste and sanitary landfill problems due to the additional usage during cleanup activities.

Economy

The early economy of English Bay was based solely on subsistence hunting, fishing, trapping, gathering and trading. Local employment opportunities in English Bay are limited, causing a heavy reliance on subsistence. Fishing and fish processing is an important source of cash income for English Bay and accounts for 78% of their subsistence harvest. The majority of people engage

in setnetting and commercial seining, and also work seasonally in the Port Graham Cannery. The oil spill occurred a week before fishing activities were to begin in Cook Inlet. All subsistence activities were severely disrupted at this time.

The spill came at the worst time of the year for subsistence, and affected changes in the lifestyle in a matter of months. Seafood, salmon, and everything from the sea which English Bay people depend on for their livelihood were all affected. Red salmon, the staple of the village is sorely missed. Fish racks and smokehouses were empty. Eating habits changed because the subsistence foods cannot be purchased in the stores.

In June, the village of Tyonek airlifted King Salmon to the community for distribution to each family. The village of Angoon in southeast Alaska sent seal meat, seaweed and seal oil. The donations of food were deeply appreciated. Dozens of cases of frozen salmon were provided by the Chugach Alaska Corporation from its Cordova cannery in September. Normally, fish is dried in the summer, and its late arrival and the wet fall weather made it almost impossible for the fish to dry in the traditional way.

Seventy people or almost the entire adult population of English Bay (includes relatives of English Bay people living outside of the community) were temporarily employed in cleanup work which followed the spill. The employment provided a boost in the economy of the village. People were finally able to afford such things as freezers, furniture, hondas, telephones, TV's, satellite dishes, speedboats, skiffs, and clothes, and were able to pay off bills, add on to houses, etc. Several families bought modernized diesel heaters to supplement their wood heat. Money earned from employment also boosted alcohol abuse and temporary disruption within the community.

The Village Council also generated revenues from renting the Community Hall, a truck, and a 350 Cat. The Village Council's store also experienced an increase in sales at their store.

Social Impacts

Social impacts began shortly after the workers were mobilized when parents went off to work leaving their children in the care of others for long hours. The absence of key people in the community resulted in staff shortages for normal services such as the health clinic, and police services. When the health clinic staff quit to work on the oil spill the clinic was unable to deal with the increased demand for services. The community at times needed the VPSO, but he was not there. Feelings of frustration and hopelessness caused incidents of drinking to rise temporary and hampered the sobriety movement in the community.

Local workers were threatened with the loss of their jobs if they spoke to media or outsiders. As it was, the media painted a very negative picture of the people.

Relationships between people changed. After constantly dealing with increased traffic in the community, the loss of subsistence and ongoing activity and disruption of everyday life, there were displays of anger and frustration. When people got money, there was less sharing among people. Stress caused many changes. Articles about the community were viewed as negative and mostly inaccurate, causing hurt, and distrust of people coming in.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORTS

Beginning one week following the spill, phone calls from agencies such as DEC, Dept. of Fish and Game, The North Pacific Rim, Chugach Alaska Corporation, Dept. of Health and Social Services, the Coast Guard and VECO began to come in. Reportedly, phone lines were jammed so that it was difficult for calls to get through. On regular pre-spill days, it sometimes takes days to reach the village. According to the Council, VECO was involved in employment and mobilization, DEC in Soldotna "didn't do much," but did check the air quality and water supply, Fish and Game told people how bad the spill was and told them to check subsistence foods for an oily smell, Chugach Alaska Corporation was instrumental in trying to prioritize shareholder employment, and The North Pacific Rim was involved in social aspects.

The deluge of the media astonished the community. Homer News, Anchorage Daily News, New York Times, Channel 2 TV from Anchorage, and TV crews from Australia and Germany descended on the community. People became tired of being interviewed, and tired of "everything popping up at the same time." People constantly came and went, and dozens of airplanes flew out of their dangerous airstrip daily. Then after VECO came, the town emptied out. Fax reports with updates on the spill began to arrive daily from the Valdez DEC office.

VECO arrived on short notice on April 12 to meet with the community. In a village meeting they informed everyone they would begin employing local people, and that employment would last until September 15. Workers were pulled out a month early, despite their promise. VECO attempted to lay people off in July, but Chugach Alaska Corporation intervened by threatening trespass of oil spill workers on their land.

In the meeting, VECO promised to send cleanup materials. Booms, cleanup bags, absorbent materials, raingear, radios, VHF radios, and hats arrived on April 16 on a barge from Homer. A fax machine was sent by the Kenai Peninsula Borough. The amount of cleanup materials were not considered sufficient and arrived 1-2 weeks late. The community learned that materials arrived in Homer and

Port Graham before they arrived in English Bay, despite the fact that English Bay was closer to the oncoming oil tide, and had been highly prioritized by Fish and Game. It was mentioned that this situation occurred because the Homer MAC Group had so much power, that they prioritized favored areas above English Bay. Another version was that a coordinator in Port Graham was instrumental in prioritizing booms arriving in Port Graham first. Still another version was that the MAC group was newly organized, and although they did try their best to prioritize sensitive areas, they made mistakes in the beginning.
Whatever the reason, English Bay did not receive the cleanup materials in a timely manner. This aspect caused people to believe the powers that be did not think their community was as important as others. It was felt that politics were involved, and in an emergency which impacted them so severely, it had no place.

When the materials arrived, there had been no training in how to prepare the booms and consequently, no one knew exactly what to do. The men worked through the night to put the booms together. On the evening of April 17, the booms were finally deployed in the lagoon just in time to protect the English Bay River system. Reports that oil sheen was splashing up on Flat Island, near English Bay came in that evening. Oiled ducks and otters were seen near the Island. Then oil mousse began washing ashore on the beaches. Booms could not be deployed in the ocean in front of the lagoon because the tides and currents would have broken them apart.

Organization for the cleanup and containment efforts were handled by VECO in coordination with the Village Council. VECO took over completely, causing a lot of confusion in the beginning. The mobilization was however, handled smoothly with only minor management problems encountered when inexperience people were involved in the coordination. Once hiring was completed, coordination improved, but communication with agencies remained poor. Contact people from all the agencies changed constantly, with the exception of Bob Warren of VECO. However, in time, even VECO disappointed them when they reassured people that they would handle everything. After they left, they would not be heard from again. The agencies did little to help, and actually tried to minimize the extent of the damage.

The week following the mobilization certainly transformed English Bay from a quiet, peaceful village to total disruption. VECO rented the Community Center. Overnight it became their base of operations, complete with phones, computers, a fax machine, snacks, gear and many people going in and out constantly. In one fell swoop, everyone able to work went to work, seventy in all. A dozen babysitter who received state certification for day care services also received $16.69 an hour.

No safety training classes were provided early on and beach workers were unaware of health risks associated in working with oil. Most English Bay people worked in either beach cleanup or vessel charters. A camp set up at Port Chatham included three cabins, a mess hall, banya, and two outhouses. Ten people worked on the beach, cleaning the rocks by hand. Workers did not have shovels, but invented ways to get the oil out of the beach. One method which worked well involved digging a hole 8 inches deep in the sand using gloved hands, then inserting an absorbent pad. When the corners were lifted, the oil came with it. This method enabled workers to get a lot of oil out of the beach, but was discontinued when they were ordered to stop using that method for cleaning. The lagoon behind Portlock was heavily oiled early and though shovels were needed and requested, they never showed up. Portlock, a historically important area, never received the cleaning it deserved.

During the beach cleanup, workers reported that VECO would come in and "mislead" everyone. As rules for beach cleaning methods changed, and new orders were given, moral went down. One individual quit in disgust. VECO was viewed as not handling the beach cleanup properly. Workers were treated like they didn't know anything. "Outside people were giving orders." And derogatory racist remarks were heard over boat radios.

Despite these problems, workers knew each other, were familiar with the ares, knew the weather, the limitations of workers, and did the best job they could. They cleaned six beaches which got continually oiled, and although they weren't clean, they said they did a good job. It was the consensus of beach workers that had they been allowed to organize their own cleanup, and were provided with adequate supplies to get the job done, they could have done a better cleanup job.

In July, the Coast Guard and VECO agreed to pull people out, after conducting a helicopter survey. Since the beaches looked clean, VECO began laying people off. In mid-August workers on Perl Island were laid off. Pulling people out early when the beaches were obviously not cleaned, and the weather good made a lot of people upset. They knew that workers in less impacted areas were allowed to continue working.

In preparing for future spills, it is important for studies to be conducted on the movement of tidal currents so that if a spill occurs, the approach of the oil can be anticipated. The knowledge of environmental conditions from local people can assist in the study of movement for the purpose of deployment of containment devices.

Adequate cleanup materials should be available as soon as possible. Three to four storage buildings are needed. Commercial booms work better in English Bay. 1,000 feet of boom is needed. If it is

available, five or six people are all that is needed to deploy the booms which can be accomplished within one hour. Cleanup gear, absorbent materials, shovels and a place to store totes of collected oil are needed.

INVESTIGATION OF CAUSES FOR DIFFERENT RESPONSES AND RESULTANT EFFECTS

English Bay did not receive prioritization for immediate cleanup materials although it was in the direct path of the oil. Politics was viewed as a factor.

Village Council personnel, though busy throughout the cleanup, did not fall over from exhaustion like other community leaders because they rotated personnel regularly.

Like many smaller communities, English Bay did not have an aggressive, vocal faction who had the political clout to improve the cleanup process and take care of unmet needs. They did not participate in the "Oiled Mayors" because it was felt they did not meet their individual needs.

Because an institutional response mechanism was not in place in English Bay, more delays and disorganization was evident.

RECOMMENDATIONS

Federal

Prevention.

State

Keep politics out of prioritizing areas for cleanup.

Improve communications on all levels among the agencies.

Preparation.
Kenai Peninsula Borough should have played a bigger role. They have more political clout with Exxon.

Local

Industry and agencies should work directly with the village.

Need reassurance from the top. Hold meetings once a month to inform people of efforts.

Improve airstrip and road to Port Graham.

KODIAK

BACKGROUND

The City of Kodiak has a population of 6,700 people. A total of 15,000 reside within the boundaries of its Home Rule Borough. Kodiak's main economy is commercial fishing and fish processing. Government, construction and services are also important elements of the economy. Subsistence dependence is important, but is less emphasized.

The earthquake and tsunami which devastated the City of Kodiak in 1964 made a lasting impression on the community. The recognition of possible natural disaster motivated the Borough and City to think ahead and develop a plan for emergency preparedness.

THE SPILL

Community residents knew about the oil spill from day 1, but many did not expect it to impact Kodiak to the extent which it did. Afognak Island and Shuyak Island were the hardest hit areas. Light sheen and mousse patties were deposited by the currents over the Island mostly on the Shelikof side on the north.

The virtual total closure of a normally thriving commercial fishery zone hit the local economy hard. Kodiak ranks among the Nation's top fisheries port.

The oil spill response was ongoing, unlike emergencies such as tsunamis which are over after they hit.

COMMUNITY REACTION TO INCIDENT

The initial reactions to a spill that began so far away were shock, denial, acceptance, anger, and depression. In May, as anger mounted over the delays in the response effort, over 1,000 people participated in a protest march against Exxon in Kodiak.

Short term impacts are viewed as disastrous. Long term impacts cause a lot of concerns about possible years of adverse affects on the commercial fisheries, subsistence foods, loss of environmental resources, and related issues of economic loss and social problems.

IMPACT ON COMMUNITY

Environmental

The spill caused considerable degradation of many coastal resources. 20,000 dead birds were collected on Kodiak Island by early September, and due to the migration pattern, new classes of birds were also affected.

Economic

Kodiak's economy was turned upside down. The spill affected the fishing economy, government, construction, and services.

Kodiak was more impacted than people realized. The spill cost the people of Kodiak dearly when the fishing economy became disrupted. Sheens shut down the salmon and herring fleets, and crews were lost to oil spill cleaning. People were told they would have to be ready to go fishing in order to get claims compensation, so they waited in preparation of potential fishing instead of going out to work on the cleanup. As a result, cleanup workers made much more money than normal, while many fishermen (seiners) and processors lost money. Over 300 boats were not able to fish and only the setnet fishermen in one bay on the island were able to harvest any fish.

Generally, service businesses did better than normal, but there was a definite shortage of people for the service type jobs. In July, the Kodiak Employment Office had 111 jobs available.

The claims compensation system was inadequate in dealing with various classes of fishermen. People who should have been compensated were not, while others who received compensation wouldn't have been involved in the fishing if it had occurred. In August, claimants noticed that Exxon was rejecting an increasing number of claims and boat owners were in jeopardy of losing their vessels because of their inability to make loan payments. The owners of vessels who provide tender service or who align themselves with permit holders and those who lease permits during normal fishing season, and crewmembers who were not offered jobs or who lost their jobs due to other uncertainties of the circumstances were seriously impacted economically. Advance payment made to cannery workers and salmon permit holders were based on the 15 million projected
catch figures published by the ADF&G. Updated figures estimated that 21 million fish could have been harvested.

The city and borough staff and budget were severely overtaxed in attempting to respond to the spill. Existing staff were burdened with all the spill activities and many suffered "burn out."

When workers left to work in oil spill cleanup, their absence definitely affected the community adversely because only the basic administrative requirements could be accomplished. Much work had to be deferred. Key people worked long hours on spill related requirements.

Attempts to negotiate an Exxon/State agreement through the Oiled Mayors for reasonable uniform reimbursement agreement fell through, and left the members of the group with a clear impression that Exxon had no intention of coming to a fair and reasonable

agreement. They blasted Exxon for their insufferable arrogance in the manner in which they treated the communities who suffered from their negligence. Definite loss of faith.

Vast amounts of food were being purchased and sent to cleanup crews, causing some temporary local shortages. Subsistence foods were virtually eliminated from the area for the 1989 season.

There was displacement of homes, office space and warehousing for spill equipment and cleanup materials.

Social

Social impacts in Kodiak were disastrous. Domestic violence tripled. Eight suicides were committed by young people after the spill. Three or four were children of Coast Guard families. The caseload for the Kodiak Mental Health Department in July rose 700%, a statistic which greatly alarmed the community. The police department responded to a higher level of domestic violence and put in considerable overtime.

Kodiak's Native communities expressed great concern for health risks from consumption of subsistence resources.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORT

From the beginning of the response effort, the Kodiak Island Borough and the City of Kodiak were actively involved in organizational functions, communications, and coordination with the various agencies and Exxon.

An Emergency Services Council, the preestablished emergency support system composed of Kodiak City, Borough, and U.S. Coast Guard Support Center officials, was utilized as the key coordinator in the spill cleanup effort. The four member council was established following many years of planning. To accomplish the plan, the City and Borough adopted identical emergency response ordinances, and the Coast Guard developed a memorandum of understanding.

The implementation of the plan begins with the Council declaring that a disastrous situation exists, thereby activating the emergency response ordinance. The City Manager then becomes the Emergency Services Director for all City, Borough, and Coast Guard resources, and the rest of the Council is advisory to him. His authority encompasses the City and the five municipalities within the Borough's jurisdiction. The municipalities are responsible for developing their own emergency response plans. However, at the time of the oil spill none had developed any ordinances to combat an emergency.

The Emergency Services Council did not make an emergency declaration of disaster during the oil spill, thereby enabling the group to function on a consensus basis. They elected to retain the overall control of the administrative process, and each agency requested and submitted their priority protection lists to the Council. The manner in which the areas nominated were assessed were based on the subsistence food use, commercial fishing, critical bird and mammal habitat and environmental sensitivity. The resources were then distributed according to the Council's directives.

Among the first organizations/agencies to contact Kodiak were the Coast Guard, Federal On-Scene Coordinator, Alaska Department of Environmental Conservation, Alaska Department of Fish and Game, and numerous others by telephone, as well as Exxon and their contractor, VECO. The National Park Service was viewed as the most professional group who worked with the Emergency Services Council. They set up a field office in Kodiak and brought up 300-400 people and rotated their rangers in the field office.
The U.S. Fish and Wildlife Service had local headquarters for the bear refuge and maritime preserve. The National Oceanic and Atmospheric Administration was the scientific advisor to the Coast Guard and chaired the Kodiak Interagency Shoreline Cleanup Committee. This agency met twice a week. The Alaska Department of Fish and Game office enforced a zero tolerance policy for fishing. The Alaska Department of Natural Resources State Parks Division and the State Historical Preservation Office assisted in the archeological aspects. Their regulatory permitting system required seiner crews to obtain a permit before being allowed to conduct cleanup work on the beaches. This system caused delays in cleanup activities.

Initially, the agencies merely kept the community informed as to the progress of the oil, since the oil was not expected to impact Kodiak, and many did not assume the situation was as bad as it later became. The Coast Guard, during the early days of the spill, provided the best factual spill surveillance data, intelligence, and transportation of necessary materials. Their vessels deployed critical materials at all hours and was available as needed.

Communications coverage was assessed early on as an important element in dealing with the spill. Consequently, the city and borough worked closely to disseminate information to the public by having public meetings three times a week. The meetings which were broadcasted over the radio and videotaped, utilized a panel format involving the borough Mayor, Exxon, DEC, and numerous agencies who sat in the audience as the forum for disseminating updated information. The meetings also linked villages in the borough through teleconference. This linkage provided village residents an opportunity to participate, raise concerns and ask questions of the agencies. As time went on, the meetings were held less frequently,

dropping to two times a week, then once a week.

When the oil began hitting the north side of the Island, operations were set up to begin making booms. Delays were encountered because the boom had to be made or ordered. The community did not get any materials from the command center in Valdez. They worked with the Coast Guard who was viewed as responsive and responsible. In late April, and early May, the Coast Guard and the military airlifted initial cleanup materials to Kodiak. Additional materials were airlifted by Exxon management and VECO, while others were brought in by surface vessels. The timeliness for supplying the cleanup materials was adequate for the basic response needs, but somewhat slow for the protection of fish hatcheries and other critical areas identified through an operational plan. Exxon brought in a boom expert and flew him around the Island.

Impact assessment was begun immediately after oil was spotted. A system to identify vessels available for charter operations and another to begin manufacturing cleanup materials were in place before Exxon arrived. The borough worked with various entities to begin building the log boom capable of handing the type of seas around Kodiak. By April 6 or 7, boom was being constructed with logs transported from Afognak Island, following negotiations between the borough and the ANCSA corporations of Port Lions and Afognak to supply the logs needed for the booms. By the time the booms were deployed, Exxon arrived.

The log booms utilized for protection of the Katoi hatchery on Afognak Island were not considered effective. Commercial type booms were more effective for that purpose. Efforts to deploy booms in other impacted areas like Karluk were not effective either. Boom was sent there despite the warning from the Exxon expert that they would not work there in an unprotected area. They did not work well, and the borough stated that the technology doesn't exist to deal with collecting oil in such situations. Perhaps the heavy ocean boom used in Norway might work better, but they were not available. Skimmers didn't work either. The efforts of the Russian skimmer in Marmot Bay and Shuyak Island were hampered by four foot swells. It was recognized after much effort that the only thing which would help Kodiak is to stop the oil before it gets there, and to develop a good contingency plan for containment of oil in the Prince William Sound.

The mobilization of workers by VECO involved the hiring of approximately 400 local people. The largest on-shore VECO contingent involved about 700 workers. About 70% of them were directly involved in beach cleanup while the remainder were employed as vessel washers, safety technicians, wildlife surveyors, and on-shore support staff. An additional 71 Norcon employees were also stationed in Kodiak. Although Kodiak had a good supply of available nonworking fishermen and cannery workers, many of them were left out of the hiring picture.

When work forces were mobilized, there was a lack of delegation of authority in the field. Delays were encountered because decisions had to be made at regional headquarters or higher up. Shoreline cleanup assessment teams analyzed priorities, passed them on to the On-scene coordinator, who in turn passed them on to Exxon for assignment of cleanup work. Organizationally, it worked well, but local officials had difficulty in convincing Exxon to provide sufficient cleanup crews to handle problem areas. The cleanup was deemed not very effective.
The outer coasts received the most oiling, and there was not a beach that wasn't hit. The southeast end did not get as much impact as the north side, but it was massive nonetheless.
Cleanup by crews from villages were much more productive than the VECO crews. Village people had a vested interest in saving their beaches and important subsistence and fishing areas.

Only 5 - 10% of the freefloating oil in the surrounding waters and that which impacted the shorelines were ultimately removed. The cleanup constituted of a quick once-over of surface contamination only. The cleanup zone for Kodiak was large in comparison with Prince William Sound and other geographically impacted areas. Logistics were a continual problem, as was the continual pressure kept on Exxon to perform adequately. Crews from Kodiak were reduced as early as August 2. Virtually everyone thought that Exxon pulled out way too soon.

New oil was continually being washed ashore on a daily basis. Although approximately 732 miles had been treated, there were over 3000 miles of oiled beaches.

Several local groups formed to advocate for specific groups of people. They included such diverse groups as a Seiner's Organization, an Ad Hoc Committee, and a congolmeration of second class cities and tribal villages who formed the Kodiak Island and Alaska Native Coastal Coalition to address issues which related to health and other issues of importance to Alaska Natives. Kodiak's City Mayor was instrumental in organizing the "Oiled Mayors," a group which was extremely effective in establishing a forum for the sharing, exchanging, and dissemination of information on the response to the oil spill between all interested municipal and tribal governments. This group provided political clout and much needed communication for small towns who did not have institutional nor political capabilities.

In preparing for future spills, the city said it is important to recognize potential problem immediately. If there is any spill, communities need to keep a large supply of containment and abatement materials on hand, in good condition, and at all times.

Local organizations should be allowed to manage their own cleanup program with assistance from federal and state agencies. The coordinating agency needs to be assured of adequate and timely monetary reimbursement for time spent on spill activities, so that they do not become dyfunctional.

Training programs for early response to contain and remove oil was identifed as a need, as was a well defined plan of action for staff to administer and manage cleanup program. Warehouse facilities supplied with containment and cleanup materials and equipment are also needed.

Adequate funds to permit people to properly cope with the on-going resident social problems is an immediate unfulfilled need resulting from the spill.

INVESTIGATION OF CAUSES FOR DIFFERENT RESPONSES AND RESULTANT EFFECTS

Kodiak's Emergency Services Council was an existing institutional agency prepared to deal with any type of emergency. The coordination with local key agencies was built in. Among its four member Council, was the U.S. Coast Guard who fortunately had a facility, the largest in the U.S. in Kodiak. Included within its resource capability was a 1,100 uniformed personnel, three aircraft runways, six C-130 aircraft, eight helicopters, four vessels and world wide communication.

While other areas utilized Multi-agency coordinating Groups (MAC Groups) in which entities involved at the planning level had equal input, the EMSC group benefitted Kodiak more because this smaller group had a broader area of concern. And because it was also charged with the decision making responsibility the result was a more orderly, effective process. This system worked well in light of the fact that the state did not have the available resources to deal with the spill.

The Kodiak Area Native Association was instrumental in taking Exxon to task for ignoring Kodiak Native communities who were in desperate need of the cleanup equipment, supplies and training for cleanup efforts. The "Oiled Mayors" group headed by Kodiak's Mayor focused attention on the plight of its members and their villages, and succeeded in adequately representing their interests.

RECOMMENDATIONS

Federal

Prevention.

Establish an oil spill liability fund that would be available to the federal, state, and community governments in the event that a responsible party denies its obligation or is unable to adequately meet it.

The federal government should initiate a federal buy-back of the leases sold in OCS Sale 92 (Bristol Bay lease sale). The risk to the billion dollar fisheries is too great to allow oil drilling or exploration in that sensitive area.

Need to isolate the "responsible party" from the direct control over the abatement activities. This would eliminate the adversarial conditions that existed and inhibited the cleanup.

Spiller should not be in charge, but they should pay for the cleanup. The State or Federal Government should put strong controlling agency in charge or in place, such as the Coast Guard. Kodiak has a Coast Guard Station which could be utilized more efficiently.

Commit funds for research for containment efforts. Develop new technology for dealing with spills. Experiments should be tailored to specific areas.

State

There needs to be a mechanism to allow a community government to obtain immediate and certain funds to provide necessary municipal services.

The community governments need assurance that they will have a role in 1) oil spill response planning , 2) containments, 3) environmental monitoring activity, and 4) a direction to federal agencies to give preference to local entities, including municipalities, in contracting for containment, monitoring and assessment services. If oil gets away, contain it before it hits fragile areas.

Communications among agencies needs improvement. Accurate dissemination of information to public is important.

Local

Make sure that whatever system is used, it is used through the Incident Command System. Encourage smaller communities to adopt them, but structure it to meet local situation and resources.

The Multi-Agency Coordinating Group works great. Emergency services are already in place.

Assurance is needed for community governments to promptly collect damages equal to lost fees or rents from injury or loss to real property, personal property or natural resources. Authorization for recovery of losses due to diminished economic activity, rather than just loss or damage to realty or personal property is also needed.

Local response effort requires local people. They know beaches, tides, areas, winds, weather, etc.

The City and Borough worked very effectively together in an emergency response situation. However, employees couldn't run the city and do everything else. They simply didn't have the staff. Backup staff is needed to help normal employees who need to be left alone to do their own jobs. As it was, everything was continually nipping them at the heels, and regular work fell by the wayside. Immediate release of funds are needed to hire people for new jobs. Stage cleanup materials in Kodiak. Materials are needed for immediate response.

Funding for local based response efforts are needed. ($250,000)

Developer/Industry

The oil industry should be required to accumulate a response fund of $2-3 billion paid to the State of Alaska so that the "In charge" agency would have monetary resources available at all time.

Responsible party for oil spills should be more strictly liable for damages to natural resources, real or personal property, revenues, and profits and earning capacity.

A flexible policy is needed to deal with claims filed by fishermen, cannery workers, etc.

Other

Training is needed to show potential workers how to conduct containment and cleanup properly. Videos can instruct how boom is deployed, and practice drills can provide hands-on experience. "Practice and planning, prevents poor performance." The strategy for oil spill cleanup needs to be improved.

LARSEN BAY

BACKGROUND

Larsen Bay is a community located on the west side of Kodiak Island, having a population of about 170 people. The village sits at the base of a large mountain along a narrow harbor. During low tide, if you walk along the beach, mussels and clam shells crunch under your feet. The residents of Larsen Bay are primarily dependent on subsistence. Their main cash economy revolves around commercial (gillnetting) fishing and subsistence. A cannery built in the early 1900's employs approximately 200 workers during the fishing season, the majority of whom are hired from outside of the community. Other than seasonal work, there are few full-time jobs in Larsen Bay, and several families depend on public assistance benefits. The community is organized as a 2nd class city under Alaska law, and is located within the jurisdiction of the Kodiak Island Borough. The city government coexists harmoniously with an active tribal council.

THE SPILL

The people of Larsen Bay knew the oil was coming the week of May 1st. When oil advanced into the Shelikof Strait and Uyak Bay, people could only watch helplessly. Despite their request to Exxon for cleanup equipment three days before the oil impacted the beach, their requests were ignored.

Massive amounts of oil mousse coated Seven mile beach, Harvester Island, Bear Island, Spiridon, Uyak, and Zachar Bays in early May. The vicinity around Larsen Bay was also hit substantially by oil mousse which splattered the beach for miles, and threatened their clam beach a half mile away.

COMMUNITY REACTION TO INCIDENT

Devastation and shock were initial reactions of the Larsen Bay people. Disgust at the lack of early response by Exxon and VECO was followed by frustration and tears as beaches cleaned by volunteers both young and old received continued reoiling. When VECO offered the workers $10.00 an hour instead of the $16.69 offered everyone else, the community reacted in defiance, and learned quickly to stand up for their rights in further spill response efforts. They revealed their strong convictions in wanting to cleanup the environment which supported their life whether or not they received compensation.

IMPACT ON COMMUNITY

Environment

22,000 birds died as a result of the oil spill, and the vicinity around Larsen Bay received tarballs, sheens, mousse patties and islands, while weathered oil freefloated in their bays.

Economic

City functions were disrupted throughout the spill. The community hall, three offices, storage, a trailer, and the teen hall were all utilized during the cleanup.

The city's loan repayment from the Alaska Energy Authority to construct a mini-hydroelectric project was due but the project had not even commenced because the oil spill cleanup absorbed all of the available work force. An erosion control project to keep the banks of the shore from washing away was also delayed. By the end of the summer, the roads were in serious disrepair from the fall rains.

The city had difficultly in receiving freight shipments because vessels which were working on the oil spill were unavailable to deliver supplies. In February, the city received a quote of $4,500 to deliver a piece of city equipment. By September, the delivery cost increased to $16,000. A request by the city to Exxon to cover the increased shipping cost was turned down.

Though the workers made good money, it does not compare to normal fishing income. Last year, there were some 13-14 year olds who made $30-40,000 from fishing. For about 30 workers, however the money was welcome, as the Fish and Game had closed the commercial salmon fisheries and residents did not participate in subsistence activities during the summer.

Social

The influx of monies into the community caused disruption in the village lifestyle. Incidents of alcohol and drug abuse rose.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORT

People of Larsen Bay knew the oil would impact their community three days before it happened. During a brief visit Exxon made to the community in April, cleanup equipment was requested but was not provided. Although local boats were available, Exxon brought in their own boat from Kodiak, which sat by the cannery for a few days raking in the money. Then Exxon brought in ten more boats from elsewhere. The locals were told that boats weren't needed.

Before the oil impacted Larsen Bay, VECO came in on April 26 with six skiffs and 12 workers from outside of the community to conduct beach surveys. Four boats were sent out to conduct reconnaissance surveys in the Shelikof side, while two boats were sent to conduct surveys in Uyak Bay. On May 1st, a boat spotted tarballs and mousse drifting into the bay. However, when the oil came in the VECO crews were nowhere to be seen.

Reportedly, as the oil began to come in regularly, a mousse island which measured a half mile long was spotted. The tides carried the island to the beach, and deposited the mousse eight inches deep.

Larsen Bay people, unable to stand by doing nothing, decided to organize their own volunteer force. The majority of the adult community rallied together. They gathered up all the boom that was available, and deployed them with fishing vessels. Booms built in Kodiak were not built properly and broke apart in the water. Although, the people had no training in containing oil, they developed a technique to corral the oil which was similar to methods used to seine fish. Private skiffs went inside the boom, then utilized bailers to scoop the oil by hand into fish totes which had been obtained from the cannery. Bailers and five gallon buckets with holes in the bottom were used to scoop up the oil for transfer to the hold of a salmon seiner. More than 700 gallons were picked up in five hours, and 6,000 gallons were scooped up during the first week. The volunteer crew collected an average of 20-30 drums of oil a day.

The Coast Guard was contacted, and responded by sending the U.S. Army Corps of Engineers barge, "Essayons" to Larsen Bay to collect the totes of oil.

On the beach, workers labored long hours into the night shoveling oiled debris, kelp, and gravel into five gallon buckets. The buckets were carried to a waiting skiff and deposited into a fish tote. When the tote became half full, it was taken to a seiner which was anchored offshore, who then delivered it to the "Essayons." A crew of 15-20 people on the beach succeeded in collecting 2,500 to 3,000 bags a day, and at the conclusion of the cleanup had gathered 52,000 bags.

At this time Exxon still had not provided professional cleanup equipment despite numerous request for them. The people said "Exxon just ignored them."

At this point, with still no resources in sight, the coordinator went directly to Exxon, and demanded cleanup resources. At last, Exxon responded, ten days after volunteer workers had been on the job. They sent supplies and a blank check to order food and additional supplies for workers combating the spill.

An Exxon representative arrived shortly thereafter with their experts whose job was to train people in deploying boom, safety techniques, and handling oil and oiled wildlife. However, the people they came to train were out cleaning the beaches and corralling the oil in their own makeshift equipment. They had an effective containment system under control, and all of their resource people knew the locations of impacted areas, when to safely go out in boats, and which beaches to protect. They had already organized boats to deploy snares, boats for picking up debris, and boats for transportation. In discussions with the Exxon folks, the Larsen Bay coordinator conveyed the problems the community had with their contractor, but were told that they would have to work with them. Then Exxon agreed to lease vessels for the same rate as others, but offered to pay the oil cleanup workers $10.00 an hour while everywhere else they were paying $16.69 an hour. This offer insulted the community and was not acceptable. The workers demanded the going rate and got it.

As the cleanup continued with VECO in charge, the workers said that they needed VECO's resources and support, but they did not appreciate what they considered their inept efforts and interference. When VECO took over, they imposed all sorts of rules for the cleanup, changed tactics for cleanup and nitpicked about such rules as taping bags instead of tying them. The beach workers took their orders from their own coordinator who was familiar with the local resources, needs, and sensitive areas. They said, "Who cares if it's a Plan A or Plan B beach cleaning, we just want to clean the beach, all of it."

Seventeen workers assigned to cleanup the beach at Spiridon Bay worked in groups of three. One shoveled oiled gravel, another held a plastic bag while another taped it closed. Many people who worked on beach cleanup became ill from the smell of the hydrocarbons.

Inspection of the beaches were conducted with a plane and skiff from 20 feet out. Coast Guard signed off beaches in the area as being treated, despite the fact that they were still fouled by mousse and oiled debris. Exxon began cutting back the local work force and rotated the cleanup workers in August, well in advance of the September 15th deadline. The community exerted pressure on Exxon and workers were allowed to continue cleanup efforts until September 5th.

When the oil cleanup concluded people were left with many unanswered questions. They were uncertain about the safety of eating subsistence foods, worried about people who are on a fixed income, and whether they will have to fish in areas unfamiliar to them.

During a town meeting following demobilization, the council provided the villagers with a holiday from community work until

October 6. Then with the advent of winter, the community preared to work on the summer projects as ice formed in the puddles, but there had been no time to prepare for the subsistence gathering.

In preparation for future spill, the best chance there is in prevention. Even with state of the art equipment in Larsen Bay, the cleanup of beaches is not effective.

INVESTIGATION OF CAUSES FOR DIFFERENT RESPONSES AND RESULTANT EFFECTS

Smaller communities could not pursue action against Exxon on their own. The "Oiled Mayors" was viewed as very helpful to them in developing a united effort to protect all of their communities.

The community benefitted from the assistance from the Borough and City of Kodiak. They had good rapport with them.

Larsen Bay organized their own very successful work force to combat the spill with improvised cleanup equipment. Their leadership was able and made analytical decisions in the field which enhanced their cleanup efforts despite orders to the contrary, and demanded better treatment and got it.

The workers had a vested interest in protecting the environment that supported their way of life. They initiated their efforts without thought of getting compensated, and used common sense in cleaning the oil rather than follow rules that didn't work effectively.

RECOMMENDATIONS

Federal

Prevention.

Impose criminal penalties and impose fines for spilled oil.

State

State should have done the organization instead of Exxon, and used local people instead of outsiders.

If the beach is to be cleaned, clean it, all of it, then move on to next beach.

Industry

Exxon should come back to complete cleanup. The beaches are not clean. Cleanup should have occurred sooner.

There were too many rules to follow.

PORT GRAHAM

BACKGROUND

The village of Port Graham is located close to the southern tip of the Kenai Peninsula facing Port Graham, an arm of Cook Inlet. The location is approximately twenty-four miles southwest of Homer, and is accessible by plane or boat. It is located four miles from English Bay, which is accessible by foot-trail, plane or boat. Seldovia, the nearest service center, is fifteen miles away.

Port Graham is an Aleut village consisting of approximately 195 people. The predominately Native village has a mixed cash-subsistence economy. The commercial fishing industry provides the primary source of cash income for the community. The majority of people who live in Port Graham are involved in seasonal fishing activities, either in the harvesting or processing. Subsistence activities have persisted as the base for the mixed subsistence-cash economy and continue to remain an integral part of the culture and economy. "What white men do for sport and recreation and money, we do for life: for the life of our bodies, for the life of our spirits, and for the life of our ancient culture. Fishing and hunting and gathering are the rhythms of our tradition, regular daily life times, not vacation times, not employment times."

THE SPILL AND COMMUNITY REACTION TO INCIDENT

"Then we heard the news. Oil in the water. Lots of Oil. Killing lots of water. It is too shocking to understand. Never in the millennium of our tradition have we thought it possible for the water to die. But it is true."

The future is uncertain, maybe in jeopardy. The impact on the subsistence is the most devastating.

IMPACT ON COMMUNITY

Environmental Impact

"We walk our beaches. But the snails and the barnacles and the chitons are falling off the rocks. Dead. Dead water. We caught our first fish, the annual first fish, the traditional delight of all--but it got sent to the state to be tested for oil. No first fish this year. We walk our beaches. But instead of gathering life, we gather death. Dead birds. Dead otters. Dead Seaweed."

In Windy Bay where many Port Graham people worked on beach cleaning, there were approximately 200 dead birds per mile.

Economic Impact

Subsistence hunting, fishing, and gathering have always been an integral part of the community's culture and heritage. Subsistence harvests of fish and game resources is high in Port Graham, with fish supplying about 80% of their total subsistence harvest. The traditional use areas for subsistence activities range from Resurrection Bay to the head of Kachemak Bay. The spill totally disrupted subsistence hunting, fishing and gathering activities.

The local cannery which normally employs 200+ people during the summer only employed 30, and only the freezing plant was in operation.

Social Impact

"We start fighting. We lose trust for each other. We lose control of our daily life. Everybody pushing everyone. We Native people aren't used to being bossed around. We don't like it. But now our own people are pointing fingers at us. Everyone wants to be boss, we are not working like a team."

"We lose control of our village. The preschool meets in the community center. We shut down preschool so the oil company can have the center. We work for the oil company now. We work for money now. The springtime season of our village ways is gone. Destroyed."

"We hardly talk to each other any more. Everybody is touchy. Everybody is ready to jump you and blame you. People are angry. And afraid. Afraid and confused. Our elders feel helpless. They cannot work on cleanup, they cannot do all the activities of gathering food and preparing for winter. And most of all, they cannot teach the young ones the Native way. How will the children learn the values and the ways if the water is dead? Very afraid. If the water is dead, maybe we are dead--our heritage, our tradition, our ways of life and living and relating to nature and to each other."

By June, Port Graham began to lack critical health services. The community also experienced social and economic shock because of the massive amounts of dollars being dumped into the local economy. Local bickering and dissolution of tradition trust erupted among local residents.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORTS

The Village Council was the main coordinator in the cleanup operations. During the week of April, Exxon's subcontractor, VECO met with the community and hired all adult residents who were available to work.

To accomplish its operations, VECO rented the community hall and kitchen facilities (1,500) a small conference room ($400), an apartment ($400). They also brought in several phones for the community hall and conference room, which incidently rang off the hook at all hours. A fax, which was provided by the Kenai Peninsula Borough, cranked out information almost constantly. The community hall buzzed with activity into the wee hours in the morning, and tables were lined in brightly colored spanking new Helly-Hanson raingear, helmets, boots, and gloves. Everyone was running everywhere. The organization and implementation of the cleanup pitted local people against each other in the competition to be boss. "There were too many flunkies running the show."

The Health Aide, VPSO, and several other employed people agreed to being voluntarily laid off to work for VECO. This caused shortages of people and services, and interruption of the daily life.

Workers returning from English Bay the evening of April 19th with oil mousse collected in a coffee can. By now, several oiled otters and ducks had been spotted in the bay. Booms were being deployed with the assistance of Fish and Game.

During the evening, many local women went out in a skiff when the tide was low to collect badarkies. It was overcast and windy, but they were afraid that if the oil washes into their bay, it would be a long time before they could go out again. When they returned, they set up an assembly line to shuck and clean the bidarkies. The kitchen facilities were used to cook them. Every family received one bag, perhaps the last for many years to come.

People wondered about the black bears who would be out of hibernation soon. When they emerge, they head for the beaches hungry and eat anything. Windy Bay, Nuka Bay, Flat Island, Dog Fish Bay and Port Chatham, all traditional areas for hunting and fishing were badly oiled by this time. Crews from Port Graham were sent to work in Windy Bay.

Subsistence fishing opened during the week of April 19th, but not one person went out to fish. Everyone was working long hours. One individual who, in preparation for the new season, cleaned out her freezer and regretfully gave her fish away.

The oil spill cleanup in Windy Bay was discontinued as of September 6, but boats assigned to the cleanup still came to Port Graham to be cleaned. Village leaders were working with Exxon to develop a winter monitoring agreement.

RECOMMENDATIONS

Evaluations of Exxon's cleanup in 1989 by scientists on the federal and state level need review by community members involved in the cleanup.

Management models patterned after the oil spill emergency response committee recommendations that set up a single "On Scene Coordinator" and local "Emergency Response Centers" need to be considered for 1990.

Develop a master plan for cleanup which can be supported by state and communities.

Have a neutral party like the "Coast Guard" officially oversee cleanup activities and direct the cleanup. The state should develop guidelines for management of the cleanup and insure that funding constraints are not the basis for making cleanup management decisions.

"We may need to help nature to restore things."

SELDOVIA

BACKGROUND

Seldovia is located on the lower Kenai Peninsula across Kachemak Bay approximately 20 miles from Homer. The ancient Aleut village "Cheslokna" was located at the mouth of the Seldovia River. The community of Seldovia was first settled by the Russians in the early 1800's. The main economy revolves around the fishing and processing industry. Seldovia is surrounded by water on almost all sides, and for years served as the commerce center for western Alaska. Approximately 2,500 people reside in Seldovia.

THE SPILL

Seldovia residents knew from day five that the currents in Prince William Sound would bring the oil to Seldovia. Before that, a few people familiar with the Glacier Bay spill and with the tanker traffic in the Sound and Cook Inlet thought that a spill could happen. Most people, however, never expected one of such magnitude.

Gore Point was hard hit on April 12th. The speed with which the free floating oil traveled amazed workers on boats. By April 21st, oil began impacting the beaches near English Bay. Aerial surveys conducted by local residents showed that there were heavy concentrations of oil near Pt. Adams. Free flowing oil, widely scattered streaks, and mousse blobs followed the currents and deposited them along the coast, and in bays and passages.

COMMUNITY REACTION TO THE INCIDENT

The magnitude of the spill astounded the Seldovia people almost as much as the lack of the response by Exxon did. Residents reeled in shock and grief as the spill worsened. Their shock and anger were quickly transferred to positive action as the community rallied together to initiate their own response. The community effort is fondly remembered as "their finest hour."

IMPACT ON COMMUNITY

Environment

The environment damage as described by the people from Seldovia was "devastating." Morse Cove and Tutka Bay were two areas important to the Seldovia people which received severe oiling. Cleanup did not occur on the west side toward Katmai and grizzlies were observed eating oiled clams.

Economic

Financially, many people, particularly those working in vessel charters, made a lot of money.

Lucrative salmon areas were closed by the Alaska Department of Fish and Game in accordance with their zero tolerance policy. The impact was very hard on the fishermen who depended on fishing for their primary source of livilihood.

The City of Seldovia was also impacted "horrendously" from all sides, including the drain on their limited budget, the increased work load on the staff and their unsalaried Mayor, and the resignation of their City Manager and four council members. The city also did not receive the financial support it needed to adequately continue oil spill cleanup operations, despite the inordinate amount of time it was required to deal with it. The City fell behind in its functions, and while Homer received three full time staff staff in the oil spill coordinators office, Seldovia received none. When funding from the State DCRA was available, Homer also received a portion for their Mental Health program, and Seldovia received nothing. The City was not able to participate in the "Oiled Mayors Group" because they could not afford the airfare to travel to meetings.

Social

Following the spill, there was a negative emotional change noted in the community's school children, which resulted in the loss of valuable instruction time. Staff members lacked the professional skills needed to provide the counseling needed to deal with this unusual problem.

Inner conflicts among industry vs. non-industry volunteer workers tore people apart. Frustration, anxiety, resentment, and hostility followed. There were more incidents of community violence, and competition for a few jobs.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORT

The Coast Guard was the first agency to contact the City of Seldovia following the oil spill. Mayor Don Gilman of the Kenai Peninsula Borough called the city from Valdez to inform them that he was there, and would assess the situation. The Kenai Peninsula Borough was successful in organizing and funding the Multi-Agency Coordinating Group which was instrumental in prioritizing the cleanup of sensitive areas.

During the 1st week of April, Seldovia residents realized that the oil was coming their way. They first met with Exxon and the Coast Guard. As a community, they told the Coast Guard that the oil was coming. The Coast Guard reassured them that it wouldn't come to Seldovia. Nothing was done. The residents were in shock and were grieving for the impacts which were already occurring. They

realized that nothing was being done. So the entire community banded together and decided to do something.

On April 5, the City Fire Chief Frank Monsey was appointed as Emergency Operations Officer. Several residents then banned together to form a team and began to recruit volunteers. The core team checked charts, discussed boom designs, and availability of logs. A volunteer list of resource people, boats, skiffs, housing, warehouses, equipment, and office space was inventoried in preparation for the community response effort. 150 people immediately answered the call to action.

A local representative was chosen to represent Seldovia on the Homer Multi-Agency Coordinating Group (MAC). Another local person was appointed as Deputy. Within three days of organizing the volunteer effort, the local community began building seine and log boom, dividing workers into teams, filling sand bags, organizing boats and skiffs, and began coastal reconnaissance surveys. The city provided the Command Center with an office, and public meetings were being held every day. All materials were donated.

On April 11 and 12th, the community volunteer effort was in high gear and all the community members were involved and working well together. Although the residents lacked technical expertise and materials, the community efforts pulled the town together like nothing else has ever done and created a sense of community and unity. The objective was to build 8,000 feet of log boom to protect Seldovia Bay and the harbor. The Coast Guard promised to provide boom and typar. But local people never saw it. Eventually, they did get one piece of commercial boom which was made in Korea. When Exxon didn't respond to requests for boom designs, local people conducted research and designed the boom themselves.

The boom was built with log and draped with typar. Sand bags held the typar sheets about three feet under the surface of the water, while buoys helped to float the logs. To help anchor the booms on the bottom of the sea, crab pots weighing several hundred pounds were tied on. Splash guards were built on top of the booms to prevent collected oil from washing over the logs with the waves. Seines and scoopers were designed, and a vessel, "Alaska Husky" was available to collect oil. A lot of ideas came from local people. There was good communications among the volunteer force.

When the boom was made, and was ready to deploy, there was still no one out there. Forces went out and spotted oil. Exxon was in picnic harbor, but they didn't do anything.

An Incident Command Team from Colorado traveled to Seldovia and worked with the volunteer group and within five days had designed a workable response plan which detailed all of the resources needed, but the plan was ignored by Exxon.

Then Exxon sent its contractor VECO in on April 12th. The volunteer effort diffused as VECO began hiring people. After seeing the lack of response from Exxon when the community really needed help, some people felt that Exxon was just throwing money at people. Many did not feel right taking oil money. The spiritual drive became lost, and most workers were mobilized by April 16. The community split apart, and people were afraid for their livelihood.

During the first days of cleanup, no one knew what they were doing. Few had any training except the mandatory safety classes held during the mornings. Mass confusion reined. One worker mentioned that the biggest mistake made was "to think you can haul a bunch of people off the streets and expect them to clean the beaches. 90% of the workers hired had never been around water." The spill continued to spread, and some workers and their vessel were sent to Green Island, Smith Island, Ellington Island, Sawmill Bay, Evans Island, Sleepy Island, Herring Bay, Perry Island, Northwest Bay, and Perl Island. Many said they were forced to move on constantly, and never had time to look back at their results. "Herring Bay looked good, but Sleepy Bay still had oil three feet deep when they left."

The effort to clean the oil was viewed as ridiculous. Every time workers would attempt to cleanup the beaches for example, groups, regulatory agencies, or someone in a monkey suit would arrive and say "You're killing seaweed." or "Stop, there might be salmon in the steam." or "Don't spray the grass above the water line and the eagles nests, too." The people working on spraying chemicals on the beach also got hollered at for spraying the water. There was always that concern that someone would shut you down. "The RAT Patrol was the worst." There were too many agencies and too many restrictions on how the cleanup should be done. "The Coast Guard should have done it but they were doing it every which way." The workers needed one agency that would cover everything. They needed organization and needed to know about the critical areas such as the salmon streams ahead of time. A local was even told that the recovered oil wasn't wanted. "So much more could have been done for a lot less." "We could have done a better job. We may have not been qualified, but we did a better job." The volunteer crews recovered more oil than the VECO crews and the Russian ship.

During cleanup, workers became sick from the hydrocarbons but Exxon did not express adequate concern. And to top things off, when the media invaded the oil scene, Exxon steered CBS News to Gore Point where they staged 200 workers complete with hoses, skimmers, ect. Exxon hired the crews for one day to pretend to clean the beaches at Gore Point, but as soon as CBS News left, the crews were demobilized the next day. Gore Point remained mired in oil.

INVESTIGATION OF CAUSES FOR DIFFERENT RESPONSES AND RESULTANT EFFECTS

The volunteer effort by the community had an enthusiam and incentive for getting the job done, unlike the efforts by the forces which later took control. The Seldovia effort was motivated by a community unity motive, whereas the VECO cleanup was motivated by the profit motive. Had the community been provided with adequate resources in a timely manner, "they could have built the Taj Mahal." When they lost their spiritual drive, the cleanup effort suffered.

The cleanup effort had "too many players," and involved people who didn't know boat capabilities, the area, weather, etc. "They hired friends."

The Incident Command Team brought in by the Coast Guard from Colorado designed a response plan that was "right on" within five days, but it was not used by Exxon. The plan detailed how many people were needed, estimated how much food was sufficient, what was necessary to set up camps, how much clean materials were needed, etc. They were not given authority to do anything so they went home. Turf wars among agencies also delayed decisions that were eventually made in the field.

Financial and staffing resources which were badly needed by the City of Seldovia were not there. The City kept on top of their limited budget and suffered tremendous hardship as a result.

Exxon had a structure in place which was strict and bureaucratic, but it was too bureaucratic to be effective. They didn't put any trust in the people who were hired as coordinators and wouldn't let them get the job done properly. There was "no one person in command."

A representative from Seldovia sat on the MAC team which was based in Homer, and made sure that the city got their fair share. However, the government players on the MAC team did not speak up in meetings with Exxon, a situation described as "pitiful." In meetings, the members from communities would report back to the team with accurate accounts of what was occuring in the field. The agencies sensed that the truth was being told in these meetings but didn't follow up to check out what was happening on such facts as workers noting that the oil in the water was sinking. Their suggestion to obtain an underwater camera to check it out was ignored. NOAA was the worst offender, in that they collaborated with Exxon, and took their word for truth. During these meetings, it became evident to many of the members that "Exxon deliberately imparted false information." The lack of their effective response was viewed as deliberate and their evasiveness to questions, purposeful.

RECOMMENDATIONS

Federal

Prevention
- prevent accidents - number #1
- work out a good contingency plan
- get oil out of the water once it leaks out of tanker
- tanker traffic safety; cut their size down to minimize bending, and put double hulls on them.
- re: vessel traffic system, if weather is bad don't come in, and establish tanker traffic lanes in Cook Inlet. Intertidal regulations are needed for Cook Inlet also.

Spiller should pay for spill, but not be in charge/control of the spill cleanup. Federalize only when necessary.

All commanders from NOAA should be subject to peer review, and have qualified people under their employ.

Review the report from Grace Harbor in Washington which showed how the oil migrated to Canada underwater and compare it to the data which NOAA has prepared.

State

State should require oil companies to fund any response effort before a spill occurs. The funds for cleanup should come from state, federal and potential spiller sources.

The state needs to make sure that criteria for effective cleanup of beaches is refined. The State should also exercise its authority and follow its owns laws.

Emergency situations need to be recognized. Delays should not be allowed to occur in response situations (with DEC and other state agencies). The State should have a 500 person task force trained to combat spills.

Organization between agencies is critical and we need to know which and what various agencies are responsible for.

Local

Seldovia needs to set up a Local Response Team to deal with local oil spill response.
- headed up by coordinator/logistical person who is respected as a local authority
- prepare predesignated list of resources/people
- utilize local knowledge
- cleanup standards need to be set beforehand
- equipment and finances need to be available

- establish workable plan
- funded by responsible party
- have the authority for oversight and ability to override decisions of bureaucracies;
- should be involved with development of response plans.
- let them be the mediator between Spiller and local community.

Need to identify areas designated for cleanup priorities (i.e. fishing streams) from different areas.

Encourage volunteer efforts. Nonprofit organizations which would head cleanup efforts are the only way to go. Seldovia is in the process of forming one now. Seldovia also needs a local based lobbying effort (Oil Recovery Coalition) who is educated about responsibilities and finances, and has political savvy.

The Seldovia Native Association proposes that an oil response team be located in Seldovia, and be organized through their organization. They have the organizational and financial capability, own their own dock and the facilities to store equipment. Training can be effectively provided, and labor can be mobilized within four hours.

Available equipment needs to be inventoried and stored in Seldovia. Perhaps, equipment from the spill should be acquired.
Need to establish a model team. Hold training sessions and techniques in the forms of videos, booklets, workshops, on standardized cleanup procedures, hazardous wastes, emergency medical training, simulated actions/responses, to other aspects such as record keeping, and office personnel management, are needed to have an effective local response. Many local people have gained personal experience in oil spill cleanup, know local weather and areas, have familiarity with resource capabilities, and can train others as a team.

Industry

The resource people working on the cleanup were spread out too much. They should have concentrated their efforts on key areas and let the others go, as they were lost already. Perhaps, 300 miles of beach should have been sacrificed rather than the thousands of miles which were impacted.

The industry needs to develop a suitable contingency plan whose standards will be workable for everyone.

CORDOVA

BACKGROUND

Cordova is a community of approximately 2,500 people whose economy revolves primarily around commercial fishing and fish processing. Cordova fisherman are familiar with oil issues from having been involved in developing Alyeska's contingency plan and in issues dealing with the construction of the Trans-Alaska Pipeline. In 1971, The Cordova District Fishermen United sued the U.S. Secretary of Interior to block the Valdez terminus and sent a delegation to Washington D.C. to express their concerns that their fisheries would suffer from operations and accidents that might occur. Their efforts to reroute the pipeline through Canada were unsuccessful.

In 1985, CDFU joined in filing notice to sue Alyeska and the seven oil companies over mismanagement of the ballast water plant which was illegally discharging hydrocarbons into the port. They also became involved in the debate to open the Arctic National Wildlife Refuge to oil development.

THE SPILL

The first days following the spill was total chaos. The town was in a state of shock.

The Port of Valdez was closed to all traffic except vessels responding to the emergency. As several Cordovans flew over the tanker Saturday morning, nine hours after the grounding, the oil was gushing out of the tanker, but nothing was happening, and no one was around. There was also no air traffic. "If this was the biggest spill in the United States, where was everybody?" Enroute to Valdez, there was still nobody. No skimmers, booms, or response teams to combat the growing oil slick. To make matters worse, the timing was bad. It was Easter weekend, and the state and federal offices were closed.

IMPACTS ON THE COMMUNITY

Environmental

Environmental impacts resulting from direct oiling within the immediate vicinity of Cordova was minimal. However, the impacts to waters utilized by Cordova fishermen was devastating. Around 1/3 of the area utilized by fishermen in the southwest district was wiped out.

Local efforts resulted in the development of a volunteer plan to rescue animals oiled by the spill. A fleet of boats from Cordova were responsible for the rescue of numerous birds, otters, and other wildlife.

In 1984, a long-term study on sea otters began in the Prince William Sound. That study produced a large baseline data for the sea otters in the Sound, enabling them to be among the two best studied populations in the world. Early on during the spill the sea otters received the most media attention. The problem was that the attention was wildlife oriented and not biologically oriented. Although two biologist/scientists, from the University of Minnesota were in Cordova during the spill, (one who was involved in collecting the original data) their knowledge and expertise were not utilized. Many people representing themselves as animal experts went to Exxon and Alyeska, and their backgrounds were not checked. Some gave poor advice which was accepted blindly. The biologists had an incredible amount of information on the location of important habitat and pupping areas, methods to handle otters, specific populations, etc. which they tried to communicate to Exxon, but they were just ignored. The result was that the priorities established for cleanup were concentrated on commercial fishing areas only, and nothing for wild species.

The biologists knew that the rescue efforts would not accomplish much early on. If an animal got heavily oiled, its chances of survival were small, so it was important to concentrate on protecting their habitat, and avoid catching animals which were lightly oiled, or not oiled at all. Lagoons where otters could have been held were already identified, and had they been used, more otters could have been saved. It was believed that the high wages paid by the industry encouraged the rescue effort to go on too long, simply because it was beneficial economically. Airplane and boat traffic in habitat areas disturbed the populations, and in many cases the rescue operations did more harm than good.

Economic

In Cordova, the economic impacts were like a neutron bomb: the effects were devastating. In April, there was no herring season, and later when Fish and Game opened the season to salmon harvest, 30,000 lbs. of contaminated salmon were caught.

The city had a budget of $4 million for FY89. The expenses related to the spill recovery came close to $1 million. Most expenses obtained from Exxon were earmarked for office operation expenses or for the purchase of cleanup materials such as booms. The city had a tough problem separating the response issues from recovery

issues. For example, funding from the state could only be used for response efforts, not for lobbying. As a result the community was forced to absorb approximately $200,000 to pay for influencing legislation, and legal fees. The city also did not have the means to take care of the immediate budgetary problems, many dealing with social impacts.

City functions during the spill ceased and were dysfunctional until the end of August. Municipal services and programs became nonexistent. The oversight, progress, ability to secure business deals by the city were hindered by the efforts to combat the spill. The spill provided an economic boom to about 60% of the community but the other 40% suffered losses.

North Pacific Processors, a large salmon buyer in PWS was negatively impacted by the oil spill. The herring season was lost, as was the black cod season, and all of the early summer halibut season (only bought 3,500 lbs. instead of the usual 200-600,000 lbs.) Fishermen ended up working on oil cleanup instead of fishing. Seining was a disaster. The processor had to go to Southeast Alaska to purchase fish, which was older. The opportunity to provide skinless, boneless fish to Hormel was also lost. The salmon harvest of 30,000 lbs. was closed down by Food & Drug Administration because they smelled oil on the fish. Kenai got too much fish, and although some were sent to Cordova, it went bad by the time it got there. The company gave up freighting fish because the crew had no training. Instead of running 750,000 lbs of fish a day, they ran less than 500,000 lbs.

The processor usually hires 225 to 250 employees every year. This year, the company ran on 2/3 of its capacity. 40 instead of the usual 75 people were hired to work in salmon processing. All new lead people had to be hired, a contrast to previous years in which 85% of its crew returned every year. The cannery could not compete with wages offered by the oil industry despite the effort of the townspeople to petition Exxon to supplement wages. The processor was only able to work for three months, while Exxon's cleanup went on for five months. The people who quit to work for
Exxon and who want to come back next year may find it difficult because they have lost rapport with the crew who remained. "This was the year when the processor would have been prepared. More planning was done, the operations were made more efficient, and ways to cut costs were figured out." Long term problems are expected, and there are concerns that cleaning the beaches next year may do more harm for the fisheries.
The claims process is referred to as a "Litany of Woe," and at the present time is in a state of limbo. Permit holders, highliners, young families just beginning in fisheries, gillnetters, seiners, cannery workers, displaced crew members, net menders are all affected. The system to file for claims is based on last year's previous sales and earnings. As a result it
not responsive to many classes of the fishing industry because it's

rules are too broad and there is no flexibility. Many people are falling through the cracks, and are not being treated in a fair manner.

Tourism and local businesses also suffered. Customers who usually frequent restaurants and hotels during the fishing season were out working on the spill. Furriers are finding it difficult to obtain furs. But sales of a cassette tape whose main song was entitled, "Exxon, You Dirty Dog" and sung by a local individual were brisk. A cab driver had sold 200 already.

Social

The extent of social impacts cannot be readily measured at this time. When the spill occurred, funding for dealing with social impacts was not provided in the city's overall budget. Some people didn't want to pay for the social impacts as the response part was deemed more important.

Child care services suffered a crisis from shortages in staff and funding. The impacts on the children varied from the need for child care, the need for an internal support system, and trying to deal with the animals which died. Bookkeepers and accountants became caregivers because the salary for child care workers could not compete with the $16.69 wage paid by the oil companies.

Much emotional stress and difficultly coping with losses were caused by the spill. There were upheavals among families. A small part of every person died. There was a loss of trust in the system, and what people saw was different than what they were told.

THE RESPONSE AND CONTAINMENT EFFORT

CDFU received a call at 7:00 a.m., and by 8:30 a.m. they had made arrangements for two of their members to be in the air, and called for a list of available vessels. By 10:00 a.m. 30-50 vessels were prepared to go on short notice. They attempted to contact Alyeska, the Coast Guard, and DEC, but got no response. At 9:00 a.m. Friday as they flew over the spill, "There was no one around." By 4:00 p.m. there was still no evidence of a boom around the tanker. One boom was attached to the stern of a tug which was floating in a straight line downstream from the tanker. There was one skimmer in the middle of the growing slick with a little tiny swatch of a trail of clear water behind it. They thought, "Oh man, if this is their best effort, we're in trouble!"

The small group from Cordova traveled to Valdez that same Friday and attended the Governor's conference, press conferences, and meetings practically around the clock for five days. Their attendance at the conference held by the Coast Guard, Exxon, and

Alyeska helped to establish CDFU's role with Exxon. A member commented that "I have never seen such chaos in my life." For the first three days there was no figurehead that was clearly in command. On the second day, a National Response Team teleconference discussed the use of dispersants.

By Sunday afternoon, a staff member from Fish and Game in Anchorage informed the fisherman's group that if there was any talk about using dispersants on zone 2 or 3 they would get in touch with them. Zone 1, where the tanker was located, was already preapproved. On Monday, the group learned that Exxon's request to the Regional Response Team for use of dispersant in zone 3 (on shore) was granted approval. A helicopter was sent over the spill and dropped dispersants on it with a bucket. Maximum ideal dispersal occurs when the oil is a certain thickness, and the dispersants are coming down with a certain droplet size as to penetrate that thickness of oil. "You don't get ideal dispersal by dumping from a bucket. You need adequate dispersal equipment, an airplane, and enough dispersants. They didn't have any of those things." A short time later however, they learned that Exxon had elected not to use them.

That afternoon and evening, an Operations Committee consisting of Exxon, Coast Guard, DEC, ADF&G, USF&W, DAFD, DES, and CDFU was established. Having a local organization on the operations committee was invaluable to Cordova because it gave them direct access to information on the response effort.

In summarizing the early response effort, a individual thought that the State, Federal, controlling agency, Alyeska's contingency plan, state-of-the-art equipment were all a show. They were not in place. The loading crews on the docks in Valdez were the response crew. Their equipment was buried in the snow.

An enterprising individual realized that the oil was not getting cleaned up, so he gathered his own equipment which included 100 herring pumps, fish totes, 5 gallon buckets, and tenders. During the first week and a half, he collected 1,100 buckets of oil and received a lot of publicity.

A town meeting held in Cordova on Tuesday was attended by 2,000 people. The CDFU office was packed 24 hours a day, and locals brought food for workers. Everyone pulled together. The kids even made a mural depicting their impressions of the oil spill. CDFU was the main organization attempting to work on the spill during the first two weeks. Then some of the townsfolk got mad at CDFU, and were getting at them from all angles. At this point, the community evolved out of this depression/anger stage and channeled their energies to positive efforts such as forming the wildlife rescue fleet and the Cordova Oil Spill Response Office.

The Cordova Oil Spill Response Office was established by ordinance in April, at the same time a Disaster Response Committee was created. This committee is made of citizens at large, the Mayor, Chamber of Commerce, Native Organizations, and Fish Processors (CDFU, PWSWAC). Its' goal was to coordinate information, identify community needs, and enable the city to speak as an organized unit regarding both short and long-term issues. Throughout the spill, there was a need to deal with multi-layered problems, i.e. absence of boat cleaning, housing, workers, child care, claims issues, and how the city wanted to work together in order to recover from the disaster.

This committee paid serious attention to the Legislation to prevent another oil spill, scientific studies, logistical strengths and weaknesses. To deal with logistical problems of transportation, the city arrived at the conclusion to conduct a long term study of a deep water port. They looked at their economy to review their infrastructure to incorporate methods to develop a better response system.

The battle of Sawmill Bay originated from the priorities set by the CDFU to protect the hatcheries. The priorities also included Main Bay, Eshamy, and Esther. Oil started showing up in Sawmill Bay on Wednesday evening of March 29th. A CDFU rep went to Alyeska to the on-water cleanup division, and said they've got to move skimmers and as much equipment as possible to protect the hatcheries. They were responsive, and boom was received by Thursday. Mosquito fleets from CDFU volunteered to begin protective measure to save the hatcheries, and their efforts were successful.

The community went through four phases, the first being the reaction to the spill and wanting to do something positive. After calling Alyeska and Exxon and receiving no response, the residents became frustrated. The positive energy turned to negative energy. People got mad. It was at the town meeting when this anger was expressed. Then when the oil took off and began impacting beaches, there was a sense of despair. Then creative efforts began the wildlife rescue, and oil spill response efforts.

In planning for the winter monitoring and response, the city pointed out that the plan to store materials and personnel in Anchorage was ineffective. They reasoned that in order to be effective, the monitoring and response needs to decentralized,

INVESTIGATION OF CAUSES FOR DIFFERENT RESPONSES AND RESULTANT EFFECTS

Cordova appeared to have dealt with the response aspects more efficiently in many respects. Two factors were instrumental in this aspect. First, Cordova has been dealing with Alyeska for the

last twenty years. It was a key factor in obtaining immediate response to their priorities. Second, the city early on had institutionalized the response effort in order to deal more effectively with the associated impacts.

By acting quickly, the members of CDFU were able to become a member of Alyeska's Operation Committee and were informed of response efforts as decisions were made. Although, the expertise of the fishermen was not tapped early, their knowledge of the waters and capabilities were utilized to keep priorities focused on protection of their fisheries. The initiative from local people to initiate a wildlife rescue operation and a push for "bounty oil" program did much to help the local response.

DEC had an office open five days a week based in Cordova, that was staffed by one person and a half-time support person.

Through the local newsletter, "Cordova Fact Sheet" many residents were kept abreast of the local situation.

RECOMMENDATIONS

Federal

True cleaning up of our beaches this winter is best done by cleaning up federal legislation. In SB 264, the funding for the oil spill legislation should be borne by the industry. The superfund level needs to be higher than $1 billion. The spiller's liability is too limited. (The $86 million in the TAPS fund got burned up in 5 days.) State's rights should not be preempted.

The Coast Guard is presently pushing for International Protocol of 1984, negotiations with various countries, including the U.S. which sets up a giant superfund and gives money to the Coast Guard if a spill occurs in our waters by international tankers. The spiller would compensate us. The problem in light of the Exxon Valdez spill, is that the negotiations are obsolete and need to be renegotiated.

Coast Guard should not be in charge because they have been under too much pressure from the industry in the past, and are too responsive to industry. They need to improve their operations. Need to deal with tanker standards on the federal level. It is too difficult to deal with them on the state level.

Manning standards for tankers are needed. It is not a good idea to put response equipment on tankers because the job of the crew is to make sure you don't lose more oil from the tanker.

Our government needs to regulate and control the tanker industry. We need legislation to access owners of ships, products, and parts. There needs to be a cap on plain liability. $150 million is too low. We should not reward negligence.

Congress needs to address problems specific to Prince William Sound resulting from the federal government's failure to force TAPS owners to comply with their own agreement. It needs to be enforced. The TAPS Trust Fund in H.R. 3277 was designed to correct these problems. Before any changes are made within the TAPS system, the agreement should be audited.

Re: Vessel standards, American flag standards result in the utilization of rust bucket or substandard tankers. The Jones Act makes it more costly to build them.

The American Board of Shipping sets standards for construction of ships. They need to be involved in the construction of tankers. Our standards need to meet standards for the Gulf of Alaska. The standards for the North Pacific are modeled after other areas.

Interstate Trade Restrictions need improvement.

State

The DEC is supposed to be regulating industrial self monitoring of Alyeska, but before the oil spill they were making do with a half time position. This one half time person was monitoring the environment, operations, and tanker traffic. We need to cut this out. "Take oil regulatory authority away from DEC. There is no place for restaurant speculators and yo-yos."

In accepting Alyeska's oil response plan, the state should insist that there be not only a response plan to put boom around oil and protect critical areas, but to develop a response mechanism tailored for all coastal communities. A legal plan should also be a part of any response plan.

We need to lobby for at least $.03 a barrel tax for the superfund. The Federal government should not have to impose taxes on the public to fund cleanup costs. The bottom line is either the public pays or we put the burden on the oil industry.

Regarding the priority developed by the Regional Response Team for the use of dispersants, instead of zone 1, 2, and 3, there should just be "yes zones" and "no zones." In a crisis, there is too much stress and no one thinking clearly, some of these decisions could be made ahead of time, sanely. This would have made the decision making easier on the Coast Guard who was being hammered on all sides. Dispersants also should not be applied in shallow water because there is no dilution factor. They should also not be applied during sensitive times of the year because there are

sensitive organisms in the water column.

A Scientific Board should be established who would assist in bringing experts and local people together to help make policy dealing with wildlife. The development of a Science Center could expand our knowledge of the impacts of oil on wildlife and workshops could be held to inform us of new developments.

The state needs to carefully review grant proposals for cleanup which may have more adverse impacts on the environment. i.e. Harvesting oiled popweed would do more harm than good, because it disturbs natural areas and reduces food for animals.

The state contingency plan should consider how risky it is to bring animals into captivity. Animals should be brought in as a last ditch effort only.

Oil companies should be responsible for following their own contingency plans in responding to oil spills, and be responsible for paying for it.

Additional funds should be provided to the State DEC. They are the best regulatory agency to deal with oil spills. The state should create a position within DEC to deal directly with oil spill. At least three core DEC staff members who know their business are needed in Cordova. Inspectors on the job who were making decisions were not familiar with the area. Inspectors are also needed at the pipeline terminal.

DEC should be in charge of oil spill cleanup, not the Coast Guard, because Exxon owns the Coast Guard. They are as much of a bureaucratic nightmare as Exxon.

DEC and ADF&G need to coordinate more. (Could have prevented harvest of 30,000 lbs. of contaminated fish.)

On the State level, fines or jail would help to make the oil industry more safely regulated.

A strong response plan needs to be established on the local level, utilizing local people. "The base can't just be in Valdez or Anchorage. The response should be based out of Cordova. You can get into this place in a plane or helicopter almost anytime. You can get to anyplace in the sound. If the dispersants were to be in Cordova, they could have sprayed it. Valdez is hard to get in and out of."

In Prevention efforts, a positive Port Control System in Valdez needs to be in place, and have the capabilities to extend all the way out to the Sound.

Criminal penalties are needed for people and corporations who do

not comply with the contingency plan.

The command center needs to be centralized. There were simply too many bosses and no one in authority.

The "Designated Response Team" established in 1983 needs to be revived.

Local

Prevention is the key. But once it hits the water and beaches, the battle is lost. If we have to deal with a spill, it needs to be organized so that the local areas have adequate equipment available. As it was, the equipment capabilities at the time of the spill was adequate to cleanup a 10,000 gallon spill. 20,000 barrels gushed out every hour.

A strong Citizens Advisory Committee is needed, but having it set up by Alyeska causes a sense of distrust. (It was set up to preempt federal legislation and Alyeska may just be stringing them along.) "We can't rely on government agencies to be the sole watchdog over industry." Because over time, they end up listening to industry, who is constantly hammering on them. The committees role would be to review and watchdog Alyeska's oil spill response plan. They would make recommendations to the regulatory agencies who makes them to industry. The public input would come in right at the beginning and throughout the policy making process. Local representation on this committee is important, but the people who serve on this committee need to fully understand the problems dealing with the environment and operations. The committee should continue to have input as new technology is developed. They need to go beyond local response, and consider prevention and tanker safety.

Communications with communities need to be improved. When an emergency situation exists, it is important to be able to get through to agencies etc. right away. In Cordova, it took hours to get through to Valdez. There needs to be a dedicated line for emergency communication. The technology is available.

Trained people, preferably locals, are needed in the response effort. You just can't take someone off the streets and expect them to know what to do. The situation was that people in some boats didn't know how to tie a knot. They need to be familiar with anchors, boats, and booms. It is absolutely vital to have people that are familiar with the area.

Protective gear was needed for the people working in the boats who were deploying boom. The volunteer effort to save Sawmill Bay, had people dipping their hands into the oily water in order to deploy the booms.

Cordova needs to be the base for response efforts. Equipment facilities, transportation systems and the port are all here.

Industry

There needs to be a mechanism to utilize volunteers without the threat of liability. There were 700 people available, but no system to use their efforts.

Better communications in the field are needed for a more effective response.

Long term (more than five years) scientific studies need to be conducted on this spill. i.e. two or three cycles of salmon, and studies of intertidal spawning of salmon.

New, more efficient methods of cleaning and cleaning equipment need to be developed. Perhaps the oil industry who spends a mint on equipment to get the oil out should put aside a fraction of their earnings towards cleanup development. The hot water method pushed the oil deeper into the gravel.

Spiller should not be in charge of the cleanup.

A world-wide inventory of spill equipment and technology needs to be compiled. A clearinghouse for cleanup ideas is also needed.

Each area needs to assist in establishing priorities for cleanup of area. In Cordova, the priority was to keep oil out of the hatcheries.

People out there working needed training. Alyeska didn't help in this aspect.

We need to be able to access everyone up and down the line. Once you transfer oil out of the flange in Valdez, a holding company should be set up. If its done for unlimited liability, the corporate veil could be pierced enabling unlimited liability.

The Prince William Sound needs to be the base for the response effort.

The state needs to get tough with the oil industry. The industry must meet certain standards. If they don't, shut down their operations or shut down the pipeline.

The Vapor recovery system in Valdez is inadequate. The Ballast Water Treatment system needs upgrading, as it is not adequate for sub-arctic conditions.

TAPS agreement provisions need to be upgraded. The state needs to get tough on its regulations. They need to enforce them. If violations occur, take action. Regulate DEC, improve their structure. Their office and field crew were unbalanced. More field people are needed, who are trained in oil spill response.

Equipment is vital in the response effort. Specific type of equipment needs to be determined and its quality needs to be maintained and inventoried. Big equipment is needed, can't depend on Navy. i.e. Marflex.

The oil industry upper level management needs improvement. In hiring, people need to be hired immediately in order to react quickly. Talent pools and inventory of equipment and other resources can be developed on the local level very effectively.

The process for fisherman's claims needs to be more flexible. Not all claims are being paid, and folks like the cannery workers and displaced crew members are falling through the cracks.

Seal Rocks at the entrance of Hinchenbook Island needs to be included in the Prince William Sound Contingency Plan, as it is the most dangerous point on the tanker route.

Someone needs to come back to finish the cleanup. Not necessarily Exxon, but they should pay for it.

CHENEGA BAY

BACKGROUND

The original village of Chenega was an ancient village whose roots are deeply intertwined in the history of the Prince William Sound. Chenega was the most important settlement in the Sound. Its residents were entirely self-sufficient and the land and sea provided sustenance and the basis for their culture. The community practiced its own form of government, and in 1936 was among the first to have a recognized IRA government. According to an elder in the present Chenega Bay, "We depended on ourselves. The seals, sea lions, deer, butter clams, ducks, fish and sealife were there. We owned our own homes, didn't have telephones, light bills, mortgages, or stores." Now, there are lots of bills to pay and the ducks and sea lions have disappeared. The sealife has disappeared. Even if they are around, we are staying away from them."

Chenega Bay was reestablished in 1984, twenty years after the original community of Chenega was destroyed by tsunamis generated by the 1964 earthquake. Its surviving residents scattered to several locations following the quake. After many years of effort and considerable planning, the community was successful in reestablishing their community in Crab bay on Evans Island. The Sawmill Bay Fish Hatchery shares the same bay. There is no airstrip near the community, so all flights in must be equipped with amphibious floats. There are few full time jobs, and the approximately 60 community residents rely predominately on subsistence and commercial fishing. Before the spill, the time was near to collect herring eggs on kelp, and prepare for fishing.

THE SPILL

Most residents became aware of the spill on the same day it occurred over TV. Radio reception is not very good unless there is an antenna. A spill happening such a long way away didn't bother most people, so most never thought it would impact them. As the TV reports showed the spill getting bigger and bigger, and as the currents brought it near Knight Island, people realized it was coming. Panic set in 3-4 days after the spill. Planes and helicopters and hoards of reporters began showing up. So many people began coming, the folks from Cordova who arrived to fight the battle to protect Sawmill Bay, TV crews from all over the world, etc.

The currents carried the oil through Montague Strait, Hinchenbrook Strait, Knight Island Strait then rolled into the bays and passages surrounding Evans Island and the community of Chenega Bay by March 27th. By then the free flowing oil covered 100 square miles. When the black tide rolled through, Ellington Island, Shelter Bay, Sleepy Island, LaTouche Island, Prince William's Pass, Pt. Helen, Flemming Island, Evans Point, and the north side of Evans Island

and up to the north end of Chenega became oiled. The oil covered the subsistence grounds of the Chenega Bay people. Although it never reached Icy Cape where a hunter recently shot two seals for food, both seals were oiled. When the spill occurred, in the words of one individual, "Chenega was asleep, or in winter mode, and some folks were out of town when the place got invaded."

IMPACT ON COMMUNITIES

Environmental Impact

Environmentally, Chenega Bay was hit hard by the spill. " Wildlife were not the only ones affected. The beauty of the country is affected. All the things you watch, ducks, sea lions and other animals out there playing around. The Natives try not to overkill the animals, just take what they need to survive. Now everything is covered with oil." The lesser number of wildlife is noticeable.

Commercial fishing harvests were cancelled but subsistence fishing harvests were allowed. The community received mixed signals with regard to the safety of seafood

Economical Impact

The greatest economical impact was on subsistence. An individual commented that he "heard people in other communities crying about money and fish." Natives aren't crying openly about their subsistence, but inside there is tremendous grief.

Twenty people from the community were hired and worked from April until September 15th.

Social Impacts

The spill and the events following the spill left Chenega Bay reeling on all levels. The community was in shock. Subsistence and the environment were destroyed, and the uncertainty for the future left some elders feeling homeless, again. The thought that the bones of loved ones who were washed away by the tsunami might now be covered with oil hurts inside. Families whose young people provided for the family and others through hunting feel the sense of loss greatly. The social and psychological impacts that hurt any member of the family affects several generations. And no one is helping. The pending litigation on behalf of the villages causes distrust of anyone coming in. People are afraid to say anything because Exxon might use it against them in court. And so most people keep it inside. And the hurt can't seem to go away.
Chenega Bay experienced a 20% increase of permanent residents and school enrollment increased 55%. The current health and social service network and community infrastructure is inadequate to deal with the increased number of people.

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORTS

Coordinators arrived from every part of the universe. Agencies who contacted the community early on included DEC, F&G, DHSS, Governors Office, DCRA, DOT, CG, Dept. of Interior, and DCED. They began arriving a week after the spill and kept coming until early November. The regular Tuesday mail flight on Chitina Air was cancelled because it was taken over by DEC, causing inconvenience for local travelers. An individual who flew over the Exxon Valdez Tanker saw tugboats, fishing boats, and planes flying around it. Nothing was happening to contain the flowing oil. By Tuesday, there were about 20 boats in the harbor and the Cordova District Fishermen's Union were beginning their voluntary efforts to protect the hatcheries at Sawmill Bay, Main Bay, Eshamy Bay, Esther, and Cannery Creek. Their efforts were greatly appreciated by the Chenega Bay people. "Cordova people really helped us out."

The Office of Emergency Preparedness and DEC personnel (Kelso & Hayden) arrived on the 27th, and according to some, their response was great. Their initial efforts evolved into the local response effort.

On April 1, the State informed the community that they were low priority for cleanup. "We thought it was a poor April Fool's joke." The community leaders reacted by contacting everybody in Government they could think of and found that the Government is responsive to pressure. Chenega Bay became high priority.

No sooner had DEC began organizing, when VECO arrived and took charge. Then s--- hit the fan. Their presence caused mixed emotions. When they showed up, their initial efforts were "clusterbumble." Meanwhile, 10-12 helicopters a day landed in front of the Community Center. Then VECO's personnel coordinator, said yes, he knew it was bad, and he wanted to hire everyone that was ready to work. He gave everyone an application described as an inch and a half thick, and said he would be back next week to do blood and urine tests, and put people through safety training. He also informed everyone that they are now on standby as of April 1. Many people threw their application into the garbage, nicely, after he left. By this time, people knew the situation was critical and wanted to do something, but they were intimidated by the "corporate response" to a village situation.

In time, local people were assisted by TNPR staff in making time cards, filling out the applications and forms, and conducting an inventory of vessels.

DEC rented a house and brought in booms and some cleanup materials. They were not sufficient in quantity, so more booms had to be flown in from Valdez and deposited on the beach with a sky crane. From there, workers had to drag them 100 yards to deploy. In the beginning, DEC needed four people to help set up the washing

system, boom cleaning, operating skiffs, and deploying booms in water, but because local people were on standby status, they were told by VECO that they could not work for DEC. VECO didn't explain to people who were interested in working for DEC that they could have broken their contract but still remain on the VECO hire list. They were made to believe that they couldn't do anything while they were on stand-by. Finally, VECO was talked into putting people on standby on loan to DEC, but higher-ups at DEC refused to hire standbys. Some of the people who eventually got hired to work for DEC were not local, but were just pulled from the beach where they had been waiting for any kind of job.

The problem in finding people to work caused delays that were not needed at that time. However, the problems didn't end there. When the washing operations got underway, someone from the hatchery contacted the higher ups at DEC, and complained that the operation was polluting the water near the hatchery. As a result, DEC was shut down on May 16 for polluting the water, and a total of eight people were laid off. A local commented wryly, "The water was already polluted."

The VECO person in charge of hiring did not endear himself to the Chenega Bay people. There were complaints of name calling, giving locals a bad time, and in prioritizing fishermen first, some local people who wanted to work didn't get hired. Meanwhile, the oil was impacting the beaches all around. People still on standby waited 10 days to get boat contracts signed. VECO delayed the contracts by saying that their lawyers needed to review them first. However, contracts were being signed right and left in Cordova and other places. People felt that they had been jerked around and misled, and VECO still had not put people to work on the beaches. Cleanup efforts hadn't begun.

Meanwhile, out in the channel, oil mousse was floating a couple of inches thick in the water. The weather was good, and if a super skimmer was present it could have skimmed most of it off before it hit the beaches. On days 18-25, there was still no equipment.

Local requests for closer monitoring the cleanup efforts resulted in adding Chenega officials to the Resource Advisory Team (RAT) assigned to the area.

Most of the 20 Chenega Bay residents employed by VECO worked in Task Force I. The force traveled by boat every morning at 7:00 and arrived at Green Island by 9:00 or 10:00 a.m. and cleaned rocks with rags and pulled out oiled seaweed until 3:00 p.m. when they were ferried back to the village. They used borrowed equipment (absorbent pad, bags, hoses, steamers, booms) from other task forces working in other areas. Green Island got continual reoiling with the tides. In the meantime, the oil washed ashore in their own backyards, all the way to Bishop Rock.

"There was a lot of duplicity in the cleanup effort. For every VECO gold hat, there was an Exxon white hat. For every white hat there was a beach master, etc. The effort could have gotten along with half the executive staff out there. There were too many bosses."

During the first week in November, an Exxon response boat traveled to Chenega Bay to conduct a training exercise in the deployment of boom as part of the winter plan monitoring effort. The weather was very cold and windy. During a village meeting, they explained to local people what they hoped to accomplished in the training, and answered questions for about a half hour. The next morning, the training session actually began when they tried to remove the boom from the cargo. When they opened the door to get it out, they ripped the boom. They admitted that they didn't know how to patch it and would need assistance from those who had experience in patching boom during the summer. On the second day of the two day training effort, the boom was still frozen in and space heaters were being used to thaw it out.

INVESTIGATION OF CAUSES FOR DIFFERENT RESPONSES AND RESULTANT EFFECTS

The response effort did not maximize the use of the local people. The events following the grounding of the tanker impacted this community on all levels. The invasion by agencies and the media, the way Exxon used the media to show how great a job they did, the demand placed on the limited facilities in the community, the overabundance of coordinators, the notion that the spiller didn't have the foggiest idea of what to do, the inability to discuss the situation because of pending litigation, the demotivation of workers, the devastation of subsistence and livelihood and the fact that beaches and water are still contaminated is only the tip of the iceberg. All of the confusion which resulted from the inept efforts, and the initiating of a corporate response to a local situation have all contributed to the situation which now exists in Chenega Bay. A sign posted in the community hall sums up a lot of what people have to say, "I have a headache THIS big, and it has Exxon written all over it."

RECOMMENDATIONS

Federal

Prevention.

The Alyeska Citizen's Advisory Committee is on the right track in their involvement in developing the contingency plan.

Fund the Coast Guard more adequately and involve them more. Revise the Jones Act so it is more economical to build safer tankers. Requirements for shipbuilding should be upgraded.

State

The State should have the responsibility and control over the cleanup. They create regulations, let them enforce them. The spiller should pay for the cleanup but not respond to spill.

In the future, get someone in the control office who knows what they are doing, and who knows about oil spill response.

If spills get away, protect sensitive areas. Learn everything there is to learn about the spill effects on the environment, social impacts, response techniques, etc. We need better ability to pick up spills, immediately.

Local

People who were working on many of the beaches were not from Chenega Bay. Initial response must involve local people. The advantages of local people is their local knowledge of the area, weather, priority areas, and currents. They will need training, equipment, and local organization. Meanwhile, technology in oil spill cleanup must advance. Twenty year old equipment and techniques didn't work. Advances in separation of oil from water is needed in order to maximize recovery. Manpower alone is not enough.

Preparation for spills on the local level is needed.

Regular meetings need to be held to keep the public aware of what is occurring in community.

"Need to have someone to help us. Can't just have a piece of paper (AOSC Report to the Governor). Let them know what is happening. The impacts on us need to be known. Information has to be noticed. Maybe someday, somebody will understand."

Industry

Oil industries must live within laws. Take them to court and fine them if they don't.

Agency personnel changed every two weeks, sometimes weekly. There needs to be continuity with the agencies. This constant change was a big factor in the confusion which continued throughout the spill efforts.

Personnel in charge of village hire need to have rapport with Native people.

OLD HARBOR

Exxon contracted oil spill workers in Old Harbor area spent 6 hours per day in transit to and from the cleanup sites and only 2 hours on actual cleanup efforts, thus accomplishing little. No boats were undertaking skimming efforts in order to remove the oil from the water before it fouled the beaches. Exxon officials made a comment that once the oil soaked into the beach gravel, no further cleanup measures were necessary. The local tribal council and fishing association, city council, and Native corporation jointly developed a cleanup proposal which provided a full 8 hour work day for cleanup crews, and forwarded to Exxon.

Local citizens found dead bear and deer which ingested oil-fouled sea kelp, and continued to sight oil and heavy mousse floating in the bays and inlets and fouling beaches in July.

KARLUK

BACKGROUND

Karluk is a small unincorporated community of just over 90 people located on the north side of Kodiak Island. The Karluk River is the pride of the community, boasting the largest run of red salmon in the world. Ninety precent of the residents of Karluk depend on fish for their livilihood and sustenance. When the oil spill impacted their community, their biggest reaction was fear for their fisheries, and their strong dependence on their subsistence way of life.

RESPONSE TO THE CLEANUP AND CONTAINMNET EFFORT

The communities priority was to protect the Karluk River. However, Karluk had been inadvertantly omitted as a priority for cleanup, and experienced many problems as a result.

The response was initiated on May 17, with the mobilization of approximately 19 workers in Karluk. The process was difficult from the beginning because equipment was inadequate, supplies were lacking, and the village lacked an institutional response mechanism. Exxon folks who flew over the area when the oil began

to impact the lagoon, gave conflicting promises to the village. They also offered less money for both workers and vessel charters, a situation that was unacceptable to the village. Then the training which was finally provided was five weeks late.

Other problems encountered were technical tasks such as workers not knowing how to fill out the forms for employment or the forms which were used to pay people. Four sheets of paper had to be filled in for each day of work. The delays which resulted in paying workers was not appreciated. Many people who trusted the system enabled the use of their personal equipment without benefit of contracts and were disappointed when they were not compensated.

The first day of work involved seventeen hours of stringing pom-poms. There was no training in deploying the booms or attaching the pom-pom onto them. The first attempts to tie pom-poms onto the booms were done when the booms were deployed in the water. Two people held onto the boom, while a third person tried to tie them on. It was very difficult, especially when the boats bobbed up and down with the ocean movement. When the booms were deployed, they disappeared into the ocean. Booms that were specialized for swift water were needed as the current sometimes ran from 10-15 knots.

Skiffs were not catagorized by use, and often boats which should have been used for transportation were used for other purposes. The wait for the tides were tedious, and when the tides were low workers had to walk over a mile to deposit their bags of oiled debris to a waiting skiff. The debris was collected with shovels and absorbant materials. Sometimes the bags were heavy, but there was only one four wheeler available to transport them. The the collection process was more delayed as a result.

The dome tents which were provided to workers were inadequate for the weather, and one actually blew away down the beach with people still in them. Army tents were later provided. Grocery supplies were slow, and workers had to eat spam and junk food for two weeks.

Two big boats from Kodiak with crews of 30 people each worked just above the Karluk people, and between them all, they got a lot of work done, despite the lack of technology in cleanup methods.

The spill had many adverse affects on the community. The emergency closures costs many fishing jobs, and intervillage rivalries for a handful of jobs caused almost one third of its population to leave in disgust. At last count, there were 67 people who remained. The community leader stated that, "Exxon's cleanup was hit and run, and people are still paying the price." "The village got shafted by the state when funds were made available through the DCRA to communities." "Too many promised made by Exxon weren't kept." And their beaches remain polluted.

WHITTIER

BACKGROUND

Whittier is a second class city incorporated in 1969, with a local population of 333 people.

REACTION TO THE SPILL

The residents of the City of Whittier reacted first in shock, then in anger to the oil spill. They were prepared to begin containment efforts before the oil reached the shore, but efforts to elicit a response from Exxon were unsuccessful. The community reacted in frustration when they were told that boom material was not available. They got the "distinct feeling that people felt Whittier was not a part of the Prince William Sound."

RESPONSE TO THE CLEANUP AND CONTAINMENT EFFORTS

The city declared a state of emergency, thus activitating the Emergency Operations Committee, who immediately began working on oil cleanup plans. Delays in their response efforts caused frustrations to mount, and just before things got really out of hand, VECO set up emergency offices and began hiring personnel for cleanup operations, and provided booming and cleanup materials.

IMPACTS ON COMMUNITY

Like many small communities, the city experienced budget shortfalls, and were not prepared for the added burden of dealing with the spill. Several city staff members quit their jobs to work on the spill, causing interruptions in the normal city functions. The city also had to hire two additional police officers to deal with the added problems caused by the influx of people into the community.

Ferry traffic, private cruises, charter boat operations, and railroad traffic declined significantly, causing tourism to also decline.

Whittier was heavily impacted by the emergency fishing closure in the Prince William Sound when oil was found near Esther Island. The closure of the fishing season impacted fish processors, fishermen, and the city, who depended on fish and sales taxes for a large portion of their operating budget. The small boat harbor was filled to capacity, and 50 vessels were anchored offshore. To make matters worse, the State Department of Transportation threatened to close the small boat harbor because of problems associated with its breakwater.

RECOMMENDATIONS

Federal

Development of legislation to prevent such disasters.

State

A fund which would be made immediately available to all related communities to deal with added costs of responding to emergencies.

Local

Proper training for immediate response teams.

Make equipment and materials for containment available for immediate response.

APPENDIX D

MULTIPLE PERSPECTIVES OF THE ALASKA OIL SPILL

Multiple Perspectives on the Alaska Oil Spill

Harold A. Linstone

Prepared for the Alaska Oil Spill Commission
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Systems Forecasting Inc.

Multiple Perspectives on the Alaska Oil Spill

Harold A. Linstone

I. Introduction

In learning from the Alaska oil spill disaster, we must recognize that we are addressing a complex system encompassing human beings and organizations as well as machines and materiel. Their interaction is crucial to an understanding of the oil shipping system. We find that the traditional "rational actor" or analytic perspective is not sufficient in dealing with complex systems. It fails to capture vital aspects of "messy" problems and decision concerns. It fails to recognize that risk is subjective; given a hazard, different parties see different risks. A study of the Three Mile Island, Chernobyl, and Bhopal accidents and of technologically induced risks generally indicates the importance of viewing them from several perspectives [Bowonder and Linstone 1987]*. The process is analogous to moving from a one-dimensional to a three-dimensional representation of the system. **Each perspective adds insights not obtainable with the others.** Thus we bridge the gap between the modeler and the real world of such accidents, between analysis and action in risk management.

Specifically we look at the problem using three types of perspective:

- the technical or "rational actor" or T perspective,
- the organizational/societal or O perspectives, and
- the personal/individual or P perspectives.

Fig. 1 suggests schematically what we are proposing - B in place of A. Note that there are several O and P perspectives, corresponding to the relevant organizations and individuals. Each looks at the problem through a different lens and perceives the risks differently. Table 1 tells us that each perspective type uses distinct values and paradigms or modes of thinking about risk.

We see the use of multiple perspectives as a basis for decision making routinely in the way top executives make decisions. Typically, a CEO, faced

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* For references, see Sec. VI.

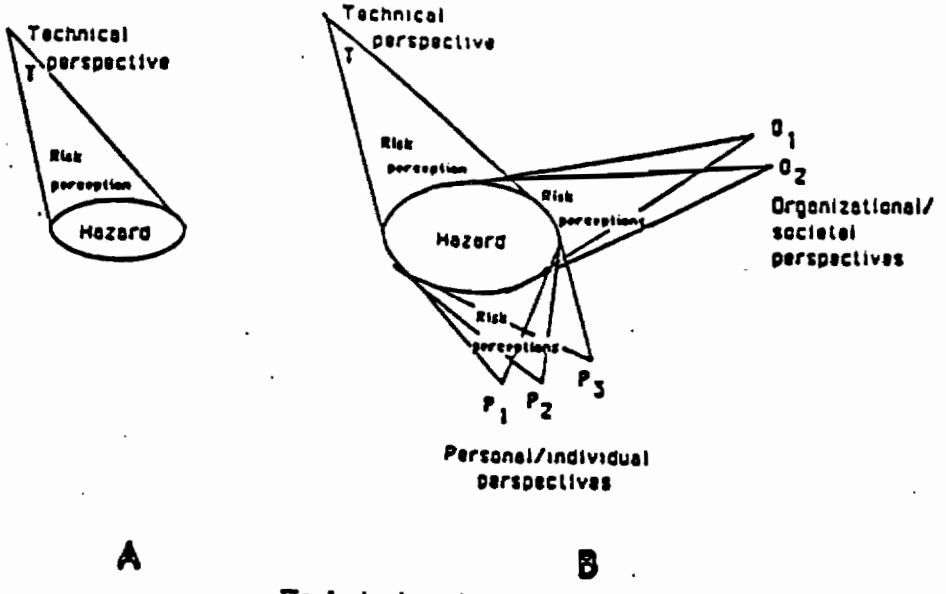

Fig. 1. A schematic representation.

with the option of moving into a new line of business, asks for a cost-benefit analysis (T), talks to his department heads to determine their organization-oriented (O) reactions (which may have little to do with the merits of the new line) and bounces the idea off his old friend who is an executive of another company (P). Then he integrates these perspectives and decides. There is no formal weighting formula in this integration process. Similarly, a trial jury listens to various witnesses (perspectives). It also hears summations (integrations) of these testimonies by the prosecutor and by the defense attorney. In the jury room it may accept either summation or do its own weighting and integrating based on the original testimonies. The same applies to our approach.

In the following three sections (II, III, and IV), we consider the several perspectives. In section V we draw <u>our</u> implications. The reader may integrate the perspectives in his or her own way and draw different implications.

Even with this 1/2 man-month mini-study, it should be evident that multiple perspectives are desirable in seeking meaningful long-term recommendations that go beyond the cosmetic and deal with the world of oil shipping realistically.

TABLE I
Risk Concerns Seen in Perspectives

Technical (T)	Organizational (O)	Personal (P)
One definition of risk for all	Definition customized to organization or group	Individualized definition
Compartmentalizing problem by discipline	Compartmentalizing problem by organization slot	Ability to cope with only a few alternatives
Data and model focus	Perpetuation of entity is the foremost goal	Time for consequences to materialize (discounting of long-term effects)
Probabilistic analysis; expected value calculations	Compatibility with standard operating procedures (SOP)	Perceived horrors (cancer, AIDS, Hiroshima)
Statistical inference	Avoidance of blame; spread responsibility	Personal experience
Actual analysis	Inertia; warnings ignored	Influenced by media coverage of risk (*The China Syndrome*)
Fault trees	Fear exposure by media; attempt stonewalling	Peer esteem (drugs)
Margin of safety design; fail-safe principle	Financial consequences	Economic cost (job loss)
Quantitative life valuations, cost-benefit	Impact on organization power	Freedom to take voluntary risks
Validation and replicability of analysis	Threat to product line	Salvation; excommunication
Failure to grasp "normal accidents"[4]	Litigious societal ethic	Influence of culture
Intolerance of "nonscientific" risk views	Reliance on experts, precedent	Ingrained views; filter out conflicting input
Claim of objectivity in risk analysis	Suppression of uncertainties	Opportunity to gain respect, fame

II. The Technical Perspective

A. Basic Facts

At 12:04 am on March 24, 1989, the tanker *Exxon Valdez* struck Bligh Reef in Prince William Sound, Alaska. This accident resulted in the largest oil spill in U.S. history. Of the 53 million gallon (or 1.26 million barrel) load of crude oil, 21% spilled (11 million gallons or 265,000 barrels). Almost all of the spill (10.1 million gallons) occurred in the first five hours after the accident. The oil has spread over 3000 square miles in Prince William Sound and the Gulf of Alaska.

The *Exxon Valdez* was built in San Diego in 1986, is 987 ft. long, and has a deadweight of 213,755 tons *. The spill was by no means the largest in the world todate. In 1967 the *Torrey Canyon* dumped three times as much (30 million gallons) off the British coast and in 1978 the *Amoco Cadiz* spilled six times as much crude oil off Brittany (68 million gallons).

The On-Scene Coordinator (USCG) notified the National Response Center, the State of Alaska, and Alyeska of the spill within one hour of the accident. Alyeska's response was delayed over twelve hours - far beyond the stipulated five hours after notification. Within 24 hours, the *Exxon Baton Rouge* was positioned alongside the *Exxon Valdez* to transfer the nearly 80% of oil still in the tanks of the grounded ship. On the second day Exxon Shipping Company assumed responsibility for the cleanup.

Initial estimates (July 31, 1989) indicate a range of oiled shoreline from 730 to 1081 miles. In addition an estimated 28,000 birds (including 109 bald eagles), 872 sea otters, and about 1000 seals died. Also there is a loss of at least $12 million in herring fishery, while 30% of the salmon spawning grounds are threatened.

The cost of the spill to Exxon has been $850 million up to July 1989, with the final cost currently estimated at $1.25 billion [WSJ 7/27/89]. This figure is comparable to the $1.3 billion cost of Three Mile Island. Note that in neither case were there any human fatalities. **

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* In deadweight tonnage it is almost identical to the P & O *Ardshiel*, subject of the bestselling book *Supership* [Mostert 1974].

** It is interesting to note that the Bhopal, India, chemical accident at the Union Carbide plant, resulting in 2,500 fatalities and 50,000 injuries (many of them severe), cost the company only $470 million in damages paid to victims.

B. State of the Technology

Alaska can consider itself lucky if the cleanup efforts do not compound the original damage and create a double disaster. That was the misfortune in the *Torrey Canyon* oil spill. Some 2 million gallons of detergents were used to treat an estimated 13,000 tons of oil on Cornish coasts and another 0.5 million gallons were sprayed at sea. Scientists found that the detergents did much more harm to shellfish than the oil. In addition, some of the aromatic hydrocarbons used to dissolve the detergents and to aid in mixing the oil also caused much damage to wildlife. [Lawless 1977: 229].

The most striking revelation with this perspective is the primitive state of cleanup technology. In the Alaskan oil spill:

• There was uncertainty about the effectiveness of **dispersants**. At the height of the crisis (at 1500 hours on the first day) a trial application was authorized because the effectiveness under the existing conditions was unclear [DOT: 17]. Three more trials were undertaken on the second and third days. Nothing of any consequence was accomplished and "the issue of dispersant use remains in dispute" [DOT: 22].

• **Burning** was tried but there was disagreement between Exxon and the State of Alaska about its effectiveness and nothing of any consequence was accomplished.

• CEO Lawrence Rawl of Exxon admits that "With a large spill like this one, you can't get **booms** around it." [*Fortune*] The Coast Guard was initially concerned that oil collected in booms around the tanker could give off fumes that might have formed a dangerous gas bubble. The fishermen helping with the booms complained about "the low quality boom...[which] continually broke, fractured, and pulled apart as the oil gushed." [O'Leary 1989]

• **Skimmers** were used with some success, "but long periods of inactivity resulted when they became disabled...only about 10% of the designed recovery rate could be achieved." Clogging was a continuing problem. Temporary storage of the recovered oil on storage vessels was slow because of difficulties in pumping the heavy, greasy material. [DOT: 19-20].

• The planned shut-down of Exxon operations for the **winter** due to severe temperatures, wind and wave conditions, and reduced daylight, indicates that any similar oil spills occurring during these months can be handled much less effectively than the *Exxon Valdez* spill. Exxon reports that many of the cleanup ships are "at great risk in bad weather". Otto Harrison's written answer to the question "What would happen if an oil spill occurred after September 15 in any year?" was non-responsive [Harrison 1989]. Presumably tanker operations would be halted and the

pipeline flow slowed or stopped in the event of winter storms.

• There is dispute about the effectiveness of **double hulls**. A Coast Guard study claims that more than half the 11 million gallons might not have been spilled if the ship had had a double hull. But the ship would be more vulnerable to leakage in case of a collision. Vice Admiral Clyde Lusk believes that double hulls would make tankers less stable. [ADN 8/3/89]

• The spill triggered some experiments with **bioremediation**. This approach has interesting possibilities, but much research still needs to be done.

Definitions also present serious difficulties. Foremost is the question: How do you define "cleanup"? Exxon's Otto Harrison uses the term "environmentally stable". DEC's Dennis Kelso talks about "treatment". **The absence of a clearcut definition underscores the complexity of the problem.**

C. Truly Complex Systems

We are now in an era of increasingly powerful technology, creating an ever larger potential for accidents that have unprecedented impacts. Recent examples are the Three Mile Island and Chernobyl nuclear accidents and the Bhopal (India) methyl isocyanate catastrophes. In the long term, the more subtle stratospheric ozone depletion by chlorofluoromethanes, nitrogen oxide, and carbon dioxide, as well as the rise in atmospheric carbon dioxide level due to fossil fuel burning, may lead to catastrophes. We are thus forced to examine complex industry-based systems in a new light. One such group comprises systems characterized by the combination of (a) very low likelihood of disastrous failure and (b) catastrophic consequence if such failure does occur. The supertanker has transformed the oil shipping system into just such a type.

In a complex system everything interacts with everything. In our case, oil shipping from Alaska has connections at one level with the Alaskan economy, the Alaskan ecology, Alaskan lifestyle, oil prices in the U.S., the U.S. economy, U.S. Mideast policy, the global air and ocean environment, the oil industry, and alternative energy development. At another level, we must deal with the actors directly involved - Exxon, Alyeska, the State of Alaska, the Federal government (DOT, EPA, NOAA), Valdez and other communities, the Coast Guard, the fishing industry, the insurance industry, international marine organizations (IMCO), and environmental groups. On a third level the system includes (a) on the high seas: the ship, radio communications, and weather, (b) in Prince William Sound: the terminal, other ships, the Vessel Traffic System, shipping lanes, and ice.

Marine accidents have involved an astounding array of factors - "radar assisted collisions", supertankers negotiating channels only two feet deeper

than they are, tugboats blocking radio channels by playing Johnny Cash music, monumental storms, captains playing "chicken" in sea lanes with 40 ships about, a frying pan destroying a luxury liner in hours, and now an alcoholic captain with a revoked driver's license in charge of a supertanker. [Perrow 1984: 170-231]

The traditional way to deal with a complex system is to compartmentalize it, dividing the system into many subsystems, addressing these separately, and dividing responsibility among various entities. A look at the system as a whole makes it clear that compartmentalization is a sure way to serious trouble.

Two descriptive parameters useful in discussing such complex systems are

• coupling - tight vs. loose

Tight coupling means there is little slack or buffer. Examples: Modern tankers have very restricted maneuverability due to the large size combined with single screws and modest engines - it takes over 20 minutes to stop a 250,000 tonner doing 16 knots. Often the ships operate with minimal clearance between hull and channel bottom. Owners create a tight coupling of another kind by pressuring captains to maintain tight schedules. Another example is the traditional authoritarian hierarchy on board the ship.

Loose coupling refers to a large degree of system slack, flexible performance standards, acceptability of delays, decentralized control. Examples: the tenuous connection between insurance rates and a shipper's operational performance, the loose enforcement of regulations by the underbudgeted Coast Guard.

• interactions - expected/simplistic/uncomplicated vs. unexpected/unfamiliar/intricate

We can illustrate the inherent problem by a simple mathematical example. Consider a system that only has three elements, A, B, and C. How many interactions are there? The answer is at least 49 (for example, A <-> C, BC <-> A). If the system has ten elements the number is over 1 million.* As we are dealing with systems having many more elements, it is clearly impossible to anticipate all potential interactions. The currently "hot" new field of science, chaos theory, has revealed that small changes in one part of a complex (non-linear) system can cause large and unexpected changes in other parts of the system. This places clear limits on predictability.

Examples of expected interactions are the visible and planned operations that comprise oil shipping, such as the terminal--tanker oil transfer relation, the tanker navigation--designated shipping lane relation, and

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* The formula is $(2^n-1)^2$, where n is the number of elements.

interactions in the boiler subsystem resulting in breakdowns.

Unexpected or subtle interactions that have involved tankers include the connection between tank cleaning and gas vapor explosions, liquified natural gas leakage and vapor cloud flammability, detergent use and ecological damage.

There is an enormous number of ways a series of very low likelihood events can combine to create an unexpected interaction, specifically a disastrous system failure. Three Mile Island, Chernobyl, and Bhopal all illustrate the point. Thus Valeri Legasov, the first deputy director of the principal Soviet atomic research institute, listed six errors made by the technicians at Chernobyl and concluded:

> If at least one violation of the six would be removed, the accident would not have happened. The engineers psychologically did not believe that such a sequence of improper actions would be committed. Such a sequence of human actions was so unlikely that the engineer did not include [it] in the project. [*Washington Post*]

In the case of the *Exxon Valdez*, we can also list a series of errors and conclude that if any one of them would be removed, the resulting calamity would not have happened:

- if Capt. Hazelwood would not have turned over control of the ship to Third Mate Cousins at 11:50 pm,

- if the Coast Guard would have monitored the ship's movements after it veered outside the normal shipping lane,

- if Alyeska would have been in full readiness status as prescribed by its contingency plan,

- if Exxon would have followed its existing policy and dismissed Capt. Hazelwood after the first drink he had subsequent to his alcohol rehabilitation (suggested by Exxon CEO Rawl in his Fortune interview [*Fortune*: 50]).

This pattern is typical for complex systems and yet not well understood by many people.

The marine transport system has aspects of both tight and loose coupling, as well as uncomplicated and intricate interactions.

We hasten to point out that even elimination of unexpected interactions would not mean that the system is **fail-safe**. By this we mean an ability to design the system so that catastrophic consequences cannot occur. In the case of oil shipping, this means designing the shipping system so that no large spills can occur. Engineers traditionally aim for fail-safe design and

this is a sound approach for relatively simple systems such as bridges and buildings. However, complex man-machine systems cannot be made fail-safe, no matter how much redundancy and control is built into the system. It means that **there is no "solution", no combination of steps, that can claim to eliminate the possibility of serious tanker accidents.**

A more reasonable objective is to make the complex system **safe-fail**. This approach does not attempt to prevent all failures but aims to make them non-catastrophic. It trades avoidance of failure for survival of failure. It minimizes the cost of failure rather than the likelihood of failure. (It is, incidentally, the design principle of advanced living systems, including human beings.)

But even this more reasonable goal is seen to be unattainable by the oil industry:

> Nothing can be promised to government or the public except a best effort to respond at sea...it is not considered likely that we can move to the point of guaranteeing containment and recovery at sea. [API p. i]

With the current level of cleanup technology (see B) the system cannot be made safe-fail.

D. An Error-Inducing System

A curious feature of our marine transport system is that it is an error-inducing system. In such a system the configuration of its many components induces errors and defeats attempts at error reduction [Perrow, 1984: 172]. As such it contrasts with the air transport system, which is **safety-reinforcing**. Table 2 displays some key distinctions. The poor safety record of ships - 15% of the world's ships have some kind of collision each year [Lawless 1977: 231] - thus becomes less puzzling.

In an error-inducing system some aspects are too loosely coupled and others too tightly coupled, some interactions too simplistic and others too intricate.

Increased electronic gear and automation are characteristic of the new tankers and the technology is assumed to reduce human error. But the effect can be perverse: it easily leads to more carelessness and a willingness to take risks previously avoided. The more complicated the equipment, the more likely it is to be out of order or improperly operated. Improved instrumentation provides "greater economical efficiency and certainly greater ease, but the risk per ship would seem to remain constant" according to a captain who was a director of Shell.[Dickson 1971]

The combination of (a) nonoccurrence of crises over a period of years and (b) the existence of contingency plans and equipment (ignoring partial

Table 2

Comparison of Safety-Reinforcing and Error-Inducing Systems

Air transport	Marine transport
co-pilot shares responsibility, teamwork	authoritarian captain, little sharing of responsibility
moderate productivity pressure captains cancel flights	severe productivity pressure owners force tight schedules
ground controller shares responsibility, ATC mandatory ATC can override captains	no equivalent of ground control Vessel Traffic System is advisory
federal presence large tough standards, enforcement FAA has central responsibility	federal presence minor lax standards, lax enforcement (U.S. ranks 14th in ship safety) VTS only small part of USCG duties no FAA equivalent
strong international cooperation	weak international cooperation
attractive work conditions strict limits on work hours	debilitating work conditions overwork common
neutral physical environment storms avoidable, alternate airfields and delays acceptable	hostile physical environment storms not avoidable, alternate ports unacceptable
accidents get high visibility extensive media coverage	accidents get low visibility unless vast environmental side effects
victims of accidents identifiable airlines carry people whose support and business they need	victims of accidents anonymous foreign seamen, fishermen, wildlife no significant customer effect at gas pump, even with sharp price rise after disaster

dismantlement and current inoperable status) creates great confidence that nothing can happen.

It is typical of an error-inducing system that operator error is a prominently given explanation for an accident. But that argument may be misleading. For example, exhaustion due to excessive work hours and routing short cuts to avoid the anger of superiors in the home office in case of late arrival may easily lead to human navigation decisions resulting in catastrophic accidents. Yet it would be totally inaccurate to simply state the cause as human error.

E. Implications

Based on the T perspective analysis, we are led in the following direction in improving the oil shipping system:

- for prevention - better understanding of system coupling and interactions to institute changes that will make the system less error-inducing and more safety-reinforcing,

- for response - upgrading of crisis management techniques,

- for response - a major effort directed at cleanup technology development.

III. The Organizational Perspectives

The principal organizations involved with the oil spill crisis are shown in Fig. 2. Each has its own view of the problem and its own agenda. Within the severe confines of this effort, we will try to sketch these perspectives. They not only differ from each other, but from the technical perspective discussed in the preceding section.

A. Exxon Corporation

As owner of the *Exxon Valdez* and a major partner in one of the most powerful industries in the world, the role of Exxon Corporation in this crisis is the central one. It is safe to assume that the most important objective of this Corporation is to maximize its profits from oil drilling and marketing operations. The dangers it faces as a consequence of the Valdez incident include

- constrictive changes in operational rules that add to the cost of shipping the oil,

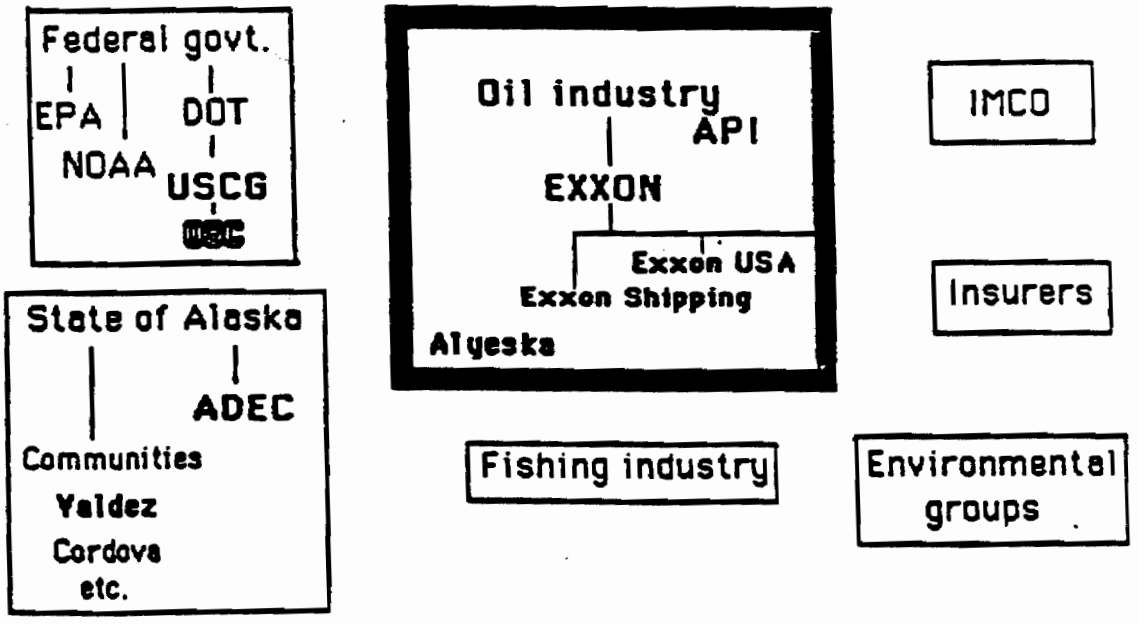

Fig. 2 - The Principal Organizational Actors

• public outrage that may translate into federal legislation impinging on the favorable tax status and future oil exploration permits for the oil industry,

• public outrage that may translate into restrictive Alaska state legislation or increased state tax levies on the oil industry,

• public outrage that may affect purchases at the local Exxon gas station and hurt the corporation's competitive position,

• expensive litigation instituted by the affected parties,

• impetus to accelerate development of non-fossil fuel energy sources such as solar and nuclear energy as well as electric batteries for cars.

These dangers are serious enough to justify a major effort at damage control, specifically a sizeable dollar expenditure. The given cost estimate of $ 1.25 billion may rise appreciably as additional cleanup operations are forced on Exxon and litigation imposes damage compensation. On the other hand, tax benefits and insurance should ultimately reduce the figure drastically. One report is that Exxon has $400 million insurance coverage. Exxon's liability under the Clean Water Act is only $14.3 million, with another $86 million provided by the Trans Alaska Pipeline Fund.

Damage control must clearly be the foremost near-term strategy. The primary components of this strategy appear to include

• focusing the blame on Capt. Hazelwood of the *Exxon Valdez*

> "Question: What have you learned from all this?"
> Exxon CEO Lawrence Rawl: "Well, take the case of the captain of the ship. We can certainly minimize this type of thing from happening again." [*Fortune* : 50]
>
> F. Iarossi, president of Exxon Shipping Company, blames the disaster on "human error", presumably that of the Captain and Third Mate Cousins [ADN 3/25/89]. Capt. Hazelwood was publicly fired by Exxon within days of the accident.

• shifting the blame away from Exxon to other organizations

> "Question: Why didn't you react immediately?"
> Rawl: "The basic problem we ran into was that we had environmentalists advising the Alaskan Department of Environmental Conservation that the dispersant could be toxic." [*Fortune* : 52]
>
> "Question: Specifically, who stopped you from applying the dispersant

immediately?"
Rawl: "It was the state and the Coast Guard that really wouldn't give us the go-ahead to load those planes, fly those sorties, and get on with it...we could have kept up to 50% of the oil from ending up on the beach somewhere." [*Fortune* : 52]

In Cordova, DEC Commissioner Dennis Kelso responded:

"I think this is an arrogant disregard for the truth, and I think it's a systematic effort by Exxon to mislead Alaska and mislead America on Exxon's failure to deal with this spill." [ADN 4/20/89]

And Alaska Governor Steve Cowper observed:

"Exxon is trying to give the state a black eye, probably to try to escape culpability on behalf of itself...Alaska is a long ways from the rest of the country and I'm sure that it's possible for a concerted public relations effort to put one over on the Lower 48." [ADN 4/29/89]

As late as August 3, Otto Harrison, Exxon's general manager in Valdez, insisted:

"the state should share responsibility for fishing closures stemming from its zero-tolerance policy. That's a marketing decision, not an environmental decision." [ADN 8/4/89]

John Sund, Alaska Oil Spill Commission member, and Dennis Kelso both disputed the validity of this assertion.

- communicating the impression that Exxon is mobilizing vast resources to clean up the oil spill

Exxon statement (Aug. 2, 1989): The current level of personnel in Alaska associated with the Valdez operations is about 11,000 people. The Exxon cleanup fleet includes 50 landing craft and 25 maxi-barges, a water pumping capability of 140,000 gpm cold water and 12,000 gpm warm water.

- communicating the impression that the cleanup operation is effective

Exxon data provided by its Valdez manager Otto Harrison indicate that, as of July 31, 197 miles of Prince William Sound and 508 miles of the Gulf of Alaska shore have been treated. Exxon's May 24 estimate of impacted shoreline mileage was 209 in Prince William Sound and 521 miles in the Gulf of Alaska area. Thus it appears that 94% of the impacted beach in Prince William Sound and 98% in the Gulf of Alaska shoreline are already taken care of, leaving every expectation that the job will be completed by September 15.

It is natural for the public to assume "treated" means "cleaned up".

• communicating the impression that new operational procedures will prevent a recurrence of this crisis

On June 14, 1989, the American Petroleum Institute (API) proposed a series of steps involving the spectrum of spill prevention, spill response, and research. Most significant is the concept of an industry-funded Petroleum Industry Response Organization (PIRO) consisting of a heaquarters and five Regional Response Centers (none in Alaska). PIRO is to provide equipment and skilled personnel to respond to major spills, presumably more effectively than was done by Alyeska in Valdez.

On August 1, 1989, Alyeska presented a Tanker Spill Prevention and Response Plan for Prince William Sound. The cover letter states: "The plan reflects a commitment of personnel, equipment, and organization second to none in the world." Its innovative features are the creation of Community Response Centers and an Incident Command System organization for the Alyeska spill response team.

A critical factor underlying Exxon's perspective is its corporate culture. Oil companies did not evolve as high tech organizations in the way the aerospace and electronics companies have. This difference comes into play when dealing with very complex systems. In this regard the oil industry is more analogous to the utility industry.

Electricity generation became a commercial enterprise early in the twentieth century, as did oil production. Although the complexity of power generation and transmission steadily increased, the utility industry was not prepared for the level of complexity presented by nuclear energy. The Rogovin Report labeled the Three Mile Island accident a "management problem". The Kemeny Commission found that "[the utility] did not have sufficient knowledge, expertise, and personnel to operate the plant or maintain it adequately." [Kemeny, 1979] There was no real appreciation in management of either the knowledge-intensive character of the new technology or the potential for catastrophe. Error-intolerance of internal operations and criticality of external effects were not perceived as central. This corporate culture contrasted sharply with the U.S. Navy's nuclear program as personified by Admiral Hyman Rickover. The differences between the Navy and utility industry in approach to construction and operations were startling.

The Three Mile Island crisis served to bring this situation into focus and resulted in major changes within the industry, for example, in operator training. It should be emphasized that the reason for the differences is not

to be found in the fact that one is a governmental organization and the other is private. Catastrophes occur in government-run as well as private settings. And so do examples of excellence in operating powerful systems that are subject to low likelihood/severe consequence incidents.

In the oil industry, the corporate organization in the era of 18,000 ton DW tankers in World War II can hardly be expected to be appropriate for the 200,000+ ton DW supertankers of today, simply because this tenfold increase in size now creates an entirely new presence - the possibility of low likelihood/severe consequence incidents.

Another reflection of the relatively low tech corporate culture in the oil industry is the astonishingly primitive level of the oil spill cleanup technology (see sec. II B). The industry's API Task Force Report (June 14, 1989) belatedly admits

> the frustrations in trying to contain and recover oil at sea and in attempting shoreline cleanup indicate a need for new technology and thus increased need for research. [API p. ii]

The Report to the President also bemoans the "primitive" state of cleanup procedures and technology and proposes new research efforts.

Profitable operation must be of foremost concern to any oil company. It is estimated by the State of Alaska that the total profit for the oil companies operating in Alaska from 1970 to 1989 has been $45 billion. [WSJ 7/6/89] Achievement of such impressive profits is aided significantly by rigorously minimizing costs.

Like its competitors, Exxon made sharp cuts in the ship crew complement - from as many as 40 in the late 1960s (for smaller ships) to the *Exxon Valdez*'s 24 in 1986 and 20 in 1989 [*Time*: 43]. The result is longer work hours and overworked seamen. Economies have also affected ship construction most significantly. Supertankers are preferred because one large ship is more economical than several small ships carrying the same total load. A single screw and shaft are more economical than twin screws and shafts. Small engines are more economical than large engines. A single hull is more economical than a double hull.

There is great pressure on the ship captain to maintain tight time schedules. Shell has determined that, for its fleet of tankers, cutting one hour in port saves a total of $5 million annually. Often tanker captains take risky short cuts to make up time; this was the case for the *Torrey Canyon* traversing the hazardous Scilly Islands with the result of dumping 100,000 tons of oil on the British and French coastlines [Perrow: 183]. At other times, they will avoid the use of expensive tugs in harbors and bays.

The overriding importance of profits to the oil company is perhaps best

illustrated by the experience of Captain Hazelwood with the *Exxon Chester* in 1985. Traveling from New York to South Carolina, he encountered a freak storm off Atlantic City. High winds snapped the ship's mast and knocked out the radar and electronics gear. Hazelwood calmed the crew, rigged a makeshift antenna, and guided his ship out of the storm. He returned with his damaged ship to New York and

> to his surprise, ran into a brief storm of criticism from dollar-conscious superiors at Exxon who had wanted Hazelwood to continue the journey southward. [*Time* : 45]

The advantages of Exxon as a large and tightly coupled organization have come into play most strongly in mounting the very large cleanup operation. As soon as it took over from Alyeska, things began to happen. This was demonstrated by its rapid deployment of the *Exxon Baton Rouge* to transfer most of the oil from the stricken ship (transfer began at 0736 hours on the second day), its rapid manpower mobilization and effective installation of a communications center in the spill area

Overall, the power of Exxon, and more generally, the oil industry, is awesome. In some respects, it exceeds that of the U.S. government. The companies are linked together not only through industry associations and a large number of joint venture arrangements, but through interlocking directorates by way of common directorates in commercial banks. [Blair: 145]. And they have a friend in the White House.

Globally, the oil industry is able to dominate the International Maritime Consultative Organization (IMCO). For example, the industry lobbied successfully against an IMCO proposal to require double hulls [ADN 8/3/89].

B. Alyeska Pipeline Service Company

This company, charged with the operation of the Trans Alaska pipeline and Valdez port complex, is owned by a consortium of oil companies. The three largest shareholders are British Petroleum with 50.01% share, Arco 21.35%, and Exxon 20.34%. The State of Alaska insists that the oil companies control Alyeska's budget to a degree that makes them responsible for Alyeska's response to the spill.

Robert LeResche, Alaska's oil spill coordinator:

> "We feel that Alyeska as a corporation was merely a sham, a corporate shell...behind which these partners have been hiding for the last 12 or 15 years." [*Oregonian*]

And ARCO President Bill Wade's speech to the Alaska Chamber of Commerce

reminded the Anchorage Daily News' Michael Carey that

> Bill Wade, ARCO, and all the other Alyeska participants maintain the polite fiction that they aren't responsible for the consortium's follies. They treat Alyeska as a completely foreign operation for which they aren't accountable. [ADN 4/27/89]

The construction of the pipeline is considered to be the most expensive effort undertaken entirely by private industry. The huge overrun incurred in that project (one estimate is $5.5 billion) has undoubtedly spurred cost cutting efforts in the operations of the consortium.

> The pipeline operator's track record, as shown in internal documents, state records, talks with regulators, public testimony and interviews with current and former employees, paints a picture of a consortium that has long pursued a policy of cutting corners on the environment. [WSJ 7/6/89]

An investigation by the strongly pro-business Wall Street Journal [WSJ 7/6/89] paints a grim picture of the company. It reports that many safeguards have been quietly scrapped, promised ones have never been built, and new regulatory controls have been vigorously fought. According to this source, employees claim they sometimes fabricated environmental records and doctored test results. Defenses against a major accident were allowed to fall into disrepair. An emergency 12-man spill response team was disbanded in 1982. Effective air and water pollution controls were resisted and continuous monitoring of harbor water abandoned. A routine inventory of cleanup equipment in March 1988 found only half the emergency lights required and half of the required length of six-inch hose. Eight of the 10 blinking barricades and 15% of the boom listed in the plan were missing. Drills for catastrophe responses were "a farce, a comic opera". Alyeska's president, George M. Nelson, terms these charges "largely discredited accusations".

On June 22, 1982, Alyeska told state regulators the the "estimated time of completion of spill cleanup of a 100,000 barrel spill would be less than 48 hours". But in recent testimony to a House Interior subcommittee, Alyeska insisted that it "never promised to pick up 100,000 barrels of oil in 48 hours." It had merely been talking about the manufacturer's rating for the equipment.

After the *Exxon Valdez* oil spill, it took 14 hours for Alyeska to respond, three times as long as its contingency plan had postulated. The barge assigned to the response had been damaged by a windstorm several weeks earlier and was being repaired. No effort was made to boom off the tanker immediately after the spill. One ex-Alyeska employee explains that the Coast Guard prevented placement of the booms around the ship for fear oil fumes might create an incendiary gas bubble. Alyeska now contends that

key parts of the plan were mere "guidelines...that cannot really be extrapolated to the real world." To this Dennis Kelso replies:

> That's like saying the fire code is just a set of guidelines. It's just an incredible and appalling fabrication...Alyeska stands as a monument to a powerful and rich industry's fundamental failure to keep its commitments." [WSJ 7/6/89]

Alyeska demonstrates the power of the oil industry.

> When individual regulators do lean on Alyeska, its response can be fierce. Dan Lawn, the state's top Alyeska inspector, was thrown off Alyeska's premises one day in 1986...Alyeska...tried to get him fired and attempted to limit his access to the terminal... Says Mr. Lawn: "I would characterize their attitude toward regulators as utter contempt." [WSJ 7/6/89]

Alyeska denies it ever tried to get him fired, but he has been reassigned by his DEC superiors. In 1988 Alyeska tried to control state inspections of the terminal by requiring advance notice of inspection visits and refusing to permit the DEC to bring video cameras. [ADN 8/3/89] Alyeska also ignored state law in failing to notify Lawn, as head of the Valdez office, that some cleanup equipment was not operational as specified in the contingency plan. [ADN 5/14/89]

In 1971 hearings before the Interior Department, L. R. Beynon of British Petroleum testified for Alyeska:

> The contingency plan which will be drawn up will detail methods for dealing promptly and effectively with any oil spill which may occur, so that its effect on the environment will be minimal...operations at Port Valdez and in Prince William Sound [will be] the safest in the world." [ADN 4/21/89]

Now even Exxon CEO Lawrence Rawl insists that

> Alyeska was not equipped to handle an unfortunate incident like this one. [*Fortune*: 52]

And the industry's own (API) Task Force Report admits:

> The industry has neither the equipment nor the response personnel in place and ready to deal with catastrophic tanker spills....the industry is not prepared anywhere along the coastal U.S. to deal with a spill of [216,000 barrels - less than the Valdez spill]. [API, p. i]

To its credit, Alyeska has recently converted three ships to emergency response vessels. They now accompany tankers in the Valdez area and are outfitted with skimmers, boom, and cranes for immediate use in case of spill.

As LaPorte has found, organizations that deal effectively with knowledge-intensive technologies subject to low likelihood/severe consequence failures have very distinctive characteristics. Most importantly,

> each organization has a strong, clear sense of its primary mission, operational goals and the technical means necessary to accomplish them. [LaPorte 1989]

Alyeska fails this criterion.

C. U.S. Coast Guard

The Coast Guard is a chronically overcommitted and underfunded quasi-military service. With 37,000 people, it is minuscule by comparison with the Department of Defense; the Navy has 600,000 and the Marine Corps 200,000 men and women. In fact, the Coast Guard is comparable in size to the combined staffs of the Congress and the White House (34,000). Since 1967 it reports to the Department of Transportation (DOT), as does the Federal Aviation Administration. Traditionally, search and rescue (SAR) was its foremost mission. With illegal immigration and drug traffic soaring in recent decades, enforcement of laws and treaties (ELT), has de facto become a far more important mission. The barrage of environmental legislation, including the National Environmental Policy Act, the Water Quality Improvement Act, the Coastal Zone Management Act, the Fisheries Conservation and Management Act, and the Marine Protection, Research, and Sanctuaries Act, add a further burden to the ELT mission.

Unfortunately, as one experienced Congressional aide notes, **"the Coast Guard just doesn't have a constituency here [in Washington]."** [*New Yorker*]. Its FY 1987 budget was close to $3 billion and this was cut by $100 million in FY 1988. As a result Admiral Yost had to cut back operations, including that at Valdez. Secretary of Transportation Samuel Skinner recently proposed a $25 "user fee" (i.e., tax) on every boat in American waters. Although the expected $180 million could augment the operating budget of the Coast Guard, the receipts might well disappear into the general treasury.

The plain fact is that the Coast Guard does not have the resources to fulfill its missions, to monitor compliance with regulations, to enforce standards, and to apprehend violators. In the case of the Valdez incident, the Coast Guard failed to monitor the tanker

after it veered outside the normal shipping lanes and did not communicate with the ship until after the grounding, about an hour after Capt. Hazelwood's last radio transmission announcing his detour to avoid ice (11:25 pm). Surprisingly, the tanker was not then tracked by radar but only spotted after it ran aground. (The Coast Guard maintains that it was not required to track ships as far as Bligh Reef.)

Organizationally, there is unhappiness in the Coast Guard with its location in DOT. One proposal to increase the Coast Guard's political clout is to establish a Federal Maritime Administration headed by a civilian Under-Secretary. Presumably he could be more effective in pushing the Coast Guard's interests in DOT. Other proposals: shift the Coast Guard to the Navy, shift it back to the Treasury, or become an independent agency.

Since the Valdez oil spill the role of the Coast Guard has been a central one: it provides the On-Scene Coordinator (OSC) in the person of Vice Admiral Harold Robbins. In this role, he must approve the cleanup plans of Exxon. In testimony to the Alaska Oil Spill Commission on August 3, 1989, he praised Exxon's efforts and expressed his conviction that the company would do whatever is asked of it next spring [ADN, 8/4/89]. However, he provided USCG data on the cleanup that differed markedly from that of Exxon - 1081 miles of beach impacted todate and only one-third of the shoreline treated. The differences may be partly due to different modes of measurement.

The relation between the Coast Guard and Exxon is itself complex. In organizational terms, we have noted the enormous power of the oil industry and the weakness of the Coast Guard. This situation must affect USCG-Exxon relations. Furthermore, recalling the connection between the U.S. military and the defense industry, we should not be surprised that senior retired USCG personnel find second careers with the oil companies.

D. State of Alaska

The state receives 85% of its revenue from oil and each of its citizens receives an annual check from the oil fund. These facts inevitably weigh heavily in the relationship between the state and the oil industry. The oil companies also contribute heavily to the legislature. Senator Drue Pearce, the chairwoman of the Oil and Gas Committee, received oil money contributions of $ 36,145 directly and $13,703 indirectly (through oil contributions to the Republican Party) in 1987-88; the total amounted to 26.6% of the total money she received. The state has a law giving large tax breaks to oil companies and efforts to repeal it have been defeated for the past three years by Republican-led coalitions that have run the Senate [ADN 4/20/89]. On the other side, an oil industry view is that the state taxes the industry too heavily and raises its taxes whenever it needs money.

The Alaska Department of Environmental Conservation (DEC) is the agency chiefly responsible for ascertaining that Alyeska actually has the equipment, manpower, and know-how to clean up oil spills. Its commissioner is Dennis Kelso. **Legislation passed in 1988 gave DEC clear authority over oil spill cleanup plans written by the company. But the state refuses to pay for the needed inspectors.** Alyeska's marine terminal in Valdez is just one of 93 onshore oil terminals that must pass muster. And DEC is responsible for more than 400 facilities, including tankers, barges, and drilling platforms. Yet there is no formal terminal and tanker inspection program. In 1988 DEC asked for more than $500,000 to hire inspectors to review contingency plans and inspect facilities, but was granted only $150,000. [ADN 3/30/89]

E. Cordova District Fishermen United (CDFU)

There are bitter complaints by CDFU about the poor response of Exxon to offers of concerned, knowledgable, and willing Cordova fishermen to help promptly to deploy boom.

> By midafternoon on the day of the spill, over 50 boats from Cordova and Tatitlek were ready to go. We still never received a phone call back despite many more attempts to contact Alyeska. [O'Leary]

The fishermen felt the urgent need to secure the five fish hatcheries in Prince William Sound and went on a worldwide search for boom. Many foreign and domestic companies called back to say Exxon had told them they did not need any more boom at this time. Nevertheless they proceeded to obtain boom equipment to secure the hatcheries.

The new Alyeska plan of August 1, 1989, shows that the oil companies appear to have learned a lesson from this experience.

F. Other Organizations

There are, of course, many other organizations involved with the oil spill crisis. Examples are the federal government agencies (NOAA, EPA) and environmental groups as direct participants, the insurers and IMCO as indirect participants. Time did not permit their inclusion here.

G. Indications

The scope of this study could not encompass the person-to-person interviews which usually constitute the primary input to the O and P perspectives. They are important in drawing in the diverse parties and their (often conflicting) views. Using secondary sources, we arrive at the

following initial impressions:

Exxon is the central and most powerful actor in this crisis. Its tight coupling and enormous resources give it great leverage when it wants to act. But it sees damage control as its foremost concern in this situation. The overriding corporate profit goals require minimizing losses from the accident, not achieving the most thorough cleanup. We must also recognize that Exxon is not a high tech organization in today's world. This is equally true for the industry as a whole.

Alyeska's actions raise serious questions about its ability to perform emergency response, one of its stipulated missions. Nor does its August 1, 1989, plan instill any confidence that it is moving to make the fundamental organizational changes necessary to become a truly high-capability response organization. As the company is controlled by the oil consortium, responsibility for deficiencies must rest with the consortium members.

Constant overcommitment and underfunding reflect the absence of any constituency in Washington for the Coast Guard. Its weakness makes it difficult for the Coast Guard to stand up to industry pressures.

The State of Alaska also has problems facing up to the industry in view of its almost total dependence on oil revenues. Its support for oversight and control of oil operations has been quite limited. The strongest reaction to the oil spill comes from the fishing communities who have been badly hurt.

IV. The Personal Perspectives

We begin this section on the same cautionary note that we concluded the preceding one - the scope of this effort did not permit the range of in-depth personal interviews which normally form the basis for the desired representative set of personal perspectives.* A few secondary sources are used here and must suffice to suggest the significance of sweeping in such perspectives.

A. Misperceptions of probability of occurrence

Human beings do not evince complete rationality when dealing with probabilities. For example, most people tossing a coin ten times and coming up "tails" each time will bet "heads" on the eleventh throw - even knowing that the eleventh toss is independent of the first ten. It is also common reasoning that an event which has not occurred in a long time will not occur in the future time frame of interest. For example, people become careless about vaccinations, such as polio and measles, because for years no significant outbreaks have occurred.

Exxon's computers determined that a Valdez-type accident would happen only once in 241 years [WSJ 7/27/89]. Many people promptly misinterpret this statement as signifying that it will not occur in the foreseeable future. Hence complacency is hardly surprising. The reality is that this very low probability by no means excludes the possibility that the next large spill may occur in the next twelve months.

Human beings have difficulty grasping very low probabilities. We are comfortable discussing probabilities of 50%, 20%, and 10%. We have problems with probabilities such as

.0056 - the probability of losing a ship in the year 1979
(400 ships lost in a worldwide fleet of 71,129)

.00004 - per cent of load spilled by Valdez tankers since 1977
(based on 8700 loaded tankers departing from Valdez)

While we can clearly distinguish between .50 and .10, it is almost impossible for us mentally to distinguish .004 from .00004, despite the fact that one is 100 times greater than the other.

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* The author was able to conduct one telephone interview with former Alyeska executive Jon Dunn, whose cooperation is appreciated. His view varied considerably from that offered by the Wall Street Journal.

In deriving subjective probabilities, or likelihood of occurrence of a one-time event, human beings integrate their own experience with a significant bias. Recent experience weighs more heavily than experience in the more distant past. For example, tests show that drivers having recently driven by an auto accident scene will estimate a higher probability that they will have an accident in the next thirty days than drivers who have not witnessed such a scene recently [Tversky and Kahneman 1974]. As an event recedes into the past, it also fades in the mind. Distant past events are discounted relative to more recent events. The *Exxon Valdez* disaster will be discounted as time moves on. It will disappear from the front pages and television screens - and most people's consciousness.

Putting this characteristic another way, we apply a discount factor to the past (and the future). The farther an event is in the past (or the future) the less important it is to us. We look at the past (and the future) as if through the wrong end of a telescope - the farther away the object, the smaller it appears to us. This also explains why the economics vs. environment debate usually tilts toward economics. The environmental effects (e.g., disappearance of a species) are typically long-term, hence discounted relative to the much more immediate economic impacts (e.g., loss of jobs).

In cases of a low likelihood event where the consequence of its occurrence is catastrophic, probabilities do not offer a basis for planning.

B. Personal responsibility of managers

When a Japan Airlines DC-8 crashed in Tokyo Bay as a result of pilot error, the president of the airline resigned. Such sense of personal responsibility is uncommon in American corporations. When the Union Carbide industrial accident occurred in Bhopal, India, Warren Anderson, CEO of Union Carbide, flew to the scene of the disaster. Lawrence Rawl, Exxon's CEO, stayed out of public view for nearly a week after the disaster and let others take the heat.

When Alyeska's top executive in Valdez, Chuck O'Donnell, was awakened at 12:30 am by a call from the terminal informing him of the accident, he ordered a subordinate to head to the terminal and went back to sleep. A company spokesman insists that this was "in accordance with accepted consortium procedures for dealing with possible disasters." [WSJ 7/6/89]

As Michael Carey puts it,

> The corporate structure encourages employees, even corporate leaders, to restrict their sense of responsibility to what's in their job description...Compartmentalized responsibility makes it easy for corporate officials to evade responsibility. [ADN 4/27/89]

C. The national leadership

President Bush held a press conference on April 7, 1989, in which he, like CEO Lawrence Rawl, focused on the "alleged human error of a pilot" as the cause of this "aberration". Although he campaigned in 1988 as "an environmentalist" and manifested righteous wrath at the pollution in Boston harbor, he has taken only mild interest in the largest spill in American history. He has not visited the scene of the disaster.

D. Cordova Fishermen

At the other end of the spectrum, the local fishery people have shown the most emotional reaction, at times stunningly articulate. An example is Michelle Hahn O'Leary of Cordova, representing the Cordova District Fishermen United (CDFU). Cordova is totally dependent on fishing. Her testimony:

> Our lifestyle is ruled by the tides and the fish that inhabit Prince William Sound, instead of by a clock...1989 is the 100th aniversary of commercial fishing in Prince William Sound. What a sad, destructive, and pathetic situation fishermen and all the members of the Sound face in this historic 100th year....
>
> We cohabit daily with land otters, sea otters, seals, eagles, Canada geese, and many species of water fowl and shore birds that feed and haul out on the beach in front of the house. These are our companions and friends...We find ourselves crying as we harvest oil coated dead sea otters and deck load our boats with birds doomed because they ingested toxic oil as they attempted to free their wings from the black goo. There are few things in this world that will tear your heart out quicker than the pained screams of sea otters as they try to get the oil out of their eyes.

At the August 4, 1989, Alaska Oil Spill Commission hearing, a fisherman read a poem he had written on the subject.

Jeff and Claire Bailey fulfilled a life dream in moving from Massachusetts to Cordova. Jeff (32) crews on fishing boats from April to September, while Claire (30) runs the Killer Whale, a combination deli and café. In December she shuts down the restaurant and fills in as X-ray technician in Cordova's Community Hospital. They live comfortably on a $60,000 income. In their leisure time he hunts moose and bear and they go clam digging, hiking and kayaking.

On March 24 their life changed. The State cancelled the herring season, although Exxon is reimbursing the fishermen for their losses. Next spring the salmon fishing season may have to be abandoned. Oil pollution cancelled his plans to harvest kelp from the bottom of Prince William

Sound. Claire's café has lost customers and help because two-thirds of the townspeople are off working on the cleanup. Exxon has paid Claire $2000, but the café continues to lose $500 a week. Conscience does not permit Jeff to go to work for Exxon - a costly decision. Jeff has become politically active as he has battled to obtain compensation from Exxon for the "indirect" losses the café suffered. [*Money*]

Many Cordova fishermen felt Exxon ignored them, but DEC was willing to listen.

> Dennis Kelso, the DEC Commissioner, is a folk hero here. He walked into a party at the Cordova Telephone Cooperative late Thursday night and a cry went up, "Our hero!" The entire group applauded and cheered....Cordovans have cast him in the role of champion in a mythic struggle against a faceless villain, a part he plays well.
>
> [ADN 4/30/89]

E. Indications

The human tendency to weigh the near-term more strongly than the more distant past or future will mean a steady lessening of interest in the oil spill as time moves on.

Exxon and consortium executives have intense loyalty to their companies, but a sense of personal responsibility for the oil spill is difficult to ascertain. Self-styled "environmentalist" President Bush has also shown no strong personal concern with the crisis.

The one outspoken group comprises the people whose lifestyle is most strongly affected by the spill, the fishermen, but they have very limited political power.

V. Implications

A. Discussion

Having taken a brief look in secs. II, II, and IV, at the oil spill crisis from the T, O, and P perspectives, we can draw some implications. Until a more in-depth study is undertaken, they should be considered indicative rather than conclusive. They are based on one integration of the perspectives. As stressed in sec. I, others, examining the same perspectives, may well use different weighting factors and arrive at different implications. This section, therefore, is in the nature of a prototype integration based on a 1/2 man-month look at the crisis using multiple perspectives.

The knowledge about the effects of oil pollution, as well as the means to clean it up, is quite inadequate. It thus is hardly a surprise that we lack an unambiguous definition of the meaning of "cleanup". It cannot be expected that sudden discoveries will resolve the uncertainties. As with the discovery of cancer-causing materials, vital impacts of oil pollution on the exceedingly complex ecological ocean system may require decades of careful field observation and laboratory research.

It took 110 years to recognize an important impact of the construction of the Canadian Welland Canal (1829). By 1939 the lamprey had worked itself from the St. Lawrence River into the Great Lakes and begun to decimate commercial fishing in Lake Huron and Lake Michigan [Lawless 1977: 208].

Exxon, which has responsibility for the cleanup, is believed to have as its goal damage control with minimal adverse impact on corporate profits. The prospects for the cleanup of the March 24 spill are quite uncertain even if the federal government were to take over the operation. It is therefore reasonable to suppose that the negotiable level of acceptable cleanup effort will determine the definition of "cleanup", rather than the definition determining the point of completion of the cleanup.

For the future, <u>assuming a continuation of the policy of shipping oil by sea using supertankers from Valdez,</u> one can postulate three levels of capability:

- Level A - A fail-safe oil shipping system

System complexity makes it totally unrealistic to expect a <u>fail-safe</u> oil shipping operation.

- Level B - A safe-fail oil shipping system

The primitive level of cleanup technology and the current organizational

culture make it unrealistic to expect a safe-fail operation.

If the assumption stated above can be lifted, there are in theory interesting options:

1. Construct a pipeline through Canada to the U.S. This option was considered in the 1960s and dropped for debatable national security reasons.

2. Have the actual cleanup capability determine acceptable tanker size. This would increase the number of tankers, and hence the tanker traffic. Although this option is not considered cost-effective and is opposed by the industry, it might well be feasible if an effective traffic control system were operative and meaningful advances in cleanup technology achievable.

3. Shift to other fuels. The high level of carbon dioxide (CO_2) emissions produced by oil (and coal) play a major role in raising the atmospheric temperature (the greenhouse effect) and contribute heavily to stratospheric ozone depletion. A shift to less CO_2-producing natural gas would help to reduce the likelihood of a climatic crisis in the next century. Even more desirable would be a shift away from fossil fuels entirely. Nuclear and solar energy produce no greenhouse gases at all, but nuclear energy also has a potential for catastrophe. This leaves solar energy as an attractive option at some future time.

However, the huge investment of the oil and automobile industries in current energy technology makes any discussion of option 3 unrealistic until an environmental crisis is imminent. Strong opposition of the powerful oil industry is also virtually certain to squash serious consideration of options 1 and 2.

Consequently, we aim for

• Level C - Various improvements

Significant improvements in prevention and response capability appear feasible and have already been proposed in the American Petroleum Institute Report and other reports on the spill.

However, successful implementation is by no means assured even if adequate funding is provided. There are three reasons:

a. The system knowledge and technology remain unsatisfactory.

b. The existing organizational setting is likely to vitiate various improvements.

b. The existing organizational setting gives little confidence that a constant high reliability and high alert status will be maintainable over a long time

period.

Level C is practical for all parties concerned, but is of only modest value unless it is accompanied by fundamental organizational changes as well as real advances in system knowledge and technology development.

1. Practical because...

A set of improvements is practical:

• It gives the public the impression that positive action is being taken.

The API Report proposes creation of PIRO, mandatory participation in Vessel Traffic Systems, mandatory escort vessels, drug and alcohol testing, alarm systems for automatic pilots, improved ship navigational capability (through tugs or twin screws or bow thrusters), and expanded research on spill response technology.

• It will not interfere with the planned flow of oil from Alaska.

Improvements can be implemented without reducing the level of oil shipments desired by the industry.

• Improvements can be specified and made appealing to all concerned parties.

For example, Alyeska's proposal to create Community Response Centers, which will help local residents with equipment to protect their shorelines, is designed to defuse numerous complaints of fishermen that Alyeska ignored their offers to participate in the early cleanup operations at Valdez [Alyeska 8/1/89].

• Even if improvements prove ineffective or complacency takes hold, no serious concerns may be raised in view of diminution of public interest over the long term.

• Improvements can be tailored to a wide range of funding levels.

• Improvements can be implemented in timely fashion so that they are in place while much oil remains to be fed through the pipeline. It must be kept in mind that Prudhoe Bay reserves are limited and the future of the Arctic National Wildlife Refuge as an oil source is unclear.

The approach is one of addressing components of the system, for example:

- Alyeska: escort vessel for all laden tankers in Prince William Sound;

- the Coast Guard: expanded marine traffic control and strengthened

licensing regulations,

- the industry: creation of PIRO, improved contingency plans;

- the science community - research on vessel configuration, bioremediation, chemical dispersants, and other relevant areas;

- U.S. Congress - oil spill liability and compensation legislation;

- DOT - improved National Contingency Plan.

It is politically desirable that each organization that wants to be involved can participate.

2. Only of modest value unless...

A set of improvements is of dubious value unless a cohesive "high reliability organization" [LaPorte 1989] is created and given full responsibility and operational control of the oil shipping safety program. The bits-and-pieces approach offered by the various proposed improvements does not leave us with an organization that can assure effective integration of improvements and continued maintenance of a high state of readiness. And it does not give us a high degree of knowledge about all aspects of the system's operating characteristics and environment. There are too many ways important sources of difficulty can fall between the cracks when taking a compartmentalized approach to safety in complex systems.

Most significantly, the error-inducing quality (see II) may still bedevil the system:

• The improvements may create such an aura of improved security that control of the ship is increasingly often left to lower rank crew members - "with these improvements, anybody can run the ship".

• The added costs to the oil companies of paying for the improvements lead them to cost-cutting measures elsewhere, for example, further crew reduction and design economies effected in new ship orders that increase risk of ship failure.

• Deterioration of local and shipboard response-related knowledge and capability because of reliance on newly established PIRO.

Also, accelerated research is likely to move in a vacuum unless there is a close linkage established with a knowledge-intensive operational organization.

B. The Desired Organization

Reliance must therefore be placed on a high reliability organization with superbly motivated and trained personnel that can cope intelligently with the unexpected. This means an organization that can shift from routine to crisis management easily and instantaneously. It must have the authority to stop tanker operations or override captains and terminal managers in pursuing safety concerns. It must have the autonomy to practice readiness and order drills. It must have a very high level of system knowledge, be able to monitor research, propose, and test new technological developments. Its corporate culture must reflect an uncommon sense of personal responsibility.

The proposed organization may be public or private. We have examples of superb organizations in both domains:

- in the public sector - the nuclear submarine, the nuclear aircraft carrier, the national air traffic control system

- in the private sector - some utilities (electric, telephone), some airlines, some medical organizations, UPS

Such an organization will exhibit a balance of tight coupling and loose coupling that transforms oil shipping from an error-inducing to a safety-reinforcing system. For example, tighter coupling in forced adherence to strict rules, looser coupling in the organizational flexibility to shift rapidly from hierarchical (vertical) to non-hierarchical (horizontal) type.

With the organizational perspective, there is a practical question always close to the surface: Where are the appropriate points of leverage for implementing recommendations for change? In view of the powerful status of the oil companies, it would appear that they have stronger leverage than any other organizational actor. Therefore, a private organization emanating from API, such as PIRO, might be a possible starting point - but only a starting point.

We must recognize that a previous joint industry operation, Alyeska, does not arouse great confidence in the proposed PIRO:

- Alyeska appears to have no autonomy;

- Alyeska is not managed and staffed by a breed of personnel characteristic of high reliability organizations. Its corporate culture appears to be similar to that of its parent organizations.

Possibly, talent from known high reliability organizations can be brought in to address the challenge of developing such a new organization. This is where the personal perspective is crucial. Leadership of a new kind is the first requirement.

C. The Desired R&D

A crisis often initiates a burst of research and experimentation. The *Torrey Canyon* disaster prompted work on detergent toxicity. It is expected that bioremediation will command more attention now because of the Alaskan oil spill. There is agreement on the part of industry and the government that research in cleanup technology is needed. The API Report and the Report to the President both stress this point.

API proposes to let PIRO manage a modest $30-35 million 5-year program (about 2.5% of the expected costs of the Alaska spill). Their plan gives top priority to prevention and mitigation of shoreline impact (about one-third of the total), but prevention of loss from, or retention of oil by, the ship merits only 2% of the budget.

This raises the same question just posed in the preceding section. If the consortium is planning to create in PIRO an Alyeska-type organization reflecting the industry's non-high tech culture, the prospects for effective R&D and interaction leading to implementation appear cloudy.

What is missing here is any sense of an industry-institute/university working partnership. If the high reliability organization is to function, the level of technical knowledge throughout the organization must be on a higher plane than has been acceptable in the industry in the past. Close interaction between the R&D people and PIRO would be of mutual benefit - to the quality of operations and to the research/engineering effort. It would specifically facilitate the transfer of technology, usually the weak link in the technological innovation process. We thus revert to the organizational discussion in B.

There is, of course, the option of a federal program. The federal government has the experience and funds to undertake a strong R&D program. But the motivation is lacking:

- There is no Sputnik orbiting the earth, (mis)interpreted by the public as an ominous sign of a Soviet military threat, loosening the federal purse strings.

- The military-industrial establishment has overwhelming political leverage, exemplified by its ability to increase military R&D from 51% of total federal R&D to over 70% in the last decade.

• Oil and spill-related technology does not have the glamor in the science/engineering community as does information or space technology.

Alaska's small population does not translate into high leverage in Congress. However, it should be noted that some states have had effective leadership and adequate financial resources to undertake technological innovation brokering activities. An example is North Carolina under the leadership of Governor James B. Hunt, Jr. [Botkin et al. 1982: 162]. But an Advanced Technology Center in this field does not appear a realistic option for Alaska. A coalition of states including Alaska also does not appear feasible; the only other west coast state for whom R&D in this field should be of major concern is California, site of the Santa Barbara oil spill. The two states are too dissimilar in resources needed for such R&D to permit consideration of such a union.

D. Recommendations and Questions

In B and C we have focused on vital changes in organization and R&D. It is evident that these needs will be difficult to fulfill. The oil industry has the potential to achieve them, but does not have the corporate culture. Its financial success hardly provides the motivation to depart from the modus operandi that created Alyeska. We recognize that organizations make major changes in their structure readily only when they are in a state of crisis, and the oil industry is hardly in such a state. The federal government has the resources but not the motivation; the State of Alaska has the motivation but not the resources.

The foremost recommendation derived from the multiple perspective work is inescapable:

1. Undertake a closer examination to concretize the high reliability organization discussed in B (p. 32). Some of the questions to be addressed:

• How are its demanding personnel requirements to be met, its autonomy assured, its authority and responsibility to be defined? Is it feasible to draw on personnel experienced in high reliability organizations?

• Under what conditions can this type of organization be organized and administered by the oil industry? Can the federal and/or state governments provide effective oversight and inspection on a continuing basis?

• How large should the organization be?

• What changes should be made in organizations that must interact with the proposed one, such as Coast Guard and Alyeska functions and their interfaces with the new organization?

• Is the role of current and forthcoming information technology (communications, information processing and display) being explored to determine how this rapidly advancing technology can create and enhance the networks or linkages necessary for nationwide rapid response? If not, how can this be facilitated?

• What incentives can be provided to the oil industry to make PIRO into the desired organization, with a clear sense of its mission and the means to accomplish them? The federal and state governments have a variety of potential leverage points that can help to exert pressure on the industry, for example, tax relief, permits for new oil exploration (Arctic National Wildlife Refuge).

• Are there any alternative ways to form and develop the desired organization? As a first step, it would be useful to explore organizations connected with the oil spill impacts but not covered in this study. Then one might venture beyond, possibly considering existing high reliability organizations as a basis. What are points of leverage which might lead to new coalitions that can form a viable nucleus?

2. If it is not possible to move in the direction of the organizational solution, at least augment the "various improvements" (level C) currently under consideration by steps to make the system less "error-inducing".

As long as the current compartmentalized view of oil shipping safety prevails and the corporate culture precludes an autonomous high reliability organization, the following path should be considered. Establish an advisory committee of system-focused experts to draw up recommendations of steps to alter some of the system characteristics to make it less error-inducing and more safety-reinforcing. Examples of such steps:

• Alter the marine insurance system to provide more incentives for shippers to operate safely.

• Provide meaningful penalties for shippers who are found to have inadequate crews (undertrained, understaffed).

• Tighten up Coast Guard enforcement by providing specific budgets for inspectors and giving the service more incentives for effective inspection programs (patterned after the FAA).

The Coast Guard badly needs a major organizational change in view of its greatly expanded responsibilities and budget shortfalls. Can a coalition of anti-drug interests, marine traffic control interests (State of Alaska, California) and environmentalists be organized to push for a substantial strengthening of the service?

E. Final Words

The aim of this mini-study has been to show the importance of using multiple perspectives in dealing with the complex, low risk/severe consequence system of shipping oil from Alaska. Improvements in oil spill related technology and some organizational response changes are widely discussed and undoubtedly will be made. However, their effectiveness may be quite disappointing unless the organizational changes involve systemic rethinking based on the demanding operational context. We have seen no evidence that this is occurring or planned. It will require a new kind of leadership.

The use of the perspectives and their interplay is summarized in Fig. 3. The exercise could only scrape the tip of the iceberg, but it does suggest what lies below the surface.

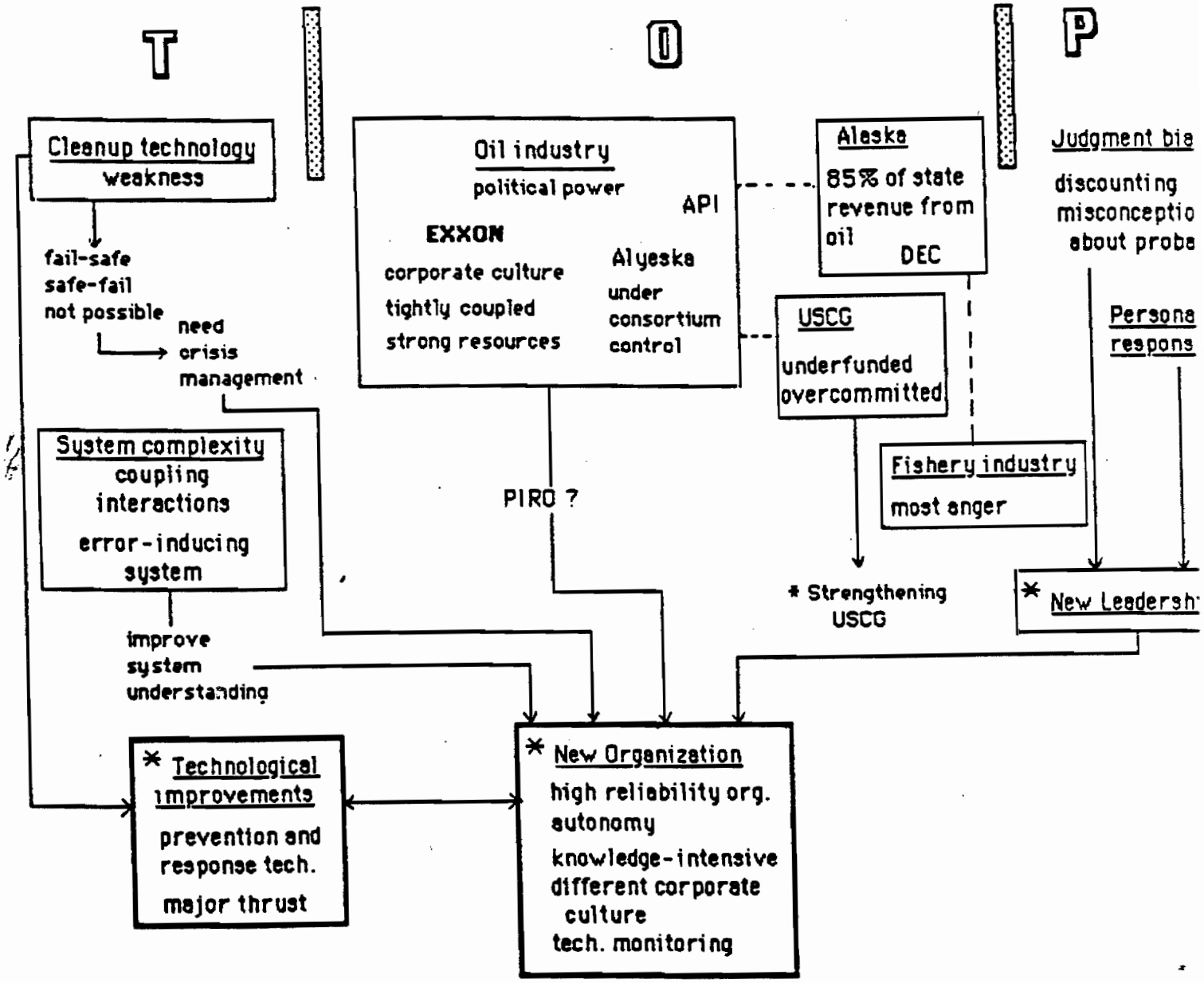

Fig. 3 - Interplay of Perspectives

Note: * refers to items emphasized in Sec. V - Implications

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APPENDIX E

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
BUDGET HISTORY

TO: John Havelock, Director, Alaska Oil Spill Commission

FROM: Larry Persily

SUBJECT: Department of Environmental Conservation budget history

DATE: Oct. 31, 1989

The information contained in this report was gathered from DEC and governor's office files at state archives, budget materials on microfiche at the Office of Management and Budget, records at the Legislative Finance Division and interviews with several OMB, DEC and Legislative Finance officials, past and present. Where statements of legislative intent were indicated in the budget, those statements were included in this report. Most often, however, there were no intent statements accompanying budget cuts.

Included with this report are copies of DEC budget documents and correspondence from fiscal years 1975-1989. The materials quoted in the report are referenced by numbers affixed to the top of each document.

FISCAL YEAR 1975

DEC's first attempt to establish a Prince William Sound office failed this year. The department requested $33,000 to establish the new office with an environmental field officer in Valdez, but the governor rejected the request and the legislature went along with that rejection (Document 75-1).

The agency also requested funding for two new positions (environmental field officers) at the Southcentral office in Anchorage, but the governor rejected both positions and lawmakers agreed. The legislature funded the Southcentral office at the governor's requested level of $83,900 (Document 75-1).

The House tried to make a substantial cut of $42,400 (almost 25 percent) from the governor's $177,600 budget request for DEC's water quality program, but the conference committee settled on $177,600 (Document 75-1).

FISCAL YEAR 1976

The legislature gave the agency the big increase it sought for water pollution control (called water quality in FY 1975), boosting the budget to $367,600, although the House again tried

unsuccessfully to cut the agency's funding request -- this time by about 10 percent (76-1).

The Southcentral office received close ($158,800) to the large budget increase it had requested ($166,300), and there was no agency request this year for a Prince William Sound office (76-1).

FISCAL YEAR 1977

In the water pollution control category, the governor approved less ($220,000) than the agency wanted ($254,300) and the House tried to cut it even further ($196,500), but the agency ended up with the governor's number at the end of the session (77-1). DEC's $220,000 FY 1977 appropriation for water pollution control was less than the 1976 appropriation of $367,600 because some of the section's work had been separated into another budget category -- environmental analysis -- and that new category received its own line-item funding starting in FY 1977.

Although a Prince William Sound regional office was not specifically approved by the legislature in the FY 1976 budget, it was created by the executive branch during the year with one full-time employee and a $75,700 budget. The agency asked for $187,500 in FY 1977 to add three more employees (two in Valdez and one in Cordova) to its new Prince William Sound office, but the governor cut the request to $143,100 and two new employees in Valdez. The legislature, despite a House attempt to cut the request by one-third, funded the new office at the governor's level (77-1). The $143,100 paid for the addition of a full-time sanitary engineer and a part-time, temporary environmental field officer in Valdez.

The Southcentral office faced its usual problems: The agency requested $470,900; the governor went for $430,300; the House tried to cut that to $333,100; the legislature approved $416,800 (77-1).

The legislature added an environmental field officer in Valdez to DEC's pipeline monitoring program in FY 1977. The pipeline monitoring and pipeline indirect impact budget categories existed within DEC during construction of the trans-Alaska oil pipeline, just as similar categories existed within the budgets for Public Safety, DNR and ADF&G. Indirect impact funding for DEC ended in FY 1976 and oil pipeline monitoring money stopped flowing to DEC in FY 1978. Gas pipeline monitoring and surveillance funding for DEC ran from FY 1979-1983.

FISCAL YEAR 1978

Water pollution control took a legislative hit, going from the governor's $250,200 to the legislature's $180,100 -- a deep 18 percent cut from FY 1977's $220,000 (78-1).

The regional offices at Prince William Sound ($152,200) and Southcentral ($453,000) received within 95 percent of the governor's request for slight increases over FY 1977 (78-1).

In a positive move, the legislature added $366,300 to the commissioner's office for a new oil terminal facility safety program (78-1). The new program came out of the budget conference committee and was not in the governor's original budget or part of the agency's budget request. The money was to come from "other funds," specifically estimated receipts from risk charges assessed under the new Coastal Protection Fund legislation adopted in 1976 and effective in FY 1978. Lawmakers authorized DEC to hire eight new employees with the money, but did not specify what positions or where they should be stationed.

In addition to the $366,300 operating budget, lawmakers approved a $6 million authorization in the capital budget to allow the Coastal Protection Fund to receive risk charges, hold the money and then spend it as necessary for oil spill cleanup expenses.

FISCAL YEAR 1979

The Prince William Sound office budget was at $152,200 in FY 1978 and the agency requested $196,600 in FY 1979 to add another worker at Valdez. The governor and legislature rejected the request, settling the budget at $159,600 (79-1).

The House tried to reduce the Southcentral office from the governor's $560,500 to $498,700, but the higher number won.

The House also tried to cut water pollution control from the governor's $282,200 to $198,300 -- a 30 percent reduction -- but the legislature settled on $279,200.

The tanker and oil terminal safety program was now a separate line item in the budget. The agency requested $991,000 for FY 1979 and the governor agreed. The House budget provided only $423,900, but the conference committee settled on $991,000 (79-1). The money was to come from risk charges assessed under the Coastal Protection Fund law. The increase over FY 1978 was for seven new positions, including three in Valdez and one each in Soldotna, Anchorage, Fairbanks and Juneau. Two of the Valdez positions were dedicated to serve as tanker and terminal inspectors. Another of the new positions was dedicated to the review of tanker and terminal contingency plans. Another

position went toward establishing baseline information on Prince William Sound's ecosystem. In its budget submission DEC said, "Baseline information for Prince William Sound is negligible and with(out) basic familiarity of the sound DEC would be hard put to prove damages and recommend restoration." (79-2)

In its attempt to cut the tanker and terminal safety budget to less than half of DEC's request, the House would have dropped seven positions, according to an April 14, 1978, memo from DEC Commissioner Ernie Mueller to OMB Director Ron Lind (79-3). "Two of the seven reductions pose grave danger to the environment," Mueller said. "As recent events have demonstrated, movement of oil by pipeline (approximately 609,582 gallons spilled since July 15, 1977) and tankers (Argo Merchant - East Coast, and Amoco Cadiz - Brest, France) inevitably result in oil spills of sometimes tragic proportions."

The memo continued its warning about the House budget: "Because recent court rulings have already eroded some aspects of Alaska's tough tanker safety law, this department is trying to maintain continuous inspection of tank vessels and a 24-hour presence at the Valdez terminal to try to reduce the potential for major spills. The two environmental field officers are required to maintain that presence. Abolishing these two positions could cost the state far more than their salary costs in terms of environmental damage, lost revenue and, depending on court rulings on the Coastal Protection Fund, oil spill cleanup costs."

The need for such a large increase in the tanker and oil terminal safety program (to $991,000) was addressed by DEC in its budget documents, along with background on the Coastal Protection Fund (79-2):

- "This program is supported entirely by the risk charges paid by operators of tank vessels and oil terminals into the Coastal Protection Fund."

- Federal efforts on tanker safety have been "slow and ineffective ... (especially) ... insensitive to the unique needs of Alaska's unspoiled environment ... the state's ongoing program has resulted in an upgrading of the tanker fleet at a much more rapid pace."

- The agency proposed using the extra money to push for increasing the number of Alaska-trade tankers with double bottoms from one to 10, and to work toward ensuring "that loaded tankers lacking certain maneuvering ability are escorted by tugs when going between Bligh Reef and the Port Valdez terminal."

- Regarding the new Coastal Protection Fund, it was noted that delays in oil spill cleanup work are "attributable to reluctance of a party to act for fear

of incurring unrecoverable expenses." The fund was intended to alleviate the problem by collecting from the guilty party and providing reimbursement for cleanup expenses to the state or other party. The department's FY 1979 budget asked for an increase in the fund's authority to receive and spend money on cleanup expenses, seeking an increase from the $6 million FY 1978 appropriation to $12 million in FY 1979. The additional $6 million authorization was approved for FY 1979.

- As for contingency plans, the budget said mock drills should be used to test response plans. "At present, there is a wide diversity in style, content and adequacy in contingency planning among the various state and federal agencies, cleanup cooperatives and industry." DEC has taken the lead in coordination, the agency claimed.

- Tankers pose the great environmental threat to the state, yet "federal efforts to upgrade tanker equipment, design and operation have focused on achieving international accord and have not been sensitive to the urgency of the totally new trade in Alaskan oil and the unique Alaskan environment."

- An option to the increased state budget increase, DEC said, would be to rely on the federal government to improve tanker and terminal safety and the national contingency fund to pay for cleanup costs. This would cause considerable delay, in part because the Coast Guard has failed to exert its authority under the Ports and Waterways Safety Act, DEC said. A second option would be to allow self-regulation by the industry. "In view of the historically ineffectiveness of self-regulation, this alternative would allow only continued degradation of the environment and not provide any benefit to the state." A third option would be to accept international standards. This was judged useless because of Alaska's small voice and lack of clout in international shipping and the low likelihood of enforcing standards or collecting damages.

- Risk charges for the Coastal Protection Fund would be based in part on a tanker's pollution deterrent features, such as radar and double bottoms, and would serve as an incentive for the industry to adopt safer practices and equipment, DEC said.

- It was noted that FY 1979 would be the first full year of operations at the Valdez terminal. "To monitor activities at the terminal on a 24-hour basis, two additional environmental field officers are required in Valdez," the department said. A full-time oil spill

response plan worker was requested to allow assignment of a worker to the task of reviewing the estimated 75-100 contingency plans expected each year.

FISCAL YEAR 1980

The agency requested an increase to $191,000 for the Prince William Sound office (to add a support person at Valdez), but the legislature rejected the increase and instead cut the office budget to $150,600 -- a drop from FY 1979 funding (80-1). It was the second year in a row and the third of the past four years that the agency was denied an additional worker at its Valdez regional office.

Southcentral also took a big hit from the governor's request of $759,500, ending the session at $601,200 (a slight increase over FY 1979).

Water pollution control received $423,900 vs. the governor's request of $424,500.

In consideration of court action striking down the Coastal Protection Fund law, funding for the tanker and oil terminal safety program was proposed by the governor at $450,800 (the agency had requested $455,700 for "maintenance level" services). However, the legislature appropriated only $250,000 under the program's "miscellaneous" category, in effect telling DEC to do what it could with that much money (80-1). The House and Senate originally had proposed no funding whatsoever for the program, but the $250,000 budget was approved during the budget conference committee. Court decisions against the Coastal Protection Fund had eliminated the funding source for the tanker and oil terminal safety program, throwing the program into legal uncertainty and apparently causing legislators to adopt a more critical view of the program's budget if it had to be covered with state general fund money.

A statement of legislative intent asked DEC to "report to the House Finance Committee concerning what other terminal safety services are available from state and federal agencies." No record of the report was found at the Legislative Library, Legislative Finance, DEC or in the legislative journals; no one remembers the report being done. Andy Spear, who was in charge of DEC's oil pollution control program in 1979-80, said he doubted the report was done.

In its FY 1980 budget submission for the tanker and oil terminal safety program at $455,700, DEC said (80-3):

- "Recent court decisions have voided the Alaska Tank Vessel Traffic Regulation Act and prohibited the state from collecting risk charges from virtually all of the

tankers trading in Alaska. The state has also been enjoined from collecting risk charges from Alyeska, Kenai Pipeline and Cook Inlet Pipeline Companies. This means that the state can no longer require or encourage equipment or certain design features on tank vessels and, in addition, we have lost our source of funding for oil spill cleanup. This budget is submitted at the maintenance level and it will allow the department to continue to administer those provisions of the statutes that remain in force." New positions authorized in the FY 1979 budget but not yet filled were left vacant after the court decision.

- Without new legislation providing for funding of the oil and tanker terminal safety program without the constitutional defects of the Coastal Protection Fund, DEC said the program would have to be funded from the general fund. The $455,700 budget was submitted on the assumption that new legislation would provide program receipts to pay the bills, but that did not happen and the $250,000 legislative appropriation was taken from the general fund.

- DEC's budget justification said nothing about encouraging double-bottom tankers, ensuring tug escorts to Bligh Reef, battling slow federal efforts on tanker safety or the Coast Guard's ineffective work -- all of which had been cited in DEC's budget request for FY 1979.

In a review of legislative cuts to DEC's overall budget, including the possibility of no funding for the tanker and terminal safety program, Commissioner Ernie Mueller sent a memo to Gov. Jay Hammond on April 19, 1979 (80-2):

- "Frankly, I was astounded at the severe reductions the legislature has proposed for the budget of the Department of Environmental Conservation. In some cases, entire programs were eliminated; in others, the operating budget was reduced so far below the current FY 1979 level that programs will be virtually crippled."

- "The department would close its field offices in Sitka and Soldotna, and eliminate its Prince William Sound regional office headquartered in Valdez." Valdez would become a satellite office of Anchorage, with one and one-half workers.

- "The department would immediately cease its oil pollution control program, including those activities mandated by state statute -- inspection of oil transfer activities, tanker and terminal inspections, review of required contingency plans, oil spill cleanup and

enforcement. The effect on the number and extent of oil spills is unknown; however, I can assure you that if an oil spill of any size occurs in Alaska, we will not respond to it in any fashion."

- The memo listed the department's second budget priority for the year as restoration of the tanker and oil terminal safety budget by changing the funding source from program receipts to general fund money. "We have discussed this matter with the legislature and they have informed us that this action would be considered only if the governor would request it." The governor's original $450,800 funding request was to have come from program receipts, but that later was changed to $450,800 from the general fund, which lawmakers later accepted at $250,000.

FISCAL YEAR 1981

DEC was reorganized in FY 1981, making it harder to track individual budget items from previous years. Most of the centralized functions such as water pollution control went to expanded regional offices. In the reorganization, the Prince William Sound office was eliminated and combined with the Southcentral region in Anchorage. The separate tanker and oil terminal safety program was eliminated, although the legislature did add $82,500 to the program's FY 1980 budget as a supplemental (the same supplemental funding bill added $49,700 to the Prince William Sound office for FY 1980).

The legislature funded the expanded Southcentral office for FY 1981 at the $1.084 million requested by the governor (81-1). However, water quality management was funded at $1.133 million, about 22 percent less than the $1.46 million requested. This time it was the Senate that did the cutting. Lawmakers cut four new positions for environmental engineers and environmental research analysts from the water quality budget.

In addition to the department's regular budget, House Bill 205 brought $1.542 million to DEC for oil pollution prevention and control (81-2). The bill, filling much of the gap caused by earlier court action overturning the Coastal Protection Fund, dealt with cleanup costs, financial responsibility and contingency plans (81-4). The fiscal note provided $1 million for an oil spill response fund, which would be replenished as the state collected expenses from spillers in future years. The fiscal note also included $542,000 for at least seven full-time staff members, equipment and contractual costs. Without the new legislation and additional operating budget, DEC said it would be unable to do an adequate job of protecting the state against oil pollution.

The bill's fiscal note analysis stated (81-5):

- Although previous court action eliminated a funding source for the state's oil pollution control effort, "The decision, however, did not appreciably decrease the department's responsibilities for oil pollution control."

- Although DEC received only $250,000 for oil pollution control work in FY 1980, the department devoted more than that toward oil spills by diverting money from coastal zone management and other federally-funded programs.

- Although the FY 1981 budget reflects a new organization with oil pollution control work assigned to each of three regional offices and to the water quality management office, the total requested did not exceed by much the $250,000 appropriated last year. The tanker and oil terminal safety positions were distributed to other offices (81-3), with four going to the Southcentral office (one environmental engineer, two environmental field officers and a clerk typist) and three going to water quality management (a tanker safety specialist, environmental field officer and environmental research analyst).

- HB 205 would extend DEC's oil pollution control authority to include offshore exploration, production and land-based facilities, as well as tank barges. In addition, the bill would lower the exemption cutoff to 10,000 barrels. "Because of this increased scope and other duties ... the existing oil pollution control program will need considerable improvement to fulfill the intent of this legislation."

- The fiscal note included funding for four new positions to inspect terminals, tankers and other facilities, including contingency plan review and emergency response work. Another of the full-time positions was dedicated to writing a state catastrophic spill plan and managing the new pollution reserve fund.

(I attempted to follow the original seven oil pollution control positions through the state system for FY 1981-1989, starting with their transfer out of the tanker and oil terminal safety program to the regional and central offices at the time of DEC's reorganization in FY 1981. Of the three PCNs assigned to the water quality office in FY 1981, as of October 1989 one no longer existed, one was listed as a paralegal assistant in the DEC commissioner's office and the third was assigned to the environmental quality division. Of the four PCNs assigned to the Southcentral office in FY 1981, three still were at Valdez as of October 1989 and the fourth was assigned to Soldotna. However,

it must be noted that just because the job assigned to a particular PCN may change does not mean the original work is not being done under a different PCN, but there is no certain way of tracking work -- only PCNs)

FISCAL YEAR 1982

DEC requested $1.687 million for the Southcentral office; the governor went for $1.577 million; lawmakers approved $1.555 million. Water quality management was approved at $1.367 million after the governor had asked for $1.372 million (82-1).

Some of the increases in the Southcentral and water quality budgets over FY 1981 levels came as oil pollution positions were moved into those offices from elsewhere at DEC. This was due in part to reorganizing positions that were created under HB 205 in FY 1981. An environmental field officer assigned to oil pollution control was moved from the director's office at environmental quality to the Southcentral office for FY 1982. An ecologist assigned to oil pollution control was moved from the director's office to water quality management (82-3).

Lawmakers added $250,000 to the oil spill expense fund that had started at $1 million in FY 1981 (82-2).

Although DEC was getting more money for oil pollution control than it had in the late 1970s, an increasing amount of the department's staff time was being focused on other issues and was detracting from tanker and terminal safety work.

Bill Lamoreaux, who now serves as regional supervisor of DEC's Anchorage office, started with the department in June 1981 as district office coordinator in Anchorage. Prior to joining DEC, he worked for the federal Environmental Protection Agency. In the early days of the Valdez terminal operations, until about 1981, DEC personnel would usually board and inspect each tanker, Lamoreaux said in an interview this month. However, other needs of the department came into play about 1981 and forced cutbacks in tanker and terminal work. Staff was spread too thin, he said. "We got tied up with more and more work." Sewer and water system reviews, hazardous waste sites and especially subdivision reviews consumed an increasing amount of staff time. People wanted to build more homes, the Alaska Housing Finance Corp. wanted to finance the homes, and DEC reviews were needed for the sewer and water systems. The agency felt a lot of pressure to keep pace with the demand, Lamoreaux said.

A full-time oil spill response staff member (to serve the entire Southcentral region) was lost to budget cuts in the mid-1980s, but the position later was restored in the late 1980s by juggling money around. The staff member, based in Anchorage, had

been assigned to review contingency plans and spill response efforts, Lamoreaux.

As the state's environmental problems started to attract more public attention, DEC staff time went from planning and prevention to site-specific problem solving. In addition to water and sewer reviews needed for subdivisions and home financing, the increasing awareness of hazardous waste sites -- particularly on the Kenai Peninsula -- ate away at DEC staff time, Lamoreaux said. Compared to the immediacy of hazardous chemical sites on the Kenai Peninsula and development problems in the Mat-Su area, the possibility of spills in Prince William Sound didn't attract as much attention. The department lacked the "ability to sell the problem" of Prince William Sound to the public and legislature, he said. Another factor in not getting enough money to deal with tanker and terminal work may have been the practice of "crying wolf so often" over possible oil pollution, Lamoreaux said.

Although not directly related to oil pollution control in Prince William Sound, a fall 1981 meeting involving DEC staff dealt with oil spill contingency plans for the Beaufort Sea. DEC, Exxon and other state, federal and industry officials had met to review contingency plans for offshore oil exploration and production facilities in the arctic. Notes from the meeting reveal similarities with the spill response problems discovered at Valdez in March 1989. A 1981 trip report from Gary Hayden, chief of water quality and environmental sanitation for DEC, to Andy Spear, oil pollution control manager for DEC, said (82-4):

> - The meeting included a review of ABSORB, a cooperative arrangement between Beaufort Sea oil operators to purchase oil spill cleanup equipment, hire personnel to work for ABSORB and train oil field workers in cleanup techniques. "After close review of the various contingency plans," Hayden said, "it was found that ABSORB will have only one person located at Deadhorse dedicated to the maintenance of the ABSORB warehouse and equipment and to pollution control matters as a full-time occupation. It was felt that although Exxon's demands on this equipment and this person may be minimal, the combination of all the companies at different locations making similar demands will overcome this person's ability to manage on-site operations effectively. It should be clear that although Exxon has identified specific persons to fill specific roles during an oil spill, these roles are in addition to their regular duties which occupy a full day, leaving little or no time for routine pollution prevention and control matters."
>
> - ABSORB's response team consists of personnel in the area and Anchorage who would be called together in the event of a spill. "It should be noted that other

applicants must also show some dedicated pollution prevention and control personnel on-site to secure DEC contingency plan approval," Hayden said.

- Exxon's North Slope oil spill manual makes note of relying on oil pollution control equipment from outside the immediate area in the event of a spill. "We believe that the transport of distant equipment to a Beaufort Sea spill site, especially under adverse weather conditions common during the arctic winter, would take too long to seriously consider much of this as 'available' during the crucial early stages of an oil spill situation. Further, the manual does not include any formal equipment use agreements with other owners to assure that equipment is operable and immediately available for response to emergencies," the DEC staffer said. "Although we do not expect to see a rapid development of arctic-oriented oil spill cleanup equipment, we feel that Exxon should at least update the statewide equipment list and note which equipment is applicable to arctic use."

- Although everyone at the meeting acknowledged the state's concerns over oil spill equipment availability and suitability to arctic use, "stipulations regarding this matter were dropped from the BLM leases, everyone knows cleanup is close to impossible in broken ice, and the state went ahead and leased state lands anyway, (so) everyone must be willing to take the risk," Hayden said.

- Although Exxon's on-site cleanup equipment for use during summer fuel transfer operations is less than what is referenced in the company's spill plans and less than necessary for safe operations, the issue never came up at the meeting, he said.

- "Al Allen of ABSORB has been with the project since the beginning and he has given hundreds of presentations, press releases and proclamations," Hayden said. "With years of practice and dedication to the one subject, he has become a supersalesman for the Beaufort Sea operators and, as Capt. Hanson put it, 'You silver-tongued devil. You've done it again.' What Al lacks in hard scientific fact, he makes up for in endurance...."

- Although Hayden acknowledged that ABSORB and its member companies have done a fantastic job in preparing a contingency plan and organization, "...they have, of course, presented it in the most positive way as they and their billions can."

- As for the industry's arguments and proposed solutions to oil spill response questions, Hayden said DEC's Northern regional office was not always swayed. "However, the Coast Guard was curiously silent during this meeting...."

In another sidelight, Dan Lawn and other DEC employees in May 1982 sent a memo to Erwin Koehler, DEC ecologist, reporting "difficulties in getting accurate records concerning contingency plans for tank vessels currently involved in the Alaska trade." The problem, in part, may have been due to misdirected paperwork going to DEC offices in Anchorage, Soldotna or Valdez, the memo said (82-5).

FISCAL YEAR 1983

The Southcentral office asked for $1.966 million; the governor cut it to $1.880 million; the legislature approved $1.663 million (83-1). Although it was a seven percent increase over FY 1982, it was a 15 percent cut from what the agency said it needed to do its job. The legislature ordered that most of the cuts from the governor's proposed budget should come from the personal services line. The agency had asked for 492 man months (vs. 432 in FY 1982); the governor approved 417 and the legislature okayed 384.6.

Water quality management was cut sharply from last year's level of $1.367 million. The governor forwarded a request for $1.111 million to the legislature and received back $1.007 million -- a 26 percent cut from the FY 1982 budget.

A memo found in the governor's office reading files at archives discusses DEC's legislative requests for the 1983 session (83-2). The January 1983 memo lists "oil spill liabilities" under the "consideration" category, with the notation, "may seek through regulations."

FISCAL YEAR 1984

The agency's Southcentral budget fared worse with the governor than the legislature. The agency requested $2.092 million (an increase over FY 1983's $1.880 million), but the governor cut it to $1.798 million and lawmakers trimmed it a little more to $1.738 million (84-1). The legislative budget showed the elimination of three positions at the office.

Water quality management went from $1.081 million and 168 staff months in the agency's request (about the same as FY 1983's appropriation), to $915,500 and 144 months in the governor's budget. The legislature approved $975,400 and 144 staff months.

FISCAL YEAR 1985

The Southcentral office did well with a legislative appropriation of $2.115 million; the governor had requested $2.141 million. Much of the large increase over FY 1984 went for five new positions in Anchorage, Wasilla and Soldotna to help with land development problems and had nothing to do with oil tanker and terminal work (85-1).

Water quality received $978,500; the governor had asked for $1.214 million. The cut wasn't as big as it looks because $186,000 was transferred from the governor's request to the Department of Health and Social Services for Norton Sound contract work. Still, the $978,500 was just $3,100 more than the FY 1984 appropriation for a growing work load.

In its support documents, DEC proposed to use its FY 1985 environmental quality budget to work toward increasing its oil spill cleanup efficiency by 10 percent (85-4). Funding for water quality and the regional offices were contained within the environmental quality budget.

A Sept. 23, 1983, memo from DEC Commissioner Richard Neve to Gov. Bill Sheffield asked for additional funding for the oil spill response fund in FY 1985 (85-2). Neve reported that the fund started with $1 million in 1980 under HB 205, was boosted with an additional $250,000 in FY 1981, and would be down to an estimated $665,000 by the end of FY 1984. It was time to follow legislative intent and restore the fund to its original $1 million, Neve said.

An appropriation of $335,000 for the oil spill reserve fund was included in another Neve memo of Sept. 23, 1983, this one to Emil Notti, legislative liaison to Sheffield (85-3). Another memo found in the governor's office reading files at archives appears to have come from the governor's legislative office and discusses the $335,000 request for the spill fund (attached to 85-3). It recommends including the request as part of DEC's regular budget, rather than seeking a special appropriation for the spill account.

The administration later asked the legislature for $600,000 in FY 1985 to bring the fund balance closer to its $1 million goal. A DEC review of proposed House budget cuts said that even if the department received the full $600,000 requested by the governor for the oil spill reserve account, the fund would have only $850,000 at the start of FY 1985 instead of the $1 million balance intended by lawmakers when the program was adopted. However, the $600,000 appropriation was denied by the legislature.

FISCAL YEAR 1986

Southcentral asked for an increase to $2.399 million, but the governor went for $2.230 million and lawmakers cut that further to $2.025 million -- a drop from FY 1985 (86-1). A chunk of the FY 1986 money went for full funding for the Wasilla subdivision review staff (almost $73,000).

Water quality, at $1.175 million, came close to the agency's request of $1.264 million.

Because of a decrease in personal services funding and an increase in contractual money, staff months for the entire environmental quality division went from 1,960 in FY 1985 authorized to 1,753 requested by the agency for FY 1986, and then down to 1,693 approved by lawmakers.

The governor asked for $550,000 in capital money for the spill expense reserve (86-2); it was rejected. The $550,000 request was to maintain the account at a $1 million balance. The account balance as of late 1984 was $447,000.

As a sidelight, the governor and lawmakers cut the department's public information office budget from the agency's request of $743,200 to the governor's request of $511,400 to legislative approval of $285,900.

FISCAL YEAR 1987

Southcentral went from the agency's request of $2.615 million to the governor's $2.371 million (later amended to $2.532 million) to the legislature's $2.351 million (87-1).

Water quality was close to what DEC wanted: The agency asked for $1.283 million; the governor trimmed that to $1.198 million; lawmakers approved $1.232 million.

The governor sought and received $300,000 for the oil spill expense fund (87-2).

DEC's public information office went from $297,300 to $98,700.

FISCAL YEAR 1988

After budget increases in FY 1987, DEC's funding fell backward in FY 1988. The Southcentral office received $2.097 million, which was close to the governor's $2.182 million -- but an 11 percent cut from FY 1987 (88-1).

Water quality was funded at the governor's request of $1.066 million -- a 13 percent cut from FY 1987.

Concern over hazardous waste sites appeared when the House tried to add funding to the environmental quality director's office for two new environmental field officers (DEC had not requested the increase). However, the conference committee agreed to only one of the new positions. The legislative intent with the new position said: "Because of the concern that hazardous waste sites and hazardous material spills pose to health and the environment, it is the intent of the legislature to fund positions associated with the hazardous substance release response fund."

Lawmakers also appropriated $825,000 to the Oil and Hazardous Substances Release Response Fund (88-2).

The DEC public information office was eliminated.

FISCAL YEAR 1989

The Southcentral office received $2.504 million; DEC had requested $2.484 million (89-1).

Water quality management asked for $9.678 million, a tremendous increase over FY 1988's $1.143 million final authorized level. The governor went along with a request for $3.202 million and lawmakers approved $2.502 million. The agency wanted to go from 184 staff months to 1,321. Lawmakers approved 312. The agency sought funding for 99 new positions (Anchorage, Fairbanks, Juneau and Soldotna, but none in Valdez). Lawmakers approved 17.

In addition to cutting the governor's request from 27 to 17 new positions, lawmakers arrived at the smaller budget by reducing funding for the new positions from 9 months to 7.5 months during the new fiscal year and reducing proposed increases for the public drinking water program, placer mining work and emergency oil spill response program. The Senate wanted even fewer new staff positions and bigger cuts in enhancement of the state's oil pollution control program and emergency spill response effort.

DEC Deputy Commissioner Amy Kyle explained in an interview this month that the agency had run with four-day work weeks during much of FY 1988 due to budget shortages, the system was overloaded, and the decision was made to prepare a zero-based budget for FY 1989, detailing the full costs of completing the work assigned to DEC's water quality section. The work was not getting done, Kyle said, and DEC wanted to make that fact known to the public, the legislature and governor. The department did not expect to receive its total request, and the governor's

office decided it would be better to go for full funding in stages, Kyle said. Also, DEC realized it could not hire, train and put to work so many people all at once, so a phased-in budget increase was preferred.

Specifics of the agency's huge request, as stated in DEC's budget backup to the governor, included (89-3):

- DEC asked for $579,000 for eight full-time positions to establish an emergency spill response capability and emergency response committee. The governor cut that to five new positions at $244,200.

- DEC sought $582,500 for 10 full-time positions to enhance its oil pollution program to reduce potential spills by increasing oil spill contingency plan reviews and enforcement efforts. The governor cut that to $251,900 and five positions.

- The agency's backup for the oil pollution control program said, "This increment establishes a core program to reduce the potential for oil spills, to ensure that industries have plans for containing and cleaning up oil spills and to take enforcement actions against spillers and recover costs to the state."

- "At present, the department has no program or capacity to inspect major oil facilities, barges or tankers. With Alaska's aging tanker fleet and oil facilities, such inspections are becoming increasingly important. Spills from terminals and tankers can often be attributed to the lack of an inspection program. This increment provides for a program to inspect 125 major oil terminals once every three years, and to inspect 20 percent of all tankers visiting at the Alyeska facility and the major terminals in Cook Inlet." (The 20 percent inspection rate was a significant drop from the 50 percent goal set in DEC's FY 1980 budget submission.)

- "One of the most effective ways to reduce the potential for extensive damage from oil spills is for industries to develop and follow oil spill contingency plans. Drills to test actual response readiness and implementation of contingency plans also need to be conducted. The department is not presently staffed at a level to allow a thorough and timely review of industry contingency plans. The result is that a large number of facilities and vessels are operating without approved contingency plans and operators are not adequately prepared to respond to oil spills. Approximately 125 contingency plans will be submitted for review and approval in FY 1989. Since one position can review about 36 contingency plans each year, 3.5

positions will be required to review 125 plans. This is an increase of 2.3 positions from FY 1988 staffing levels."

- Another new position was requested to "develop written policy and guidance for the oil pollution control program including guidance for approving contingency plans, disposing of oily wastes, determining appropriate levels for cleanup (i.e. 'how clean is clean') and enforcement actions ... there is presently no program staff to provide this capability."

- "The department has never had a budget or staff to respond to emergencies like the Cook Inlet oil spill, the Crown Point tank car chemical release, or the Peters Creek groundwater contamination incident. And yet, departmental staff are called upon to perform investigations, take samples, participate in remedial actions and are often involved in enforcement actions associated with these types of emergencies. Such activities often require staff commitments of several months and erode the department's abilities in other program areas."

Also, there was legislative intent language in the FY 1989 budget for the commissioner's office (89-1): "The Department of Environmental Conservation, especially its senior management, (should) increase its efforts to work with industries to resolve disputes in an orderly and businesslike fashion and without unnecessarily resorting to the courts."

The oil and hazardous substance release response fund received $500,000 in the FY 1989 capital budget (89-2). The department had asked for $2.145 million.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION BUDGET HISTORY

(Totals include state and federal funds and program receipts and reflect authorized budgets as approved by the legislature and do not include supplemental fundings.)

FISCAL YEAR	PWS OFFICE	SOUTHCENTRAL OFFICE	WATER POLLUTION	TANKER & OIL TERMINAL SAFETY	TOTAL DEC BUDGET
1975	$0	$83,900	$177,600	$0	$1,541,000
1976	$0	$158,800	$367,600	$0	$3,616,500
1977	$143,100	$416,800	$220,000	$0	$4,454,100
1978	$152,200	$453,000	$180,100	$366,300	$4,745,100
1979	$159,600	$560,500	$279,200	$991,000	$6,240,800
1980	$150,600	$601,200	$423,900	$250,000	$5,953,900
1981	$0	$1,084,000	$1,133,000	$0	$7,827,100
1982	$0	$1,555,000	$1,367,000	$0	$13,395,900
1983	$0	$1,663,000	$1,007,000	$0	$15,359,300
1984	$0	$1,738,000	$975,400	$0	$13,647,000
1985	$0	$2,115,000	$978,500	$0	$15,719,400
1986	$0	$2,025,000	$1,175,000	$0	$16,150,100
1987	$0	$2,351,000	$1,232,000	$0	$16,542,100
1988	$0	$2,097,000	$1,066,000	$0	$15,864,800
1989	$0	$2,504,000	$2,502,000	$0	$21,005,300

EXPLANATION OF INCREASES IN DEC BUDGET TOTALS:

FY 1976: The large increase over FY 1975 was due in part to higher funding for land use, village safe water, water pollution control, technical and management services.

FY 1979: The large increase over FY 1978 was due in part to higher funding for the new tanker and oil terminal safety program, air quality and program coordination budgets.

FY 1981: The large increase over FY 1980 was due in part to the new funding contained in House Bill 205 for oil pollution control efforts.

FY 1982: The large increase over FY 1981 was due in part to higher budgets for facility construction and operations, the regional offices (particularly the Southeast and Northern regions), a $577,000 placer mining project, air and solid waste programs, gas pipeline activities and a new office of science and technology.

Also in FY 1982, sanitation, litter and oil pollution programs were transferred from central offices to the regional offices.

FY 1983: The large increase over FY 1982 was due in part to the addition to DEC's budget of seafood and animal sanitation and inspection services (transferred from the Department of Health and Social Services).

FY 1985: The large increase over FY 1984 was due in part to a new program for placer mining research and higher funding for air and solid waste programs, the commissioner's office, facility construction and operations and regional offices.

FY 1987: Although the legislature appropriated $16,542,100, anticipated revenue shortfalls caused the governor to freeze DEC's budget at $15,104.700.

FY 1989: The large increase over FY 1988 was due in part to the much higher funding for water quality operations and higher funding for air and solid waste, sanitation and laboratory and monitoring programs.

APPENDIX F

THE IMPACT OF FATIGUE AND OTHER FACTORS ON HUMAN PERFORMANCE AND HOW THEY RELATE TO MARITIME ACCIDENTS

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PREPARED FOR
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THE IMPACT OF FATIGUE AND OTHER FACTORS ON HUMAN PERFORMANCE AND HOW THEY RELATE TO MARITIME ACCIDENTS

INTRODUCTION

This study examines factors that contribute to fatigue, and how fatigue then impacts human performance. There is very little research on the direct link between fatigue and maritime accidents, but a significant amount exists on the link between fatigue and performance. The research substantiates that long working hours (shifts), long tours of duty, sleep deprivation, monotony, danger, noise, alcohol/substance abuse, and other factors are directly related to fatigue and stress, and are conclusively linked to human performance and error (Hockey 1983).

The research also documents that eighty percent or more of marine accidents are attributable to human error (Gardinier 1981 and Perrow 1984). Since certain factors in the shipping industry, such as reduced vessel manning standards, contribute to increased work hours, and thus sleep disorders and job performance deterioration, this paper suggests a causal relationship between fatigue and maritime accidents. For this very reason, the Baltic and International Maritime Councils are now investigating manning and fatigue problems and the absence of international regulations to reduce maritime accidents (Grey 1989). In the U.S., the National Transportation Safety Board (NTSB) is concerned that reduced manning and violations of safety standards are on the rise, though no action has been taken to date.

This paper identifies and analyzes literature related to fatigue to determine the impact(s) of fatigue on accident prevention, and then provides recommendations based on these findings that will contribute to the development of safety standards for the operation of maritime vessels. This paper also examines the role of fatigue in emergency response and management procedures.

FATIGUE AND HUMAN PERFORMANCE

Fatigue, while frequently cited as a contributing factor in accidents, remains an elusive element in terms of definition, recognition, measurement, prediction, and alleviation. In reviewing the scattered evidence on the effects of fatigue, a broad definition would encompass all the consequences resulting from deprivation of rest, thus including the effects of loss of sleep, extended work shifts (physical fatigue), and mental fatigue.

Human errors are not necessarily the result of the individuals involved, but rather they are often attributable to factors external to the individual. These factors can be identified and controlled, such as a poor human-machine interface, the inappropriate use of automation and high technology, inadequate support systems, including supervision, communication, and training, or by environmental or human factors, including sleep deprivation, boredom, fear, or substance abuse.

A study of air crew fatigue found that changes in work efficiency are determined by a host of "forcing functions" divided into situational, environmental, and personal factors. This division is well suited to an examination of maritime fatigue. Situational factors that can be identified, monitored, and when appropriate, modified, include improper use of automation and inadequate personnel support systems. An example might be an "experienced" marine pilot who becomes "overtaxed" by high technology because he is unfamiliar with new navigation systems and has not received adequate simulation training (Hartman 1967).

Environmental factors can include being subjected to long or extended shift hours, ambient conditions (i.e., toxic fumes, smoke, noise), monotony, and sleep deprivation. This can create a scenario where a pilot and/or crew members may become the "accident waiting to happen" (New Orleans Baton Rouge Pilot Commission, Personal Communication). Personal factors such as alcohol/substance abuse, family matters, and fear can also contribute to fatigue, possible rendering a crew member incapable of rapid response and decision-making tasks.

However, among the most comprehensive compendia on fatigue to date is Stress and Fatigue in Human Performance (Hockey 1983). The text provides a thorough and systematic analysis of human stress and fatigue interactions that produce changes in behavior and performance in working and social environments. The research studies and references on stress and fatigue (nearly 1,500 entries) could be useful to medical and psychological staff officers if incorporated into maritime training programs and vessel manning consideration. However, no such medical or psychological officer is included in the typical required maritime crew complement (NTSB 1989 [MM 040]). In lieu of these positions, some effort might be made to incorporate pertinent data into the training of those who serve in these functions -- captains and mates.

CASE STUDIES LINKING FATIGUE WITH MARITIME ACCIDENTS

Veteran mariners claim "nowhere is fatigue worse than on the tankers that ply the waters between Valdez and the refineries of Puget Sound." It was crew fatigue that led to the grounding of the Japanese tanker Matsukaze in Washington's Strait of Juan de Fuca last year. The crew of 21 was exhausted from cleaning tanks between quick ports of call on the West Coast, according to a Coast Guard report on the incident (The Seattle Times 1989).

An Exxon Seamen's Union representative has charged that the March 4, 1989 Exxon Houston spill off the coast of Oahu was due to poor maintenance and inadequate crew numbers. When the Exxon Valdez sailed on March 24, 1989, it sailed with first and second mates exhausted by many hours "on duty" during the loading process and no fully competent officer ready to take control when the captain reportedly was not there to perform his duties (DeFries 1989).

Donald Tepas, an industrial psychologist and sleep expert, suggests that the Exxon Valdez disaster fits the pattern of sleep-related accidents. "It's not unreasonable to suspect either that they were not able to detect how sleep deprivation was affecting their performance or they were unwilling to admit it" (Engstrom 1989).

When the Union Oil Tanker Torrey Canyon despoiled the beaches of England and France in 1967 with 30 million gallons of spilled oil, a combination of factors (behind schedule, tides) induced the Captain to transit the treacherous Scilly Islands, where 257 wrecks have been recorded between 1679 and 1933. A combination of errors (fix miscalculations, mistrust of instruments) caused the 1976 Argo Merchant disaster, at that time the largest coastal oil spill in U.S. history (Winslow 1978).

Since 1980, tankers in the U.S. alone were involved in 468 groundings, 371 collisions, 97 rammings, 55 fires and explosions, and 95 deaths (The Seattle Times 1989). In the area of collisions alone, it was determined that 89.4 percent of collisions between 1970 and 1974 were caused by deliberate violation or judgment errors, both "human factors" (Gardenier 1976).

FATIGUE AS A RESULT OF SHIFTWORK AND SLEEP DEPRIVATION

Coastal maritime voyages, more demanding than transoceanic trips due to frequent port calls, may require a captain to be on duty for up to 48 continuous hours. It is not uncommon for mates to put in 14-hour shifts. In the case of the Exxon Valdez, for example, testimony suggests third mate Cousins may have had little or no required rest on the afternoon of March 23, 1989. In fact, he may have put in up to 18 hours or more without rest or sleep. Other crew members also appear to have violated congressionally mandated "crew duty time limitations," which state that "a licensed individual or a seaman may not be required to work more than eight hours in one day..." (NTSB 1989 [MM 040]).

It is conceivable that excessive work hours (sleep deprivation) contributed to an overall impact of fatigue, which in turn contributed to the Exxon Valdez grounding. It is known that the Exxon Shipping Company (ESC) extended tours of duty from 60 days to 90 and 100 days, and that "Exxon manipulated overtime records" to justify their demanning (crew reductions) as a cost-savings device and thereby "exacerbated the crew fatigue factor" (NTSB 1989 [MM 040]).

Fatigue-inducing sleep deprivation and long shifts are frequently cited as major factors contributing to accidents. Some workers adapt well to shift systems, but others lead "miserable" lives affecting both job performance and behavior of fellow workers. While fatigue presents a complex problem for research, [it] can be made more manageable by considering only the effects of prolonged periods of work on duty." There would be obvious benefits if an adequate testing instrument were to be developed to differentiate between these two types of workers (Hockey 1983).

One of the major reasons why people react differently to shift work appears to be the disruption of the normal sleep/wake cycle which in turn disrupts the circadian rhythms (body temperature and 'internal clocks'). In a laboratory shiftwork study, results indicated that at least twelve successive nights were required before the phase of temperature rhythms had shifted to be in phase with the new routine. The effect is that rotating shiftworkers get two hours less sleep per day (Colguhoun 1968).

Hockey laments the "remarkably few field studies" that relate shiftwork to performance, but concludes that permanent shifts are preferable to rotating shifts and that night workers should be persuaded to remain on a nocturnal routine on their rest days.

Several techniques have been developed to predict "shiftwork suitability" using questionnaires in order to "fit" personnel with the "disruption of sleep/wake cycles." The "Circadian Type Questionnaire" has proven effective in predicting individual sleeping habits but fails to consider shiftworker tasks, hours of performance (on duty hours), and sleep loss (Folkard and Monk 1979).

The most extensive survey of human performance in relation to the demands of prolonged work/rest schedules is contained in an annotated bibliography by Krueger, Cardenales-Ortiz, and Loveless (1985). Several citations focus on methodological approaches to the study of sleep deprivation, watchstanding effectiveness, and work/rest duty cycles.

One particular study that addresses sleep loss in the context of fatigue and continuous working hours was conducted by the U.S. Forest Service (USFS 1983) for the 1982 fire season. The hypothesis was that the standard USFS 2-shift concept, the first day being 16 hours work/8 hours rest and subsequent days 12 hours work/6 hours rest, results in inadequate rest and recovery time. Compounded by travel time, briefings, and logistical complexities, it was estimated that crew members spent at least 18 hours a day without sleep. The report focuses on the length of work shifts versus the length of rest periods as related to various shift alternatives. Factors contributing to fatigue in the standard shift routine include inadequate rest, smoke inhalation, lack of body fluid replacement, mental attitudes, and environmental conditions. It concludes that fatigue is cumulative and compounded by successive shifts without adequate sleep and rest recovery.

Recommendations were then implemented to experiment with shift alterations to increase recovery time. A 24-hour work/rest cycle was field tested and monitored by the Missouri Equipment Development Center. The results of the shift alteration experiment showed that increased rest and recovery time did not improve work performance nor decrease the accumulative effects of fatigue. The USFS opted to retain the traditional standard 2-shift concept. The USFS is currently planning to test a 3-shift, 8-hour work/16-hour rest cycle and a 12-hour work/rest rotation.

While the literature on sleep deprivation, "ideal" adjustment to shiftwork, and work-rest schedules is extensive, it is unfortunately contradictory. A study could be undertaken to offer recommendations relative to shipboard crew shifts, optimal performance, and avoidance of fatigue-related accidents or errors. Additionally, an inference can be made as to the effect of the length of a tour of duty. Captains, such as Hazelwood of the Exxon Valdez, worked on a six month on, six month off basis. It seems reasonable that this system would only exacerbate the effects of shift work.

IMPACT OF ECONOMICS ON FATIGUE AND HUMAN PERFORMANCE

It is clear that there are strong commercial pressures that overcome safety considerations. Economic pressures have created inducements to reduce manning and training in order to

remain competitive with vessels of foreign registry that operate under less stringent standards, thereby increasing the probability of stress, fatigue, sleep deprivation, and accidents.

The motive of profit in shipping carries with it a certain degree of willingness to undertake risk. Captains are judged on their ability to keep schedules. Shell Oil once calculated that cutting one hour in port on the 13,000 or so port calls its tankers make in a year could save $2.5 million a year. Respondents in one survey agreed that "the ability to make schedules is viewed as the single most important factor in a company's evaluation of a captain's performance." Over one-third of the respondents indicated that refusal to sail in bad weather or with a faulty ship would bring strong censure. Fully 99.6 percent said they had sailed on a ship that they personally know was unseaworthy (Perrow 1984).

Perrow insists that our maritime industry is an "error-inducing system... when production pressures are often extreme (and) working conditions are debilitating... the equipment is complex and barely maintained... wild storms, 70-foot waves, ice-covered decks and equipment... and fog so thick you cannot see the main deck below."

In Senator Baucus' opening statements to the July 1989 hearings before the Subcommittee on Environmental Protection, he stated that the three major oil spills that took place in a single 12-hour period in June, 1989 "suggests to me that spills are just an expected cost of doing business for the oil shipping industry. Frankly, it seems to me that the industry has decided that it is cheaper to spill and pay for its cleanup than it is to prevent spills and develop effective techniques to contain them. Unfortunately, the cost of this mentality is enormous, from the consumer who pays for the costs of accidents through higher prices, to the destruction of earth's critical natural resources, to the seamen who, on occasion, pay for it with their lives.

Arthur McKenzie of the Tanker Advisory Center in New York City estimates that 1950s' tankers carried a crew complement of 40 to 42 crew to manage about 6.3 million gallons

of oil, whereas when the Exxon Valdez grounded on Bligh Reef, it was carrying a contingent of 19 crew and 53 million gallons of oil (The Seattle Times 1989).

THE IMPACT OF VESSEL MANNING POLICIES ON FATIGUE

Despite the long history and high stakes of reduced manning policies, the U.S. Coast Guard (USCG) has no agency-wide standard for setting minimum crew size. The USCG decides manning requirements on a case by case basis. USCG has certified Exxon tankers for a minimum of 15 persons (14 if the radio officer is not required) at Exxon's request. While Exxon has defended their actions as an economic decision, criticism has been leveled against them for manipulating overtime records to better justify reduced manning levels. Recall that the earlier discussion of shiftwork highlighted ESC's extension of tours of duty from 60 days to 90 and 100 days, contributing to further fatigue.

Frank J. Iarossi, President of ESC, justified reduced manning levels in a paper titled, "Surrendering the Memories" (June 1988), by noting that other ships, mostly foreign flag ships, have successfully operated at crew levels far below current Coast Guard standards. He stated that it is ESC's policy to reduce by the year 1990 its standard crew complement to sixteen on its fully automated diesel powered vessels, down from twenty in 1984. Robert LeResche, Alaskan Oil Spill Coordinator, has observed though, "the paper makes little mention of consideration of ship safety or crew fatigue" (NTSB 1989 [AOSC 0040]).

Iarossi's cut-cost-at-any-price policies are "absurd," according to C.E. DeFries, President, National Marine Engineer's Beneficial Association. "All over the world," he states, "the number of mariners aboard each vessel is dropping to levels undreamed of a decade or two ago" (DeFries 1989).

A modern vessel is highly automated and the work aboard both psychologically and technologically demanding. Iarossi contends that because of this high level of technology, reduced manning is justified. Yet the literature on the subject suggests that automation does not replace humans in systems, rather, it places the human in a different, more demanding role (Great Lakes Advisory Board 1987). Automation typically reduces manual

workload but increases mental workload. Wiener discovered that, in cockpit automation, pilots believe that "the automatic devices demand constant attention... each device creates its own scanning demand." A Boeing 767 captain told him, "It is more complicated to direct an automatic system than to do the job manually..." (Wiener 1985).

It becomes clear that the requirement for the human operator to monitor the details of computer decision-making transcends the justification for reduced manning. High technology apparently induces greater risk-taking behavior on the part of the user, providing a false sense of security and validity (Perrow 1984).

Robert Lawler, captain of the Arco Anchorage, a ship only one-quarter the size of the Exxon Valdez, has a Coast Guard certificate allowing as few as 18 officers and crew members. He says he wouldn't sail with a crew that small because, as it is, "the crew's schedule calls for loading and unloading the tanker every four days. Sleep is taken in four-hour snatches" (The Seattle Times 1989).

In other nations, vessels are already operating with less manning. For example, on a modern, sophisticated West German ship that carries hazardous and environmentally threatening cargoes, an officer points out the "quite outrageous hours of overtime that we have to work, seven days a week, month after month... with 16-hour days considered normal in port and 12-hour days required by the two-mate watchkeeping regime at sea" (Grey 1989).

In the Gulf of Alaska, there are few, if any, rest days in port. Seamen are often required to work 12 hours and more a day on these vessels. "In bad weather, near land, or with an exhausted crew, the vessel becomes a mobile bomb with little margin for error" (DeFries 1989).

THE IMPACT OF MONOTONY, BOREDOM, AND NOISE ON HUMAN PERFORMANCE

The effects of monotony, boredom, and noise on human performance have been documented for some time and tend to be generalized as factors of fatigue associated with "distinct patterns of output." Severe boredom is related to "progressive fatigue" but positive changes in output occur in anticipation of the end of work (Wyatt 1937). A more recent review paper on boredom (Thackeray 1981) concludes that the findings from both laboratory and field studies suggest that feelings of boredom are accompanied by low or declining rather than high or increasing levels of arousal.

The general level of activation or arousal of the central nervous system is one factor which determines vigilance effects. The deterioration of skill over time was measured in the Cambridge Cockpit studies (Hockey 1983) in which subjects sat for long periods, responding on aircraft controls to changes in a variety of instruments. As alertness declined, progressively larger deviations of the instrument readings came to be tolerated before any corrective action was taken. Lapses in attention happened with increased frequency, as operators became more easily distracted. Further, any failure to meet implied or objective standards or performance causes anxiety, which in turn worsens the performance (Hockey 1983).

Boredom is regarded as an individual's emotional response to an environment that is perceived to be monotonous. Exposure to a monotonous environment can exert adverse effects on task performance, as can exposure to noise and even vessel motion. The Office of Research and Development, USCG found that vessel motions produced significant increases in crew fatigue and changes in concentration. Performance tasks (i.e., navigation plotting, visual search, and watchstanding) were degraded during eight-hour shifts during consecutive days at sea. Ship mates cope with fatigue and boredom by "day dreaming" and "mind blanking." Pacing, coffee drinking, and magazine reading are also "distractors" of boredom and fatigue (D'Amico et al. 1986).

Auditory fatigue appears as a temporary threshold shift, such that sounds of constant pitch come to require greater loudness for detection. Broadbent's studies (1971) conclude that fatigue is reduced by noise-induced arousal or by incentives, but not alleviated by boredom or sleep loss.

THE IMPACT OF FEAR AND DANGEROUS ENVIRONMENTS ON HUMAN PERFORMANCE

A mariner's life, particularly the route south through the Gulf of Alaska, is especially gruelling. Men and women on these ships are faced with powerful winds, huge sea swells, and in winter, a numbing cold that can encase the deck in ice.

Robert Peacock, an east coast ship's pilot who served seven years as a tanker captain in the gulf, stated in a recent interview that while wind and water batter the machinery, they also "grind on the nerves of the overworked crew." Further, crude oil and other products, including their deadly fumes, carried on tankers are flammable and explosive. USCG records show that there were 55 fires and explosions aboard tankers in the U.S. between 1980 and 1988. "Tankers have detonated like bombs and rained crude oil down from the sky as the result of ignition sources as tiny as the static electricity emitted by a stream of water sprayed inside a tank to clean it." When the tanker Hillyer Brown ran aground in Alaska in 1973, the captain didn't report the accident for 11 hours; he said he feared the radio transmission would ignite the fumes from 42,000 gallons of gasoline surrounding the ship (The Seattle Times 1989).

The magnitude of an individual's response in a dangerous situation will depend on a number of factors: (1) the individual's predisposition towards feeling anxious and being aroused; (2) the individual's assessment of the dangerousness of the situation and his ability to cope with it; and (3) previous exposure. The precise pattern of physiological and biochemical responses varies from individual to individual unless the situation is perceived as being extreme. In extreme situations, increases in heart rate, respiration rate, skin conductance, and muscle tension can be expected, as well as the increases in the secretion of various hormones. Behaviorally, deterioration can be expected in manual dexterity, in

sensory-motor tasks, and in the performance of secondary tasks. When a situation has induced fear in an individual (as measured by subjective and physiological responses), then a deterioration in the efficiency of performance can be expected, especially in tasks involving sensory motor skills or divided attention (Hockey 1983).

THE IMPACT OF ALCOHOL ABUSE ON HUMAN PERFORMANCE

Given the reported history of alcohol abuse by the master of the Exxon Valdez, the fact that alcohol has long been a part of the life and lore of seafarers, and a review of USCG disciplinary records for 92 alcohol-related cases in the past five years (The Seattle Times 1989 describes it as "a pattern of wrist-slapping"), it is obvious that stringent enforcement of alcohol policies must be pursued.

In short, addiction to alcohol is primarily physiological. People become addicted because their bodies are physiologically incapable of processing alcohol normally. Their enzymes, hormones, genes, and brain chemistry work together to create an abnormal reaction. There is evidence that alcoholics do not drink addictively because they are depressed, lonely, immature or dissatisfied, but rather because they have inherited a physical susceptibility to alcohol resulting in the "physiological imperative" (addiction) to keep drinking and not, as so many believe, a psychological compulsion to drink (Milam 1981).

When an addicted person stops drinking, as is necessary when he returns to duty, it results in nervousness, weakness, insomnia, nausea, excessive perspiration, impairment of memory, and the necessarily concomitant deterioration in task performance and increased mental fatigue (Nielson, Hawkins and Veech 1975).

Milam's study includes recommendations pertinent to the maritime industry, such as effective screening and diagnostic tools, to determine whether employees in critical positions have a predisposition for, susceptibility to, or the presence of alcoholism.

NOTE: ***This paper does not mean to suggest that anyone involved with the Exxon Valdez is an alcoholic, only that there is a definite physical link between alcohol abuse and human performance.***

THE IMPACT OF FATIGUE ON DISASTER RESPONSE EFFORTS

Following disasters, certain organized behavioral responses are likely to occur. Common responses include: (1) "the more severe the disaster, the more different types of organizations [become] involved;" (2) existing organizations experience less "stress" than expanding organizations whose roles are ill-defined; and (3) "extended" organizations have great difficulty mobilizing in emergency situations due to lack of information or remoteness from the disaster (Stallings 1978).

Each of these responses was apparent in the immediate period (24 to 96 hours) following the grounding of the Exxon Valdez. In situations such as this, the autonomy of organizational systems breaks down as new "higher" level management teams are added and decision-making and coordination efforts accelerate (Dynes and Quarantelli 1977). Many response efforts take a heavy physical and psychological toll on organizational personnel (Drabek 1986). This is sometimes referred to as:

> ... the burn-out syndrome, a state of exhaustion, irritability, and fatigue which may creep up on an individual unrecognized and undetected, and markedly decrease his effectiveness and capability... Symptoms include confusion, slowness of thought, inability to make decisions, to think of alternatives or to assign priorities; negative feelings about self and others; cynical dehumanizing attitudes; depression, irritability, overexcitability, extreme mood swings; physical and sleep disturbances (Hartmann and Allison 1981).

Hartsough and Myers (1985) examined the problems faced by disaster workers and methods available to help them cope with the physical and/or emotional fatigue of their work. Symptoms of fatigue such as sleep problems, loss of concentration, irritability, nausea, and tension are all "stressors" related to the disaster event, the tasks (and extra demands) required of workers, and the organizational systems operating the efforts. The above problems stem from a lack of "infrastructure" in the emergency management building process, and when compounded with administrative and manpower fatigue, lead to organizational system failure (Siegel 1985).

Following the Exxon Valdez oil spill, response efforts led to the inundation of the city of Valdez by containment equipment, cleanup workers, and volunteers. What transpired is

what many disaster researchers refer to as "mass convergence" -- the convergence of so many people and equipment that a situation is created which is counter-productive to the organizational and work tasks at hand (Siegel 1985). In submitted testimony, W.O. Stevens, President of Exxon Co., U.S.A. attested to a cleanup effort tantamount to "probably the largest buildup of equipment and personnel ever assembled to combat an oil spill." Organizationally, however, it was not until April 2, 1989 that a shore cleanup committee was approved and April 8 before "preliminary approval of a shoreline strategy was granted by state and federal agencies" (Congressional Oversight Hearings May 5-8, 1989).

During this two week lag, a growing manpower force was relegated to "sitting around" in anticipation of assisting in cleanup efforts. A cleanup worker reported, "Veco hires people... ahead of any work schedule and has them hanging out at a Valdez warehouse doing nothing during mid to late April... when... wishing they were actually working on cleaning up the oil." Idleness, boredom, and often times, lack of provisions fatigued many workers well before work assignments were administered. Many abandoned the anticipated task at hand.

Cleanup crews already in progress were exposed to a range of hazards, from extreme cold and fatigue to crude oil exposure (i.e., toxic fume inhalation, skin contact, and/or ingestion). Workers were not trained to understand the risks of skin contamination and central nervous system disorders that may result from hazardous waste cleanup work. In the "Report of Health Protection of Cleanup Workers," it was learned that "... many of the workers have been putting in seven-day weeks; traveling several hours by boat to a work site can extend a work day to as much as 12 to 14 hours. Fatigue surely increases the chance of a worker slipping on an oil-soaked rock and suffering an injury" (Congressional Oversight Hearings 1989). Other factors compounding fatigue included the isolation and remoteness of cleanup sites and the lack or absence of health and sanitation facilities.

Severe symptoms of fatigue on the part of cleanup workers were reported along with reports on working conditions. Communications recorded in the months following the accident included:

- "people getting sick and headaches... breathing landing craft exhaust as they wait to board;"
- "no fresh water, coffee breaks or toilets on the beach;"
- "supposed to have a short, scheduled break every two hours;"
- "untrained people doing jobs that trained people on board the ship [U.S.S Juneau] could be doing;"
- "the... bureaucrats will not let us join forces with our local Cordova people and clean the beaches. We have to sit and wait for days and days on the U.S.S. Juneau..." (Congressional Oversight Hearings 1989).

Working conditions deteriorated as cleanup members became exhausted and frustrated. Workers had to put on wet and oily clothes and boots each day; headaches became constant. In short, conditions were such that workers were refusing to go on to the beach (Congressional Oversight Hearings 1989).

The USFS maintains a long standing tradition of analyzing response tactics and operations related to firefighting. Their strategy and decision-making process could be effectively applied to oil spill response mobilization and cleanup efforts. In terms of rest requirements, fatigue, and safety, the Missoula Equipment Development and Test Center has acknowledged that production (i.e., work) and safety are linked to fatigue and that relationships between fatigue and accidents needs further examination.

The USFS is especially concerned with two types of fatigue: (1) short-term fatigue which occurs during a shift ; and (2) accumulative fatigue which builds between work shifts. In their experience, morning shift changes (between 7:00 and 9:00 a.m.) optimize the provision of fresh crews and familiarity with the day's assignment. Crew workers require frequent rest periods (at the discretion of the "fire boss"). The fire boss also assures that tired crews are not assigned to long shifts without rest. He/she may opt for staggered and split shifts. A "Safety Chief" is employed in firefighting teams to oversee the "adequacy of rest and its effects upon fatigue" (USFS 1983). He/she also monitors and provides "timely" information on changes in line personnel and assures completion of crew work/rest logs.

Considering the logistical problems encountered by members of Alaskan oil spill cleanup crews, it would be useful to examine the air operations organization and pre-planning procedures the USFS employs to provide continuous support and provisions to fire line workers. Notably, abundant supplies of liquids (i.e., fruit juices, water) and hot meals are fatigue reducing requirements. Oil spill workers commonly complained of "no water" and "dry sandwiches" at the work site. In addition, USFS standards for "mop up" and "cleanup" operations are well documented and could assist in the contingency plans of future oil spill operations.

In the Alaskan oil spill response effort, shoreline work sites are hazardous due to cold; hypothermia due to becoming soaked from hoses, dispersants or rain; and fatigue due to long work hours, remote sites, slippery surfaces, animal hazards (bears), and exposure to chemical toxins. Complaints among workers include overwork, mechanical dangers, human health and safety problems, inadequate training, and inordinate stress due to cramped living quarters.

Worker exhaustion is best illustrated by a single grievance describing a fire alarm aboard the U.S.S. Juneau. When an urgent intercom message announced, "Fire, fire, fire... This is not a drill...," not one of the clean-up crew moved and in fact all went back to bed before the announcement that the fire had been put out (Congressional Oversight Hearings 1989).

PREPAREDNESS RECOMMENDATIONS

1. In the absence of consistent regulations for manning standards, the impact of manning and fatigue upon maritime accidents should be investigated in conjunction with the efforts being taken by the Baltic and International Marine Councils.

   Alaska should investigate the potential of statewide and port-by-port manning standards. These standards would dictate minimum number of crew members, required training, length of shifts, and duration of tours of duty. These standards could be developed in coordination with minimum insurance requirements or efforts taken to influence the availability of insurance.

This manning standards investigation should be completed in conjunction with a study on ship workshifts to determine optimum performance conditions, including a rotation of tasks to alleviate monotony, length of shifts, and duration of tours of duty.

2. Include information on the recognition and detection of, and response to, stress and fatigue, and the conditions that contribute to, or exacerbate them, in training programs required of captains and mates. Training materials can also be provided to the management staff of shipping companies so that they may better understand the potential effects of shipboard conditions resulting from their decisions.

3. Request that the USCG and shipping companies examine procedures, policies, and penalties related to alcohol and substance abuse, and make modifications where appropriate.

RESPONSE RECOMMENDATIONS

1. Examine the policies and procedures of the U.S. Forest Service for response and operations tactics for fighting wildfires. This existing system plans and adjusts for fatigue impacts and organizational requirements. Consider the modification and adoption of appropriate policies and practices for incorporation into state-approved contingency plans.

2. Establish, train, and utilize pre-identified response teams that can react quickly and effectively, on their own, or in conjunction with additional and/or larger response teams.

3. Establish a standard of care that governs work conditions for response teams and oil spill cleanup workers.

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APPENDIX G

THE ROLE OF INSURANCE FOR THE PREPAREDNESS AND RESPONSE TO OIL SPILLS: LIABILITY AND COMPENSATION ISSUES

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THE ROLE OF INSURANCE FOR THE PREPAREDNESS AND RESPONSE TO OIL SPILLS: LIABILITY AND COMPENSATION ISSUES

INTRODUCTION

The insurance industry can potentially be an important partner in a comprehensive program to reduce oil spill losses by providing insurance incentives for the safe transportation of oil and other hazardous cargo. This research paper seeks to examine the current state of the maritime insurance industry -- in general and in Alaska -- and offer suggestions on how insurance can play a role in reducing losses and improving preparedness and response. Information on pollution insurance was gathered from reports in insurance journals, congressional testimony, and articles and analyses by insurers, academics, newspapers, and government publications. In addition, telephone interviews were conducted with insurance representatives from Exxon, the Lloyd McClennan Insurance group, and the National Flood Insurance Program.

Exxon has accepted responsibility, but not liability, for oil damages resulting from the accidental grounding of the Exxon Valdez in March of 1989. To date, Exxon has spent $1.25 billion in cleanup and in the payment of damages to individuals and businesses that suffered from the direct impacts of the oil spill, including economic injury due to lost business (Wall St. Journal November 30, 1989). In addition to further cleanup and unresolved private claims, Exxon faces potentially huge fines and penalties under numerous state and federal statutes governing water pollution. The Alyeska Pipeline Service Company may be as liable as Exxon since it is obligated under the Prince William Sound Contingency Plan to respond to, contain, and clean up spills in the Sound. "Alyeska handed off the spill response to Exxon without approval by the state, and Exxon's subsequent response was not according to the state-approved plan" (Oil Spill Chronicle November 14, 1989). In any case, judgments regarding liability and compensation are sure to be discussed in the courts for years.

INSURANCE THEORY

Insurance offers a means of managing risk by distributing it among large numbers of individuals or enterprises. Risk is the possibility of injury or loss. Through the payment of insurance premiums, "the insured avoids the risk of suffering a large loss by substituting the certainty of suffering a small one... in effect, the insurer distributes risk among all of its insureds" (Abraham 1986).

It should be noted that there are a number of ways besides insurance to manage risk. In oil transportation, optimizing safety through advanced technology, training programs, adequate staffing, repair and maintenance, response plans, and other methods is a particularly important means of risk management. Within the insurance industry, risk pools, deductibles, and policy limits are risk management techniques.

In theory, insurance assigns the costs and benefits of risk exposure to those who experience the risk, stimulates the policy holder's motivation to avoid risks "through a differential rate structure which rewards prudence and penalizes imprudence," and provides for accumulation of reserve funds to meet large payout requirements associated with rare catastrophic occurrences. In practice, however, insurance functions depend on the price of the service, the appeal of the service, the industry's willingness to provide the service, and industry's assessment of its capacity to meet extraordinary payouts without sacrificing its economic viability (Petak and Atkisson 1982).

> As the industry's assessment of its ability to accurately predict risk declines, the prices for the service rise, or may not be offered at all. When a solid actuarial base of information concerning the probability of loss to particular persons or properties under particular defined circumstances is missing, the price goes up or the industry's willingness to engage in the service goes down (Petak and Atkisson 1982).

When such prohibitive conditions exist, the federal government may become involved in order to help remove disincentives to purchase, assist in assessing risks, and assist in developing reserves, or "capacity," for meeting very large payouts (e.g., flood insurance and earthquake insurance, discussed below). The federal government could also assume a more direct role by: (1) sharing in premium payments (with state and local governments), (2)

acting as a direct reinsurer for prime oil spill insurance carriers, or (3) providing research, technical assistance, and financial support in the establishment of state insurance programs (Petak and Atkisson 1982).

Currently, there is pending federal oil spill legislation that exceeds these possibilities. The legislation is titled the "Oil Pollution Prevention, Response, Liability, and Compensation Act of 1989." It has been passed by the House of Representatives as HR 1465 and is currently before the Senate for modification, amendment, and passage. This legislation will combine, supercede, and improve a host of earlier laws.

A stronger regulator role (than Petak and Atkisson's or the pending legislation) might require the purchase of a particular type of insurance as a condition for receiving federally insured loans, federally subsidized loans, and/or loans provided by federally regulated financial institutions. The insurance industry strictly opposes such "mandation," unless it is accompanied by means to protect insurers from huge payouts in catastrophic incidents. There exists, however, many examples of mandatory insurance: states require purchase of no-fault automobile insurance, lenders require purchase of fire insurance, states require purchase of workmen's compensation insurance, etc. A variation of required insurance is contingent insurance, where coverage (either private or federal) is provided only when certain conditions, such as licensing, manning, training, and equipment standards are met.

HAZARD INSURANCE

Insurance as Hazard Policy

The development of the National Flood Insurance Program (NFIP) and the investigation into a national earthquake insurance program has grown out of a recognition that these hazards are national problems with far-reaching economic impacts. These federal programs also attempt to fill the void created by the private insurance industry's inability to market this type of service profitably. These programs also recognize the limited means that potential victims otherwise have to protect themselves and reduce their vulnerability to hazard risks. These programs are designed to meet needs similar to those posed by a potential oil spill.

The primary difference between federal flood and earthquake insurance and federal oil spill insurance is that in the former, insurance is purchased by those at risk from losses resulting from unpredictable natural events. Oil spill insurance (if it were to become available) would be purchased by those responsible for losses resulting from preventable human error or mechanical failure. Insurance from floods and earthquakes (potentially) gives those at risk from losses some control over their own protection. Oil spill insurance would protect the spiller from liability claims resulting from those at risk to losses, who have no way to protect themselves other than placing the responsibility for compensation with those responsible for the damage. Under these programs, potential victims can protect themselves against flood or earthquake, but not the effects of oil spills. In the latter instance, the victim's only protection is being provided by the perpetrator. Thus, the latter is really compensation, not insurance.

Vulnerability is the susceptibility or exposure to injury, loss, or liability from a hazard. Alaska's vulnerability to oil spill hazards is largely a consequence of national energy needs and the development of Alaska's oil reserves, the Trans-Alaska Pipeline, and the transportation of oil through the state's sensitive coastal environment. People, businesses, economics, natural resources, and the environment are potentially vulnerable. The considerable risks are nonetheless acceptable to local, state, and national interests, who share with private industry in the benefits and risks involved. As a petroleum-dependent society, it is said that "we're all in the oil business" because to some degree, all Americans are affected by Alaska's oil trade, which accounts for nearly one quarter of U.S. petroleum production. Considering this, and the possibility that private industry may not be able to insure oil pollution liability in the future, arguments for a user's tax or national insurance program to compensate oil spill losses may deserve further examination, and in fact, is an element of the pending federal oil spill liability legislation.

Insurance as a Mitigation Tool

Hazard mitigation "is a management strategy that balances current actions and expenditures with potential losses from future hazard occurrences" (Petak and Atkisson 1982). Mitigation activities go further than distributing or sharing the risk and are intended to

eliminate or reduce the probability of occurrence of a hazard event, or reduce the impacts of hazards that do occur. Successful mitigation usually involves a combination of approaches in a coordinated, cost-effective strategy. Providers of fire insurance, for example, offer mitigation incentives by basing a community's fire coverage premiums partly on factors such as proximity to fire stations and hydrants, available water pressure, hose diameters, and number and type of fire trucks. Local governing boards maintain favorable fire insurance rate classes for their communities by ensuring that fire alarms, water supplies, facilities, staffing, equipment, and training exceed industry standards. While the cost to a community for these improvements could easily be $1 million, each structure owner's premium might be reduced by $25.00. In a community of 50,000 insured structures, this would represent an *annual* savings of $1.25 million.

Some general insurers are encouraging comprehensive prefire plans for large facilities, businesses storing hazardous and flammable substances, and structures containing costly assets, such as computers. The two objectives of prefire planning are to identify potential fire hazards in specific facilities and to familiarize firefighters with these hazards in advance. Prefire plans consider building characteristics, fire suppression systems, available public fire protection, warning systems, evacuation plans, hazards in proximity, assignment of emergency duties, coordination with law enforcement, emergency medical services and local media, and types, quantities, and locations of hazardous and flammable materials (Brotzman 1989). Both approaches to fire insurance provide incentives to reduce fire losses by maximizing the firefighting capabilities of the response system. Provisions in the national flood and earthquake programs offer additional examples of how risks may be balanced with proactive efforts to prevent or reduce losses.

National Flood Insurance Program (NFIP)

The 1968 National Flood Insurance Act (Public Law 90-448) made nationally-subsidized flood insurance available to individuals in communities that enforced federally approved floodplain management regulations. Following passage of a 1969 amendment, floodprone communities could become eligible for limited amounts of flood insurance under an "emergency phase." As detailed flood maps and local regulations were developed,

communities could enter the "regular" program, whereby larger amounts of insurance coverage became available to policyholders (May and Williams 1986).

The Flood Disaster Protection Act (Public Law 93-234) in 1973 mandated that floodprone communities regulate their floodplains or forfeit access by its residents to federal loans and loans from federal institutions. This regulation was softened in 1977 to prohibit only federal disaster flood relief, unless flood insurance was purchased.

The Federal Emergency Management Agency (FEMA) is the federal agency responsible for managing the flood insurance and disaster relief programs. FEMA's responsibilities in implementing the program fall under two categories: insurance activities (e.g., enrolling individual participants, establishing rates, paying claims) and floodplain management activities (e.g., establishing flood zones, enrolling communities, establishing standards). Flood insurance is available only to individuals in communities that have adopted a floodplain ordinance and regulations developed under FEMA guidelines. The objective of the ordinance is to ensure that proposed development does not aggravate existing flood hazards and that new buildings will be protected from future floods. Communities that do not adhere to the floodplain management standards may be suspended from the NFIP. Communities and individuals may appeal suspensions or locations of structures on FEMA maps. Of the roughly 20,000 floodprone communities in the U.S., over 17,000 participate in the NFIP (May and Williams 1986).

In an effort to recognize and encourage community activities that go beyond minimum program standards to reduce flood losses, the NFIP has developed a Community Rating System that awards flood insurance premium credits to communities that undertake: (1) public information activities, such as outreach projects; (2) mapping and regulatory activities, such as open space preservation; (3) flood damage reduction activities, such as flood control projects; and/or (4) preparedness activities, such as flood warning systems. Like fire insurance incentives, there is an enormous potential savings to constituents of a jurisdiction willing to fund some major improvements that will mitigate the risk.

Earthquake Insurance

In response to the limited availability and high cost of earthquake insurance in high risk areas of the U.S., a federally-supported system has been developed to cover catastrophic losses and protect insurers and reinsurers from "institution-destroying loss levels," where reserves are insufficient or the magnitude of an accident exceeds worst-case scenarios (Petak and Atkisson 1982).

Underwriters of earthquake insurance need to establish the Probable Maximum Loss for each hazard zone and for individual locations in order to determine total earthquake exposure and reinsurance needs. The most important and most elusive factors affecting earthquake underwriting decisions are probability that an earthquake will occur and estimated maximum intensity. However, utilizing probability studies, seismic building codes, and hazard mitigation recommendations, geologists today are much more capable of making these projections. Other factors that influence the underwriting include: proximity to known faults, height of structure, soil conditions, age of structure, type of construction, type of materials, and the value of contents (Holtom 1989).

> Although earthquakes are beyond anyone's control, the selection of risks, underwriting standards, retentions, deductibles, and rates are not. Careful consideration of these factors can take some of the unknowns out of earthquake underwriting (Holtom 1989).

Currently the federal government is investigating the possibility of establishing a national earthquake insurance program, similar to the flood program, where insurance would be made available at a subsidized rate, but only after a community adopts regulations that require new construction to meet seismic safety standards and perhaps the retrofitting of certain classes and types of older, more vulnerable structures.

Development of an "actuarially sound national catastrophe fund" to compensate oil spill victims from federal and state and oil industry contributions might accomplish essentially the same ends "as a more conventional insurance system" (Petak and Atkisson 1982).

MARITIME INSURANCE

Commercial insurers provide maritime insurance to cover the hull, cargo, and, to some extent, the liability associated with the transportation by commercial vessels. The U.S. hull insurance market grew up following World War I in order to accumulate capacity, develop underwriting expertise, and keep expenses under control. The American Hull Insurance Syndicate, comprised of 55 member companies, was formed to create a single agency for the underwriting of hull business, such as issuing policies, collecting premiums, and settling claims on behalf of its member companies. There is also a market of independent insurance companies writing hull business. Together, they have a capacity of over $80 million (about $40 million each). The Syndicate also insures ship owners outside the U.S. and is active in reinsurance relationships with European nations and other international markets (Schumacher 1984).

In order to determine adequate premium levels to meet exposures presented by a particular shipowner, the Syndicate typically reviews:

1. The background of executive and operating officers of the fleet;
2. The age, classification status, and condition of fleet ships;
3. The operations, training, and origin of fleet crews;
4. The trading patterns of the company;
5. Cargos carried;
6. The distribution and frequency of the routes used;
7. The maintenance and repair policies of the company (Schumacher 1984).

Pollution Liability Insurance

Prior to the 1970s, the insurance industry provided comprehensive general liability policies for U.S. businesses which covered a broad range of commercial liability due to accidental personal injury or property damage. In the early 1970s, certain pollution-related liabilities were specifically excluded as the nature and cost of pollution incidents and associated liabilities became more evident. Some insurers developed separate policies, specifically to cover pollution risks, that imposed dollar limits per incident (General Accounting Office [GAO] 1987).

By the mid-1980s, however, few insurance companies were offering pollution insurance due to the uncertainties regarding potentially enormous claim payments, "unfavorable" legal trends involving liability standards and insurance coverage, and the broad liability established by federal and state environmental laws. The insurance industry has maintained that the basic concerns of underwriting a risk -- the process of identifying and evaluating risks and setting the premium to be charged for risks accepted by the insurer -- cannot be satisfied when assessing pollution risks, thereby making them uninsurable (GAO 1987).

Commercial pollution insurance is generally unavailable and when it is, coverage is limited and expensive and selectively provided to clients that carry coverage by the insurer for other risks. One option to traditional insurance coverage is participant-owned and operated risk pools that cover catastrophic liability losses. It is unclear from the literature examined in this research how effective risk pools have been in meeting the insurance needs of the oil transportation industry. Another option for pollution liability coverage, when available, is reinsurance. Reinsurers are companies (or governments) that assume a portion of the potential liability risks that the insurance companies underwrite in exchange for a share of the premium (GAO 1987).

In the absence of available and affordable liability coverage, many oil shippers operate without it once they have demonstrated financial capability to the limits of liability set forth in applicable federal laws. These financial requirements ensure that operators have assets on hand to cover the pollution liabilities faced. In essence, these shippers are self-insured.

Ocean maritime insurance differs from property and casualty insurance in that there are no regulations regarding the filing of rates and policy forms with state insurance authorities (partly due to great variations in commodities, vessels, distances, etc.) (Picone 1989). Liability insurance premiums are calculated according to the type of vessel and the degree of risk of different classes of vessels. Oil carriers are rated at the high risk end of the scale. In spite of these differential ratings, owners with poor loss records have generally paid only slightly higher premiums (Schenker 1981).

In light of California's Proposition 103 rollback of automobile insurance rates, the U.S. marine insurance market is concerned about the political climate for retaining its exemption from rate and form regulations. The U.S. market is very slow relative to the international insurance market, primarily due to the unpredictable future of U.S. trade. All quotas on imports, for instance, impact the business of cargo underwriters (Picone 1989).

The potential for huge catastrophic payouts has probably had the greatest impact on the market. According to John Hickey, President, American Hull Insurance Syndicate, "There is no way that we can continue to pay tomorrow's catastrophe claims with today's inadequate premiums." The hull syndicate had a profitable year in 1988 because they were selective and "lucky," and because they had no major casualties for two years. "We shall continually strive to write marine business the only way we know how -- profitably. We are a unique organization with a long tradition and we are perfectly positioned to pick up the pieces when the current market explodes -- which it will," said Hickey (Picone 1989).

Although the Exxon Valdez is a relatively new tanker, the average age of most ships, according to Lloyd's Register, is over 10 years old, and the high costs of shipbuilding will preclude any rapid modernization of the fleet. Due to the poor economic condition of the shipping industry, according to Walter Kramer, Vice President of the American Institute of Marine Underwriters, the emphasis "is on cost-cutting measures and economies of scale." Kramer maintains that the aging fleet and smaller crews on more automated ships will contribute to more accidents in the future. The research being conducted for the paper, "The Impact of Fatigue and Other Factors on Human Performance and How They Relate to Maritime Accidents," also supports this. Higher underwriting losses will then lead to higher insurance rates, compounding problems in the industry. Ship owners and insurers need to work together to reduce the chances of accidents, and those "practicing sound hull loss prevention techniques should receive credit for their efforts" (Picone 1989).

OIL SPILL LIABILITY AND COMPENSATION

International Conventions

The myriad international, national and state laws, statutes, and funds that address pollution from oil spills has been widely characterized as a "patchwork quilt" of overlaying standards and liability limits. The following is a discussion of the various acts, treaties, and funds potentially applicable to U.S. oil transportation interests or to accidents in U.S. waters.

The Convention on Civil Liability for Oil Pollution Damage (1969) and Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage (1971) provide a means of sharing oil pollution costs among countries that are parties to the Conventions. The two international oil spill treaties establish maximum liability amounts of oil shippers (Smets 1983). The 1984 Civil Liability Convention (CLC) establishes a financial responsibility regime where each party is required to ensure that ships in its ownership have insurance or other financial security to cover the owners' liability under the Convention up to the prescribed limits.

The 1984 CLC and FUND Protocols implement the provisions of the above conventions. They allow member nations a way to enforce judgments that affect foreign vessels and help ensure that the assets of the owner or insurer liable for oil pollution will be available to meet damage claims. The U.S. has failed to ratify the 1984 Protocols. Opponents maintain that the Protocols would provide coverage beyond current federal and state laws under only a limited set of circumstances and, in some cases, they would preempt state liability laws. Supporters argue that the Protocols offer a way to share the costs of U.S. oil spills worldwide by allowing the U.S. access to the international oil spill compensation fund and would also allow the U.S. to influence international maritime negotiations. Amendments to the Protocols, they claim, could be added in the future to increase liability limits (U.S. Senate 1989).

The Bush Administration favors adoption of the 1984 Protocols but opposes the preemption of state liability laws beyond the extent necessary to implement the Protocols. Secretary of Transportation Skinner has testified that any claims for damages in excess of the owner's

limit of liability could be brought directly to the international fund, which, according to Skinner, has an excellent record of payment (on average, eight months) (U.S. Senate 1989).

The French government ratified the 1984 Protocols within two months of their introduction, but unfortunately six years after the Amoco Cadiz accident. Eleven years later, the lawsuits are being settled for a fraction of what France spent dealing with the spill (U.S. Senate 1989).

Federal Laws

The Federal Water Pollution Control Act, 1970, as amended by The Clean Water Act, requires owners to file a certificate of financial responsibility for each tank ship owned that demonstrates financial capability to the extent of the owner's minimum cleanup liability.

The Clean Water Act of 1977 provides liability of up to $50 million for the actual costs incurred by federal and state governments to remove the oil and restore natural resources and the environment. Section 311 provides that the vessel owner is liable to the U.S. Government at $150 per gross ton unless the spill is the result of "willful negligence or willful misconduct within the privity and knowledge of the owner," then the liability of the spiller is unlimited. At $150/gross ton, the liability limit for the Exxon Valdez is approximately $14 million. The 311 (k) revolving fund is maintained by federal appropriations at a targeted balance of $35 million and is administered by the U.S. Coast Guard. Only one-half of the $143 million from the fund spent since 1971 has been recovered from responsible parties. The fund currently stands at only $2 million (House of Representatives 1989a).

The Federal Limited Liability Act allows ship owners to petition to limit liability for damages to the value of the vessel and freight on board following the accident, thus disallowing liability for any damages. This legislation has been enforced inconsistently in past oil spill litigation.

The Offshore Oil Pollution Compensation Fund is a renewable fund of up to $200 million administered by the Secretary of Transportation to cover oil removal costs and damages to fishing, recreation, ecosystems, and related activities. These funds, as well as those under Section 311 of The Clean Water Act and the following two acts, would all be combined into one large oil spill compensation fund under the pending federal legislation.

Other federal laws that may be applicable in major oil spills are the Outer Continental Shelf Lands Act Amendments (OCS) of 1978 and the Deep Water Ports Act of 1974.

State Liability Systems

The Trans-Alaska Pipeline (TAP) Fund was established in 1973 by the Trans-Alaska Pipeline Authorization Act to pay damage claims, including cleanup costs resulting from oil spills from vessels carrying oil to ports from the pipeline system. The Fund is liable without regard to fault for damages in excess of $14 million but not more than $100 million per incident. To date, the Fund has never paid a claim. Exxon has agreed to administer all claims it receives and may submit claims to the Fund before the two-year application deadline in March of 1991. Since the act exempts the Fund from liability arising from a claimant's negligence, Fund officials intend to contest any claims filed by Exxon (GAO 1989).

Alaska Statute 46.03.780 Liability for Restoration provides that a spiller is liable to the state for damages related to the sum of money required to "restock," "replenish," and "restore" the environment to its previous condition. Damages are recovered by the State Attorney General on behalf of the citizens of Alaska (Graham 1989).

Alaska Statute 46.03.822 Strict Liability for the Discharge of Hazardous Substances provides that the "person owning or having control over" a polluting vessel may be relieved of strict liability only if the spill is due to act of war, negligence of a third party, negligence on the part of the state of Alaska or the United States, or an Act of God (Graham 1989).

Alaska Statute 46.03.758 Civil Penalties for Discharges of Oil, enacted in 1977, establishes "substantial civil penalties" in order to provide a "meaningful incentive for the safe handling of oil" and to insure compensation for the state. The regulations establish a range of penalties, depending upon "toxicity, degradability, and dispersal characteristics" of the spilled oil and the "sensitivity and productivity of the receiving environment." Alaska Statute 46.03.758(b)(2) provides that penalties can be multiplied by a factor of five if the spill is due to an intentional or grossly negligent act or if the spiller did not make reasonable attempts to contain and clean up the spill (Graham 1989).

Variations in the maximum penalty amounts are designed to accommodate recovery needs in the most sensitive environments:

1. Maximum $10.00 per gallon for oil entering most freshwater environments;
2. Maximum $2.50 per gallon for oil entering most confined saltwater environments;
3. Maximum $1.00 per gallon for unconfined saltwater or other environments without significant aquatic resources (Graham 1989).

Other features of the Civil Penalty statute include:

1. A vicarious liability provision that holds owners liable for actions of their contractors. Intended to provide a further incentive for safe operations, this feature also increases the likelihood the state will be able to recover for damages to the environment;
2. A liability limit of $100 million was added under strong pressure from the oil industry, which argued that the industry needed advance knowledge of its maximum potential exposure;
3. A deduction for the gallons cleaned up from penalties owed by the spiller, in order to provide an incentive to clean up as much spilled oil as possible;
4. Reductions in penalties for mitigating circumstances, when events surrounding a spill would make full penalties inappropriate;
5. Exemption of spills less than 18,000 gallons, in order to provide some protection for small oil handlers (Graham 1989).

A spiller may be liable under the Civil Penalty statute, as well as other state statutes, but recovery will generally be sought under one statute or the courts may interpret the action as a double recovery. The state may allege liability under all applicable state and federal statutes and then pursue the course that provides the maximum potential recovery. Once a case is filed, however, it is usually settled out of court for a lump sum amount. Otherwise, if left to the courts, a determination would be made as to which is the controlling statute.

A detailed investigation of Alaska's civil penalty scheme for oil spill liability and compensation was completed in January of 1989 at the University of Washington's Institute for Marine Studies (Graham 1989). The investigation was documented as a Master's Thesis and includes an evaluation of the existing system. The report concludes that Alaska's civil penalty approach is viable. However, it also identifies inconsistences and shortcomings, and offers sound recommendations to make Alaska's liability and compensation system more effective. This report is attached to this paper as an appendix. Review of this study's recommendations by the Alaska Oil Spill Commission (AOSC) and the state legislature is an important recommendation of this report.

PROBLEM STATEMENT

In the aftermath of the Exxon Valdez accident, the Alyeska Pipeline Service Company -- the industry consortium that operates the Trans-Alaska Pipelines on behalf of seven oil companies that own the facilities -- has been soundly criticized for allegedly allowing the oil companies to save money by curtailing preparations for a large-scale oil spill throughout the 1980s. In addition to the problems caused by economic and competitive pressures, automation, safety violations, and a poor preparedness and response evidently also contributed to the disaster (this is also substantiated by research completed for the paper, "The Impact of Fatigue and Other Factors on Human Performance and How They Relate to Maritime Accidents").

1. Economic pressures: the competitive pressures in the oil and oil transportation industry, particularly with respect to competing with foreign carriers, most of which rely on lower standards and have less technology to

finance. Oil transporters are under constant pressure to move fast and stay on schedule. The Exxon Valdez was five days behind schedule when it ran aground. The Exxon Valdez was also on the outer fringes of the Coast Guard Vessel Traffic System (VTS) when the accident occurred. Federal cutbacks are primarily responsible for the failure to extend the VTS to the outer rim of Prince William Sound. The cost of extending the system, according to the Coast Guard, is estimated at $20 million (House of Representatives 1989a). Expansion of VTS is included in the pending federal legislation.

In 1981, a 20-member emergency team responsible for 24-hour response to oil spills in Valdez Harbor and Prince William Sound was disbanded by Alyeska to cut costs. Alyeska officials argued that such a large-scale spill as the Valdez was highly unlikely (New York Times). Also in 1981, Alyeska turned down an offer from the city of Valdez to stockpile cleanup equipment and materials. Alyeska personnel advised city officials that warehousing booms, dispersants, and other types of cleanup resources sufficient to attack a large-scale spill would be "a tremendous waste of city money" (House of Representatives 1989a). The pending legislation will reinstate national emergency strike teams and require contingency plans for major spills and adequate equipment for response.

2. Automation: as discussed in this paper, more automated ships and smaller crews may lead to an increase in accidents and resulting oil spills. When the Valdez ran aground, the systems that automatically power and steer the ship were on, a violation in that part of the Sound. These systems may have contributed to both the grounding and the large volume of oil released.

3. Safety violations: violations of the Valdez master pilot involving alcohol have been the most publicized, but a number of other violations connected to the accident apparently took place: the Valdez didn't notify the Coast Guard, as required, that it was leaving the shipping lanes to avoid ice floes; and federal

violations involving improper manning for the waters, including control of the ship by third mate (not certified as a pilot) and the failure of the Master to be on the bridge. The look-out was out of position, helping the local pilot depart the ship just minutes before the grounding.

4. Inadequate response and preparedness: As mentioned above, there were inadequate resources in Valdez to respond to an accident of this magnitude. Alyeska's contingency plan included a scenario for a catastrophic incident and noted that the response would be inadequate. After the Valdez spill, it took hours for emergency work to begin. Alyeska's only cleanup barge was out of service, an absorbent boom was buried under snow, and only 45 drums of dispersant were on hand -- enough to dissipate 3% of the spill (Anchorage Daily News November 3, 1989).

Our investigation did not find any evidence that insurance adversely affected the response to this incident. This question came to light when the response to a recent (November, 1989) Alaska grounding was delayed until the hull underwriter could determine whether or not there could be any salvage value. Possible responses involved burning, sinking, or blowing up the ship. These actions were not allowed without the approval of the underwriter.

POSSIBLE SOLUTIONS

The advantages and disadvantages of a number of alternatives to maximizing safety and preparedness through insurance and liability mechanisms are discussed below.

Unlimited Liability

The threat of unlimited liability, it is argued, encourages a higher standard of care in the oil industry and prompts prevention-related activities in both the public and private sectors. Supporters of unlimited liability essentially support the rights of states to establish liability, in order to go beyond federal or international minimums as necessary to protect the health and welfare of their people and environments. Opponents of unlimited liability maintain

that this alternative will result in commercial insurance being unavailable and the oil industry taking its business away from states with unlimited liability laws. (Since nearly one quarter of the U.S. source of petroleum comes from Alaska, this seems unlikely.) Most states and environmental groups argue that states should nonetheless have the right to protect their tourist and fishing industries from oil spills at the expense of a certain amount of business activity (United States Senate 1989).

Advantages:

1. Strongest position in support of "the spiller/polluter pays" principle;
2. Encourages a higher standard of care;
3. Preserves state's rights.

Disadvantages:

1. No insurer will provide unlimited coverage;
2. Oil industry may avoid states with unfavorable limits;
3. Spiller could "hide" assets, declare bankruptcy, and "walk away" from spill.

Limited Liability

In the wake of the Exxon Valdez disaster, future liability limits will face pressures to relate more realistically to the full range of oil pollution damages -- not just for cleanup, but for damages to property, natural resources, losses in earnings, and loss of use of real or personal property. Documentation of a carrier's financial capability levels may also have to follow suit (Schenker 1981). If Congress sets liability limits in the proposed federal compensation and liability legislation, limits could be driven by the financial capability of each company and by its commitment to state-of-the-art technology as a safety incentive (i.e., lower limits available to shippers that commit to modern cleanup equipment, modern monitoring systems, advanced ship designs, etc.). (United States Senate 1989). The recommendations of the investigative report detailing Alaska's civil penalty scheme for oil spills makes similar recommendations through the elimination of certain provisions, including the $100 million ceiling on penalties. The pending federal legislation suggests lower limits for safer transfer points, such as deepwater ports.

Advantages:

1. High, but fair liability limits might stimulate U.S. marine insurance market;
2. Parties responsible for spills will at least pay something, both into reserve fund and for damages up to limits;

Disadvantages:

1. Probably won't cover all damages in catastrophic accidents;
2. Unless the limits of liability are very high (and reflective of full range of costs), the "cost of doing business mentality" toward managing oil (spills are inevitable) will prevail (United States Senate 1989).

User's Fees

In addition to setting minimum liability limits, toughening standards, and lifting all liability limits in some cases, possibly the most important feature of proposed federal liability and compensation legislation is the establishment of a national fund for cleanup and recovery costs that exceed liability limits. The fund would be developed through a 5-cent per barrel tax on the oil industry, the rationale being that oil companies should bear a responsibility for cleaning up and restoring the environment when damages exceed the responsible party's limit of liability (United States Senate 1989). According to Atlantic Richfield Company testimony before the Senate Subcommittee, merging the federal funds created by the TAPS Act, OCS Act, and Deep Water Ports Act would immediately establish a reserve fund in excess of $400 million (United States Senate 1989). This is included in the pending legislation. This legislation also includes user fees for the expansion of the VTS.

Advantages:

1. Prevents need for each state to establish its own fund (more economical and efficient);
2. Allows oil shippers to pay into one centralized oil fund instead of individual funds of each state;
3. Retains state liability laws;

4. Can be established together with adoption of 1984 Protocols to cover incidents where damages exceed Convention liability limits;
5. When fund builds up, part of it can be dedicated to improving safety measures, training programs, etc.

Disadvantages:

1. Does nothing to eliminate the "patchwork quilt" of regulations.

National Contingent Insurance

As was the case with hazard insurance for floods and earthquakes prior to the development of national and federally-supported insurance programs, commercial pollution insurance, when available, has become increasingly unaffordable. Nationally, we are all dependent on the Alaskan oil business and concern over the frequency and magnitude of the impacts of oil spills has become a strong national issue. In addition, its resources and natural beauty make Alaska a "national treasure" and a source of national pride. Proponents of national oil pollution insurance make these and other points in support of arguments for a national program.

Advantages:

1. Mitigation and contingency planning can be required as a condition of participation;
2. Incentives relating to the cost of coverage can be employed to prompt oil shippers to operate in as safe a manner as possible.

Disadvantages:

1. Oil shippers may become more complacent or careless with insurance protection to fall back on;
2. Many are not convinced that the oil industry can be relied upon to protect the environment.

Deepwater Ports

Government and industry could investigate the possible development of new offshore deepwater ports, such as the Louisiana Offshore Oil Port (LOOPS), where spills may be less likely to occur and easier to clean up than those closer to shore. The open waters around offshore ports are also more amenable to the use of "non-mechanical cleanup means," such as dispersants. Oil is transported between port and shore via underground pipelines.

Advantages:

1. Eliminates threats of groundings and narrow channels;
2. Spills would affect less sensitive environments;
3. LOOPS operates wide "safety zone" around port and 24-hour traffic control and communications.
4. Pending legislation calls for lower liability limits for vessels utilizing deepwater ports.

Disadvantages:

1. LOOPS has been losing money and has not proven to be an economical alternative for potential port users or investors (United States Senate 1989).
2. Exposure to harsher environment could potentially limit the number of days facilities could be used.

RECOMMENDATIONS

1. The AOSC and the state legislature should review the analysis of the civil penalty scheme for oil spill liability and compensation in Alaska (Graham 1989) and determine the appropriateness of the studies' recommendations for adoption and implementation.

2. The development of a user's tax and national oil spill compensation fund offers a number of important advantages over the "patchwork" liability and compensation system currently in place, and deserves further examination in the near term. These,

and many useful mitigation measures, are incorporated into the pending federal legislation. Alaska should strongly support this legislation package.

3. Localized liability and penalty schemes should be investigated on a port-by-port basis. These schemes should investigate the potential of providing access to terminals contingent not only upon certain levels of liability or financial capability, but also upon certain standards for vessel manning, training, licensing, and equipment.

4. Offshore deepwater ports -- and their obvious advantages in limiting oil spill damages -- may provide the best long-term solution to the problem, provided that economic and environmental problems can be overcome.

Any of these initiatives should be pursued in the context of a complementary liability and compensation system that: (1) defines the relationship with other international, federal, and state laws; (2) preserves state liability laws; (3) clearly defines the liability of each shipowner and the scope of claims that can be made against the responsible party; (4) retains the "polluter pays" principle in pollution liability; and (5) serves to bring under a single umbrella all aspects of oil spill liability and compensation to ensure that all claimants are compensated (United States Senate 1989). The pending federal legislation accomplishes these goals and should be promoted. Reviewing the recommendations of Alaska's civil penalty scheme for oil spills will also accomplish these goals. Developing particular schemes for individual ports can address the varying degree of risk due to frequency of vessels and localized conditions. This may also provide the only mechanism that ensures that a certain level of safety is maintained by visiting vessels, regardless of their nation of origin or registry.

The national flood and earthquake insurance programs, as models, can serve to guide those involved in the development of a similar program for oil spill pollution hazards. Loss prevention should become a strong factor in the development of insurance rates and costs. Repetitive offenders might find it difficult to obtain protection at any cost (Schenker 1981)

or find insurance too expensive to stay in business. Those ship owners and operators working to reduce the likelihood of accidents should get credit for doing so.

Lower liability limits could be made available only to those companies that can demonstrate financial responsibility, good safety records, and a commitment to state-of-the-art technology. Inadequate training procedures, inadequate charts and guiding systems, and inadequate maintenance and repair policies are examples of reasons to deny lower liability limits (United States Senate 1989).

The Exxon Valdez disaster has revealed the need for more mitigation and preparedness planning throughout the system (ship owners, pipeline operators, local, state, and federal governments). Contingency response plans should consider the extraordinary resource demands placed on the response system in major oil spill accidents, and then improve plans through regular drills and exercises. Following the grounding of the Arco Anchorage off Port Angeles in 1985, Arco, the Coast Guard, and the Washington Department of Ecology co-managed a successful cleanup effort that took four months. Coordinators credited a joint response exercise conducted a year earlier with creating a familiarity that led to a smooth working relationship in the actual event (Anchorage Daily News May 7, 1989).

The best opportunities to implement mitigation measures generally follow the occurrence of a disaster, when the hazard is still fresh in memories and there is usually a mandate to improve or change the system. The state of Alaska, Alyeska Pipeline Service Company, and Exxon have all taken proactive steps to mitigate the impacts of future spills. Alyeska has acquired several new, large oil skimming vessels to escort tankers from the Valdez Terminal out of Prince William Sound. Alyeska now plans to stockpile cleanup equipment and supplies and is increasing tariffs approximately $3 per barrel in order to finance pipeline corrosion repairs, oil spill prevention and improved spill response, and legal fees from the Valdez spill. The state is raising severance taxes to create a $50 million emergency relief fund for oil spill cleanups (Anchorage Daily News November 2, 1989) and the AOSC has recommended a number of new safety measures, including giving authority to the State Harbor Authority to close down ports if conditions are unsafe (Anchorage

Daily News November 12, 1989). The glaring shortfalls in response and preparedness systems may, in the long run, prove to be more positive if steps are undertaken that prevent future such occurrences. It is important to institutionalize these measures now so that the system does not become lax in between oil spills.

Although the costs of monitoring systems, training programs, and other prevention and response measures may seem relatively minor compared to oil profits, cost/benefit analyses of mitigation opportunities must demonstrate that mitigation and preparedness are in the best financial interests of the oil industry as well. A public/private partnership is likely to produce the best mitigation results.

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APPENDIX H

INSTITUTIONAL INFLUENCES: THE COAST GUARD IN VALDEZ

Institutional Influences: The Coast Guard In Valdez

A REPORT TO THE ALASKA OIL SPILL COMMISSION

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January 1990

Institutional Influences:
The Coast Guard In Valdez

When the EXXON VALDEZ ran aground last March, the daily routine in the Coast Guard's Valdez Vessel Traffic Center was substantially different than it had been during the early years of oil tanker operations in Prince William Sound.

The number of personnel assigned to the Coast Guard station had dropped significantly over the years. And where previously three watchstanders -- with a supervising officer among them -- once stood each eight-hour watch in the Valdez Vessel Traffic Center, in the early hours of March 24, 1989, only an unsupervised civilian operator was at the radar console.

By some accounts, the radar he sat before was of lower quality than the center's original equipment, with the newer Raytheon radars often losing range when the weather turned the least foul. Indeed, in the drizzly conditions that existed late on March 23, less than an hour before the grounding, the previous watchstander had difficulty keeping the EXXON VALDEZ on radar when Capt. Joseph Hazelwood radioed to inform the Vessel Traffic Center he was maneuvering to avoid ice. Shortly afterward, the massive tanker disappeared from the screen altogether, despite the fact that it was still several miles inside what the radar's maximum range usually was in optimum conditions.[1]

Along with the cuts in staff and equipment also had come a tangible change in the Coast Guard's attitude about how Prince William Sound

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[1] National Transportation Safety Board hearing, May 17, 1989, testimony of Gordon P. Taylor, pg. 525

tanker operations were overseen by the Vessel Traffic Center. While no one suggests that the service had become any less interested in keeping tankers laden with millions of gallons of crude oil out of harm's way, veterans of the Valdez trade and the Coast Guard's former Valdez commander say the Coast Guard's vigilance was markedly relaxed after the first several years of oil shipments passed without a major tanker disaster.[2]

From the beginning of the debate over siting the pipeline terminal at Valdez, the oil industry and the Coast Guard sought to ease the worries of environmentalists and fishermen who feared the prospect of a supertanker accident despoiling the pristine sound. For its part, the Coast Guard touted two significant components of its plan to protect the environment from tanker accidents: a promise to push for rules requiring double-bottomed tankers and sophisticated electronic monitoring of traffic in Prince William Sound, likely through the installation of a Loran-C retransmission system, an electronic network that would continuously broadcast a ship's position to vessel traffic controllers.

By the time the oil was flowing down the pipeline in 1977, however, the Coast Guard had retreated on both proposals, in no small part due to the oil industry's opposition to the expense of the additional safeguards.[3]

In response to a Congressional mandate, the Coast Guard did develop a Vessel Traffic Service operation designed to promote safety in Prince William Sound and the Valdez Arm by confining tankers to a Traffic Separation Scheme -- dedicated one-way ship lanes running north and south, split by a wide separation zone. And through the Valdez Narrows -- the half-mile-wide throat of Valdez Arm cleaved by Middle Rock, where

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[2] James Woodle, William Good, Robert Beevers, personal communications

[3] Stan Jones, *Anchorage Daily News*, October 15, 1989

many believed an accident was most likely -- the rules called for restricting traffic to one-way, one-lane passage.

The Coast Guard, which was operating five other traffic service operations in major U.S. ports at the time, believed the separation scheme provided a substantial measure of safety. Although some in Alaska wanted something more akin to the tighter control of an air traffic operation, the Coast Guard had rejected that concept of absolute vessel traffic control long before the Valdez system was developed.

"When the general concept of Vessel Traffic Service was being conceived in Washington in the 1960s, there was significant discussion about whether it should be a controlled operation or advisory," said retired Admiral Richard Knapp, who commanded the Coast Guard's 17th District in Alaska from 1980-'84. "The result they settled on was to have a largely advisory operation, but with traffic controlled in the traffic lanes."[4]

A prime factor in crafting a largely advisory system was the conviction that critical decisions concerning vessel movements should be left to the captain of the vessel, said Knapp, who was assigned to the office of the Coast Guard Chief of Staff in Washington at the time.

But former Coast Guard officer Virgil Keith, a naval architect and engineer who conducted simulated Prince William Sound tanker sailings for the State of Alaska prior to the opening of the pipeline, believes in this case, the Coast Guard fell short of providing the level of tanker surveillance U.S. Senator Warren Magnuson had in mind in 1973 when he pushed amendments to the Trans-Alaska Pipeline Authorization Act to mandate a vessel traffic control system for Valdez.

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[4] Richard Knapp, personal communication

"As a naval engineer, when I read the Pipeline Act, it doesn't mean that just part of the Sound will be covered, it means all of the Sound," Keith said. "That's what the State of Alaska was fighting for, and that's where the Coast Guard let us down."[5]

Perhaps because of the original controversy over the prospect of shipping millions of gallons of crude oil every day through such a largely unspoiled marine environment, the Coast Guard in the early years of Valdez tanker operations does appear to have enhanced its level of vigilance well above that of providing a simple traffic advisory system. Tanker speed and movement were monitored to the limits of the available equipment. Watchstanders in the Vessel Traffic Center plotted tanker positions every six minutes, beginning the moment the ships were first picked up on radar. Tanker captains wishing to deviate from the traffic lanes for any reason sought permission from the traffic center beforehand, and watchstanders kept an especially close eye on the ships -- or at least maintained frequent radio contract -- once they did deviate.[6]

The EXXON VALDEZ, by contrast, had been neither detected on radar nor heard from by radio in more than a half-hour when it plowed into Bligh Reef. And nearly a full hour had passed since its last communication with the Vessel Traffic Center when Capt. Hazelwood finally called by radio to inform the watchstander that his ship was "fetched up hard aground" on Bligh Reef and leaking oil.

In part to accommodate staff reductions, the Coast Guard in 1984 had dropped the practice of physically plotting tankers at six-minute

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[5] Virgil Keith, personal communication
[6] Woodle, op. cit.

intervals.[7] Watchstanders now were physically keeping charts only after tankers entered the one-way zone of the Valdez Narrows. And although captains still were required to notify the Vessel Traffic Center of each lane deviation (a rule the EXXON VALDEZ violated at least twice before its unscheduled stop at Bligh Reef), it now was standard practice to merely inform the center of a lane departure, instead of requesting permission.

And, because the system never was intended to be a controlled operation, the Coast Guard maintains the watchstander probably wouldn't have given direct orders to the EXXON VALDEZ to change course -- even if he had seen the ship approaching Bligh Reef -- despite a Traffic Service rule advising that in certain circumstances, "recommendations will not be sufficient and it will be necessary to direct or prohibit vessel movement"[8] to avoid collisions or groundings.

Steven A. McCall, commander of the Valdez Coast Guard station at the time of the accident, testified before the National Transportation Safety Board's hearing on the accident that the direction rule generally comes into play only in situations where the center has information the ship might not have, such as the location of another vessel on a potential collision course.[9] In the case of the EXXON VALDEZ, McCall testified, it's unlikely the watchstander would have ordered the ship to make a course change, even if he could have known it had already violated the rules by leaving the traffic scheme altogether.

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[7] NTSB hearing, May 20, 1989, testimony of Commander Steven A. McCall, pg 1254
[8] NTSB hearing, May 20, 1989, quoted from Valdez Vessel Traffic Service Manual, pg 19
[9] NTSB testimony, McCall, pg 1245

Q You said earlier that there is no way in the world that the traffic controller could have prevented this ... grounding from occuring. If he had made a radio call like that (informing the ship it was outside the lanes), do you think that might have been a way that he could have shaken the third mate out of his doldrums and maybe gotten a change of course sooner?

McCall There's a lot of speculation in that question. I believe that had the watchstander ... been able to contact them, and based on the situation you just presented, this ship would have acknowledged that they knew they were outside the lanes, which they already admitted they were. So the watchstander would have just got a 'Roger that,' and he would have been watching them on the scope. [10]

Commander Edmond P. Thompson, who assumed command of the Valdez Coast Guard station after the EXXON VALDEZ grounding, agrees with McCall's contention.

"The fundamental philosophy is that a Vessel Traffic Service is an aid to navigation, not a navigational control system. If you deviate from the lanes and don't tell us, you get challenged. But once you tell us you're leaving the lane, we assume you know what you're doing and don't get

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[10] ibid., pgs 1231-32

challenged. I'm just not sure he'd have been challenged in this case," Thompson said.[11]

At the heart of such a system is the long-held mariners' notion of deference and supreme respect for a ship captain's experience and the responsibility inherent in the rank. It's no small measure of the depth of this faith in the ship's master that the watchstander on duty last March 24 was able to busy himself with paperwork and other shift-change duties, even though he knew a supertanker carrying 1.2 million barrels of oil had left its normal traffic lane and was out of view of the Coast Guard's radar as it dodged icebergs in the dark.[12]

The fact that the Vessel Traffic Center's radar couldn't keep track of the EXXON VALDEZ has prompted a fair amount of debate since the accident. The Raytheon units were installed because they could be maintained at lower cost by the Coast Guard's own technicians, saving a projected $3.8 million in maintenance costs over 10 years.[13]

Although watchstanders say the current radars are adequate, Patrick Levy, a civilian technician who maintained the original AIL/Eaton radars, strongly disagreed with the decision to install the Raytheon units. Levy wrote Alaska Congressman Don Young in 1984 when he learned of the Coast Guard's plans, warning, "This is not an upgrade of an existing system, but a downgrade with a new system. I still can't help feeling that this is a tremendous waste of taxpayers' money and is also bringing an oil tanker disaster in the Sound closer to a reality."[14]

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[11] Commander Edmond P. Thompson, personal communication

[12] NTSB testimony, Blandford, pgs 550-554

[13] *The Exxon Valdez Oil Spill: A Management Analysis,* by Richard Townsend for the Center for Marine Conservation, September 1989, pg 13

[14] Patrick Levy, letter to Congressman Don Young, February 29, 1984

After a six-month evaluation of the new radar, then-Valdez Coast Guard Commander Michael Cavett complained of poor reception during bad weather. His superiors turned down his request to replace one of the Raytheon units with a more powerful radar, however, because the Valdez radar operators favored the Raytheon's resolution over a unit that would provide longer range.[15]

The AIL/Eaton radar routinely picked up traffic about 18.5 miles south of the Potato Point radar site, according to the technician.[16] The current radar provides coverage of Valdez Arm and Prince William Sound at a range of up to 20 miles in optimum conditions, but its useful range often is much shorter, especially in conditions of snow, rain or high wave action. McCall told the safety board the radar's range averaged 14 miles during the month following the accident, but he also conceded that sometimes watchstanders can't pick up ships as close as six miles.[17] McCall, now assigned to the Coast Guard's Second District in St. Louis, Missouri, later said he wasn't aware just how inconsistent the radar was until he monitored its performance throughout April 1989 at the request of the safety board.

"It surprised me to find out we had that big a gap in the coverage," he said. "The previous radar was more powerful, and in hindsight, it would've been nice if we would've been able to see (the EXXON VALDEZ)."[18]

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[15] Jones, op. cit.
[16] Townsend, pg 12
[17] NTSB testimony, McCall, pgs 1204-1205
[18] McCall, personal communication

Removing the AIL/Eaton radars also didn't make sense to Jim Woodle, who commanded the Valdez Coast Guard station and the Vessel Traffic Center from July 1979 to March 1982.

"Switching to the Raytheon radars allowed the Coast Guard to lay off the civilian contractors who had been doing the maintenance work," Woodle said. "It seemed wiser to me to train Coast Guard personnel to maintain the higher-quality radar if they were just interested in saving money."[19]

Woodle, who left the Coast Guard to become Marine Superintendent and Port Captain for the Alyeska Pipeline Service Company, said an earlier Coast Guard decision against placing a radar site at either Bligh Island or Glacier Island also helped reduce tanker traffic coverage and ice detection in Prince William Sound well below the level environmentalists and fishermen believed would be in place when oil began to flow through the Trans-Alaska Pipeline twelve years earlier.

But despite not delivering on some of its earlier promises, the Coast Guard apparently had an adequately staffed, strictly regulated operation in its Valdez Vessel Traffic Center and Marine Safety Office before the most serious budget cuts began in the mid-1980s.

Woodle, for example, had 10 more personnel on staff than were assigned to Valdez when the EXXON VALDEZ grounded, and a higher percentage of his staff was assigned to vessel traffic. The watchstanders also appear to have cast a much more critical eye on tanker operations: In addition to more closely monitoring the ship traffic outside the Narrows through constant plotting, ships were required to radio the traffic center at

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[19] Woodle, op. cit.

frequent checkpoints if they were in the traffic lanes and no state harbor pilot was aboard.

The level of monitoring the Traffic Center maintained during Woodle's tour makes it difficult to for him to accept the contention by McCall and Thompson that the watchstander wouldn't have delivered a direct order to the EXXON VALDEZ if it had been observed approaching the reef.

"I just don't agree with that. Certainly we would have had more awareness of the ship's position, and if we knew where he was, we would've directed him to get back into the lanes," Woodle said.[20]

Woodle said he never expected tanker captains to perform as if they were his military subordinates when he ran the Valdez station. Nonetheless, he was distressed to hear the casual nature of the radio conversations between Capt. Hazelwood and the Traffic Center when recordings of the transmissions were made public after the grounding. To Woodle, it was another sign that the operation had allowed an important part of its policing authority to erode.

"We were definitely traffic cops. We monitored speed. We monitored position. And when they sought permission to leave the Traffic Separation Scheme, an officer had to make that decision," he said. "The pilots really objected to that. They felt they could take a ship anywhere in the world and they strongly objected to having to ask us permission. But they did it."[21]

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[20] ibid.
[21] ibid.

While tanker captains did sometimes request and receive permission to deviate from the lanes to avoid ice, Woodle said it was not a regular occurrence.

"We did not allow routine departures from the Traffic Separation Scheme. When the ice was present in large amounts, they had the option of staying in the lanes and slowing their speed to five knots, or staying in port until the ice cleared," he said. "The theory was that if they'd slow down, they could usually get through the ice without having to deviate out of the lanes."[22]

By contrast, when the EXXON VALDEZ left the southbound traffic lane, it was executing what had indeed become a routine maneuver. And instead of slowing, as might have been the case in earlier days, Third Mate Gregory Cousins testified when the ship ran aground it was travelling at 12 knots and was in "load program up," meaning a computer program was increasing the engine revolutions toward maximum sea speed.[23]

Keith, whose Annapolis, Maryland, firm has studied Cook Inlet and Prince William Sound tanker operations for the Alaska Oil Spill Commission in the wake of the EXXON VALDEZ casualty, said in allowing lane deviations to become routine, the Coast Guard ignored the fact that the original idea of confining tankers to the lanes had a larger goal than simply collision avoidance.

"It also was designed to keep traffic out of the sensitive fishing areas -- to keep tankers from running over fishing boats -- and to give a tanker a good measure of 'coast time' in the event of a power failure," Keith said. "If the Coast Guard had thought more about all the reasons for

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[22] ibid.

[23] NTSB testimony of Gregory Cousins, May 16, 1989, pg 57

the separation lanes, they might have been might firmer about making the tankers stay in them, and this accident wouldn't have happened."[24]

Woodle said having three-person watches in the Traffic Center did create a certain amount of duplication, but given the amount and nature of the cargo involved, he believed the redundancy was justified. That belief also guided a policy of boarding and inspecting every tanker that called at the Alyeska Pipeline terminal. The policy was Woodle's, not that of the Coast Guard, which was averaging only ten to fifteen percent boardings nationally, he said.

"The one-hundred-percent boarding policy was not a Coast Guard requirement, but we had the people and the Alyeska terminal was our only customer, so it would have been ridiculous not to make use of the staff we had," Woodle said.[25]

Woodle said the inspectors checked lifesaving gear and safety equipment in general; firefighting gear and other equipment essential to the safe loading of oil; and reviewed the ship's charts.

William Good, a master now running a ship in the Texas-Florida refined oil products trade, said when he made his initial tanker trips to Valdez between 1978 and 1981, he always knew what to expect.

"They would board and check every piece of equipment to see if you were in violation. That was the routine -- they'd check you over and over again, just like a mid-period inspection," Good said. "It was a real pain, but the fact that it was there kept you on your toes. Everyone was very

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[24] Keith, op. cit.
[25] Woodle, op. cit.

conscientious. You lived in fear of screwing up and that's how it should've been."[26]

When he returned in the mid-1980s, Good said, things were much different.

"They'd still board you, but it wasn't nearly as stringent," he said. "It just seemed to become a much more friendly situation."[27]

Good suggests the turning point came after Ronald Reagan moved into the White House in 1981. The combination of cuts to the Coast Guard budget and the influence of Reagan's strong belief that government had little need to regulate business made the eventual loss of vigilance inevitable, Good believes.

That theory has some credibility with Bob Beevers, a captain who sailed extensively in the Valdez trade from its beginnings until his retirement in 1987.

"In the early years, you could count on the Coast Guard being there when you docked, or if they weren't standing there, you knew they'd be there shortly," he said. "They continued to have their safety inspections, but after 1984, I really think safety meant nothing to them. And in my last two years up there -- '86 and '87 -- they very rarely even visited the ships. In the latter years, if they did come to the port, it was definitely during eight-to-five hours, Monday through Friday."[28]

Woodle, in his new civilian position at the Alyeska terminal, said he noticed the change in attitude fairly soon after his departure from the Coast Guard. He said there soon was a "general feeling" at Alyeska that the Coast

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[26] William Good, op. cit
[27] ibid.
[28] Robert Beevers, op. cit.

Guard had lessened its vigilance; certainly, he said, the agency didn't execute its duties with the presence it once had.

"The Coast Guard started slacking off, even its response to oil spills," he said. "We'd call them from the terminal and tell them there was a slick on the water and they'd ask how big it was. You'll never find this in writing, but it became a rule of thumb that if the amount of oil spilled didn't at least equal the amount of fuel it took to drive over there, they wouldn't respond, whereas before we'd go if a cup or even a tablespoon of oil hit the water."[29]

Woodle and Beevers believe perhaps another, even more potent, force also came into play after the first few years of tanker operations: the same kind of complacency that a federal report found was "a major enemy"[30] of the preparedness of government and industry to deal with a major oil spill in Prince William Sound. After twelve years and thousands of tanker transits through Prince William Sound without major incident, the potential for disaster in the area covered by the Vessel Traffic Service simply did not loom as large as it once did.

Probably a major factor in the Coast Guard's false sense of security was the fact that everybody's favorite disaster scenario -- a collision or grounding in the Valdez Narrows -- had never materialized. McCall told the Safety Board that "Valdez Narrows is and has always been the major concern point for the VTS Valdez"[31] and that once a vessel "departed the

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[29] Woodle, op. cit.

[30] Report to President Bush, May 18, 1989, by Secretary of Transportation Sameul K. Skinner and Environmental Protection Agency Administrator William K. Reilly, authors' cover letter

31 NTSB testimony, McCall, pg 1254

Narrows and was in expanding waters, the perceived danger decreased, especially with no other traffic in the area."[32]

The Coast Guard was doing its job in keeping traffic under control in the confines of the Narrows, and the idea that a tanker out in the sound might someday cross all the way out of the lanes and crash into Bligh Reef was all but inconceivable before last March, McCall said.

"I don't want to say 'complacent,' but I think everybody convinced themselves that everything was fine, there was not going to be any trouble," he said. "The concern was the Narrows ... If someone had presented us with the (EXXON VALDEZ) scenario as a script for ABC's 'Monday Night at the Movies,' I think everyone would've just laughed. No one would've believed it. In fact, I still have a hard time believing it happened."[33]

Keith, however, believes if that truly was the Coast Guard's view -- that Middle Rock and the Valdez Narrows presented the only real potential source of trouble -- then that's further evidence the agency indeed was ignoring historical considerations that were part of the development of the Prince William Sound tanker transportation system.

"The Valdez Narrows and Middle Rock absolutely were not the only area of the Sound that people were worried about," Keith said. "The area between Hinchinbrook Entrance and Seal Rocks, for example, was identified as a high-risk area back then, and the risk is just as high there right now. The idea of relaxing because a tanker has made it safely through the Narrows just doesn't make any sense."[34]

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[32] ibid., pg 1255
[33] McCall, personal communication
[34] Keith, op. cit.

Thompson, who assumed command of the Coast Guard in Valdez in July 1989, sees maintaining a high level of attentiveness in the traffic center as the station's biggest challenge now. Despite the fact that Valdez is the third-busiest port in the United States by tonnage, Thompson said, activity often is very slow, running anywhere from no tanker traffic to several ships in a single day, Thompson said.

"My perception is that this is a pretty quiet outpost most of the time," Thompson said. "If this VTS weren't mandated by law, the number of transits wouldn't justify its existence. But by tonnage and the mere presence of a facility that's shipping 20 percent of the nation's oil, it's definitely justifiable to have a VTS here."[35]

The Commandant of the Coast Guard has now ordered the Traffic Center staff to return to the practice of physically charting tanker movements, noting positions every six minutes in the sound and every three minutes through the Valdez Narrows. Temporary personnel have been assigned to Valdez to provide each watch with an additional person.

Although Thompson does not believe the work requires officer supervisors, he does plan to have a chief petty officer -- the service equivalent of a mid-level manager -- oversee each watch. He has asked that these personnel be senior radar specialists, and he hopes to get them permanently assigned to Valdez by mid-1990.

Thompson also issued a rule in September requiring a large section of the traffic scheme -- from south of Bligh Island north to the Valdez Narrows -- to be restricted to one-way traffic for 24 hours after any tanker deviates from a lane to avoid ice. Thompson issued the rule after two

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[35] Thompson, op. cit.

inbound tankers and one outbound ship simultaneously deviated from the normal traffic lanes. Two of the ships were between the shoal waters of Bligh Reef and the leading edge of the ice floe -- a situation that had far too much resemblance to the pre-grounding maneuvers of the EXXON VALDEZ to suit the Coast Guard.

"I don't believe they were in danger because the water is six miles wide where they were making the deviations," Thompson said. "But I felt the rule was justified because they were all out there dodging around together, and because of the fundamental issue of the EXXON VALDEZ avoiding ice. This at least eliminates that one variable for captains to have to worry about."[36]

According to a November 1989 letter from Transportation Secretary Samuel K. Skinner to Gov. Steve Cowper, the Coast Guard also plans to reinstall a more powerful radar to improve its foul-weather surveillance in the Sound and upgrade the radar displays in the Center with equipment that includes an alarm that will sound in the event a vessel is off track. The agency also is considering requiring tankers to carry some sort of steady transmission equipment -- possibly linked to a satellite system -- that would continually broadcast ship positions to the Traffic Center, and is studying whether it needs improve its navigational aids at hazardous points in the Sound, including Bligh Reef.[37]

But in rejecting a state request to require tankers to either stay in the separation lanes and reduce speed during heavy ice conditions or remain in port until the hazard is reduced, Skinner's letter also made it clear that the Coast Guard's traditional respect for the authority and responsibility of the

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[36] ibid.

[37] Letter from Transportation Secretary Skinner to Governor Steve Cowper, November 22, 1989

ship's master remains undiminished, notwithstanding the tragedy of the EXXON VALDEZ.

"The master of a vessel underway is charged with the responsibility of safe navigation," Skinner wrote. "A Vessel Traffic Service can provide valuable navigational information, but the master must integrate this information with his experience and other factors only available aboard his vessel to determine appropriate maneuvering orders...In the absence of other traffic, there is not practical reason why a vessel should not use all sea room available to reduce contact with ice or other hazards to navigation."[38]

[38] ibid.

APPENDIX I

EFFECT OF U.S. COAST GUARD ENFORCEMENT ON OIL TANKER SAFETY

RESEARCH REPORT

Effects of U. S. Coast Guard Enforcement Performance on Oil Tanker Safety

Report submitted: December 4, 1989
Principal Investigator: Mary Evans

EFFECTS OF U. S. COAST GUARD ENFORCEMENT PERFORMANCE ON OIL TANKER SAFETY

Date of Preparation:
Dec. 4, 1989

Principal Investigator:
Mary B. Evans

DISCLAIMER

Errors in facts or judgments presented in this report are the sole responsibility of the principal investigator.

ACKNOWLEDGEMENTS

This draft report could not have been completed in the short amount of time available without the very generous assistance of nine people. In particular, William P. Coughlin, maritime reporter for the *Boston Globe*, and George F. Reinhard, former merchant mariner and oil tanker executive, now maritime arbitrator, Port Washington, New York, together provided most of the documentation cited in this paper as well as invaluable insights, and I thank them.

I am also very grateful for the help, documentation, and advice provided by: Professors Ralph Johnson and Zygmunt Plater of the University of Alaska Sea Grant Legal Research Team; Charles Hamel, of Charles Hamel and Associates, Alexandria, Virginia; Tanker Advisory Center Director Arthur McKenzie, New York; Rick Steiner, University of Alaska marine advisor at Cordova, Alaska; and Boston College law students Bert Cooper and Dan Cronin.

In addition, it would be difficult to prepare a discussion of Alaskan tanker safety issues and consequences of Federal decision-making without a basic understanding of Prince William Sound: its weather and current patterns, geography and oceanography, and its human and nonhuman inhabitants. I owe that knowledge to *Peregrine* and her crew.

Contents

EXECUTIVE SUMMARY

The grounding of the *Exxon Valdez* demonstrated the inadequacy of present oil spill response technology and hence the need for oil spill prevention. The U. S. Coast Guard has authority not only to respond to oil spills but also to prevent tanker accidents, by oversight of petroleum shipping operations, regulation of tankship design and construction, and inspection of vessels and shore facilities.

Whether the Coast Guard is able to fulfill these responsibilities in an impartial, competent, and careful manner is critically important for ensuring safe passage of oil tankers through American waters. Evidence suggests, however, that the Coast Guard has fallen short in two important aspects of its work. Both in its enforcement of existing regulations and in decision-making on tanker design, the agency has demonstrated inattention to its duties and pro-industry bias.

Examples of negligent Coast Guard enforcement of existing tanker safety regulations include:

- Inadequate vessel inspection and enforcement practices that contributed to the loss of the *Marine Electric* and may have contributed to loss of the *Texaco Oklahoma*

- Use of only cursory evaluations in approving reductions in tankship crew sizes, despite lack of knowledge of the effects of reducing crews on tankship safety

- Poor preparedness for the *Exxon Valdez* oil spill, despite a series of earlier spills during the previous winter in Alaskan waters

- Weaknesses in oil tanker traffic oversight in Prince William Sound

- Relinquishment of authority to conduct an investigation of the *Exxon Valdez* grounding

- Misleading data analysis in a recent study of the effects of double bottoms and in an estimate of the probability of marine spills along the route to Valdez

Design of oil tankers may be the single most important pollution prevention factor. Coast Guard tanker design decisions have apparently been influenced by pressure from the oil industry which it is charged to regulate. For example, the Coast Guard twice reversed support for a requirement that oil tankers have double bottoms.

A variety of factors may be the root causes of these observed problems. For example, inattentiveness to inspection and enforcement duties may be explained at least partially by funding restrictions and the higher priority given to other duties, especially drug interdiction. Other evidence suggests that the Coast Guard is sensitive to industry pressure. Several factors may promote Coast Guard decisions favoring shipping industry interests:

- Energetic advocacy of shipping interests by a well-funded and powerful industry

- Knowledge that higher-paying jobs in industry may be acquired by Coast Guard officials after retirement

- Similarity of backgrounds and work experiences of Coast Guard personnel and members of the regulated shipping industry

• Proliferation of Coast Guard mandates imposed by Congress

• A historic Coast Guard concern with facilitating marine commerce

Coast Guard tanker design decisions in particular may have been influenced by two factors:

• A historic national concern with the economic and national defense implications of observed declines in the U. S. merchant marine and expanding competition from overseas. This concern may encourage a bias on the part of the entire Federal Government favoring shipping interests over environmental protection.

• Federal promotion of international cooperation in regulation of tanker trade and uniform regulation of international oil shipping. This inhibits development of U.S. regulations that are more restrictive than those imposed by other maritime nations.

Unresolved problems with safety of tankships in the Alaska trade exist. These include inadequate staffing of vessel inspectors at ports where most Alaska tankers are examined, high frequency of hull failures and power losses, and a large proportion of poorly-rated tankers in the Alaska fleet. The State of Alaska has opportunities to reduce or eliminate these problems and to promote better Coast Guard enforcement practices.

• The State may petition Congress for modification of existing statutes which authorize the Coast Guard to conduct complete criminal investigations of marine casualties, but which do not so authorize the National Transportation Safety Board or other Federal authorities.

• The State may petition Congress for modification of existing conflict-of-interest legislation to prevent potential misuses of influence and information by former Coast Guard employees.

• The State may use provisions of the Administrative Procedures Act, 5 USC § 553(e), to petition the Coast Guard to enact regulations restricting travel in Alaskan waters during periods of darkness and hazardous weather, mandating improved navigation equipment, requiring licensing of tankship and transfer facility owners, mandating improved checking of operator competence, and establishing improved tanker design standards.

• The State may choose to join other coastal states to test its right to use CZMA consistency provisions to adopt state regulations for tanker safety and to develop cooperative mechanisms for oversight of petroleum shipping operations, Coast Guard decision-making, and inspection practices of both the Coast Guard and the American Bureau of Shipping.

• The State may establish mechanisms for both State and citizen oversight of Federal decision-making and shipping operations in Prince William Sound and elsewhere in Alaska.

• The State may campaign in the U. S. Congress and at International Maritime Organization conferences for better tanker safety and design standards.

INTRODUCTION

Frequencies of accidental oil spills from tankers and of total losses of tankers worldwide have shown overall declines during the past 10 years (Figures 1 to 3). This appears to suggest that sufficient tanker safety measures are in place. The declines probably result, however, from a worldwide decrease in the amount of oil transported by sea rather than from improved safety practices. This decline began in the mid-1970s, but reversed itself in 1986 (Figure 4). The worldwide seaborne oil trade is expected to continue to increase through the 1990s. Associated spills and vessel losses probably will increase again as well. In fact, the frequency of accidental spills from tankers has increased since 1987.

Condition of the Valdez fleet Safety of the Valdez tanker fleet is a particular concern. Numerous accidents and near-accidents in Alaskan waters, a 1988 Coast Guard report of hull weaknesses apparently endemic to vessels in the Alaska trade, fleet age, and the large proportion of tankers in relatively poor condition traveling to Valdez are causes for concern.

Design weaknesses common among tankers in the Alaska trade may speed deterioration of ship condition. Coast Guard vessel inspection records and incident reports for the 3-year period between 1984 and 1986 were examined in a casualty study released last year.[1] Tankers serving the Valdez terminus make up only about 13 percent of the U. S. merchant marine fleet, but experienced 52 percent of all structural failures of U. S. ships. Tankers in the Alaska trade suffered more than three times as many hull cracks and other structural failures as tankers on other routes. Fatigue cracking was most common in the midships region of vessels, suggesting that the constant up-and-down working of tanker hulls in heavy seas is the primary stress factor.[2]

The Tanker Advisory Center reports on the probable safety performance of all tankers, using information compiled from Lloyds List and other standard sources. Tankers are rated annually on a scale from 1 (low) to 5 (high); this information is used by charterers, cargo owners, underwriters, brokers, and others. Tankers are rated on the basis of rates of reported casualties, loss experience and reputation of shipowners and owner nations, and other factors (McKenzie 1989). The mean rating of the 94 tankers in the regular Alaska trade is 2.8; 14 of the 94 tankers, or 15%,

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1. The study was described by W. Rempel, *Alaska oil ships in sea of troubles*, Los Angeles Times, May 15, 1989, at A1. An additional study of structural problems observed in the TAPS fleet is being conducted by Coast Guard Headquarters. Results will be released in early 1990.

2. Recent cases of such hull cracks in tankers serving the Valdez terminus include the following (See Eric Nalder, *Alaska fleet: cracks in the system*, Seattle Times, Nov. 13, 1989 at A4, col. 1, and W. Turner, *Two big oil spills traced to one tanker*, The New York Times, Oct. 15, 1989.):
   - A 17-foot-long crack in a port tank of the 1,008-foot-long, BP-leased tanker *Stuyvesant* observed during a drydock inspection after a 23,000-barrel spill in January 1987 from the tanker into the Gulf of Alaska. In October 1987, the *Stuyvesant* spilled another 16,000 barrels near the Queen Charlotte Islands through an 18-foot-long hull crack formed after the tanker was hit by a freak wave.
   - Three bottom cracks, one 9 feet long, in the Interocean tanker *Thompson Pass* in January 1989. The tanker spilled 71,000 gallons of oil into Valdez harbor on January 3.
   - Eight small hull cracks, the largest 4 inches long, in the Keystone Shipping Company tanker *Atigun Pass*, found during a drydock inspection, summer 1989.
   - A 6-inch bottom crack in the *Mobil Arctic*, discovered during loading at Valdez in July 1989.
   - A 6-inch side crack in the *Arco Juneau*, found September 1989.

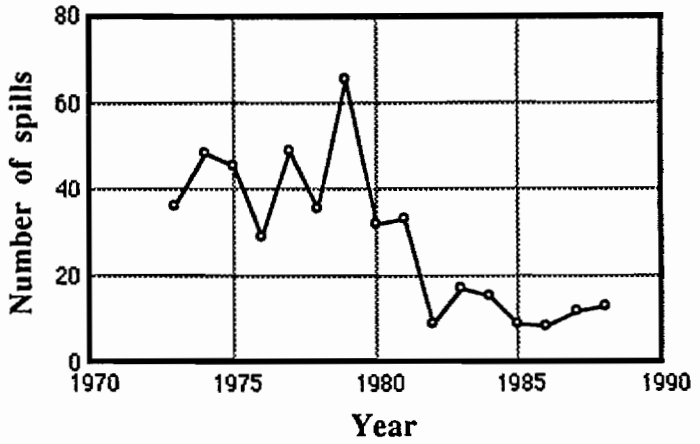

Figure 1. Trend in number of accidental oil spills worldwide from tankers 10,000 dwt or more in weight. Compiled from Tanker Advisory Center data.

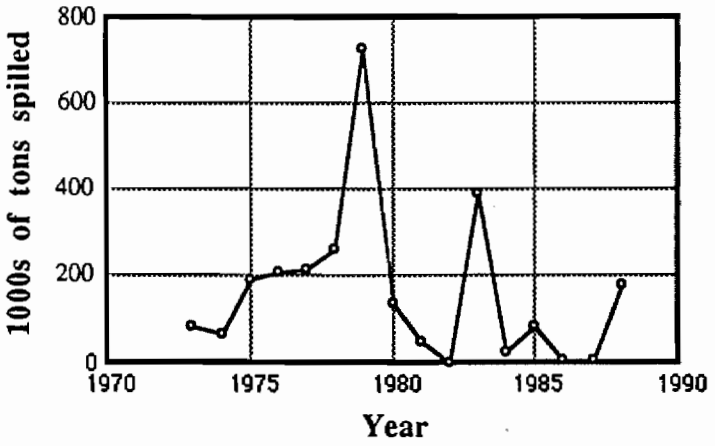

Figure 2. Trend in the tons of oil spilled worldwide from tankers of 10,000 dwt or more in weight. Compiled from Tanker Advisory Center data.

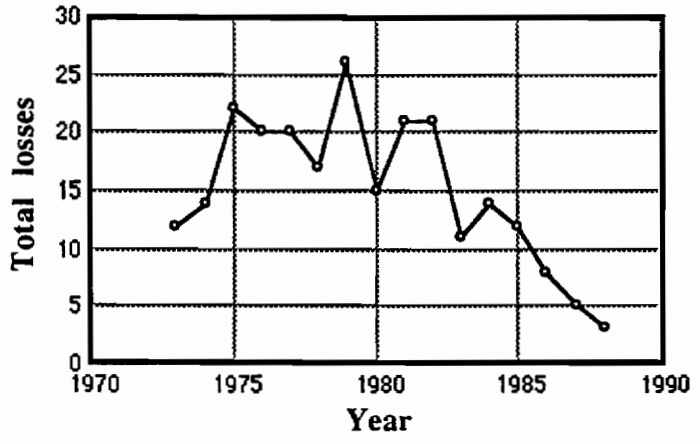

Figure 3. Trend in tanker total losses. Compiled from Tanker Advisory Center data.

received a rating of 1 (Figure 5).[3] Tanker Advisory Center Director Arthur McKenzie cautioned that a rating of 1 does not mean that a tanker is unsafe, only that it is may perform less safely and prudently than tankers receiving higher ratings.[4] In fact, however, more than one-third of tankers rated 1 by the Center experienced casualties each year from 1986 to 1988 (Table 1). 'Casualties' include hull cracks or other failures, collisions, groundings, losses of power, as well as other mechanical failures or accidents. The wide range in casualty rate and the large number of tankers receiving the lowest rating suggest that seaworthiness of at least some tankers in the Alaska trade is in question.

Table 1. Annual percent of oil tankers worldwide at each Tanker Advisory Center rating level which reported casualties during the period from 1986 to 1988.[5]

Rating	Percent sustaining casualties		
	1986	1987	1988
5	8.8	6.8	9.0
4	9.9	10.9	10.9
3	12.7	10.0	10.9
2	13.7	11.9	13.6
1	35.4	33.8	34.4

Another concern is age of the tanker fleet serving the Valdez terminus. Average age of tankers in the regular Alaska trade is 18 years (Figure 6).[6] Exxon Corporation considers the nominal life span of an oil tanker to be 20 years.[7] Because a surplus of oil tankers exists worldwide, fleet sizes of all major oil companies have declined over the past 15 years[8], new tankers are not being constructed, and hence old tankers are not being replaced as originally anticipated. As a tanker ages, age-related structural failures and corrosion normally become increasingly common and significant. Such problems may develop more rapidly, and become more severe, in tankers in the regular Alaska trade, which encounter more severe weather and heavier seas than do vessels elsewhere.

Adequacy of Coast Guard regulation Careful regulation of the petroleum shipping industry by both state and federal agencies is essential for ensuring safety of the Alaska tanker fleet. It is naive to expect the industry, which depends on profits, to be objective in its decisionmaking. Apparent problems with the Alaska fleet suggest that current safety enforcement practices and methods of setting tanker design standards require review.

3. Calculated from data presented by Stan Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989, at A9, col. 3.
4. Arthur McKenzie (Oct. 1989): personal communication.
5. These data are presented in: Arthur McKenzie, 1989, *Petroleum tankship operations* at 17-4c.
6. See Stan Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A9 cols. 1 and 2.
7. See Exxon Corporation, *Large oil tanker structural survey experience, a position paper*, June 1, 1982 at 3 and 23.
8. See Arthur McKenzie, 1989, *Petroleum tankship operations*, at 1-1 and 3-6.

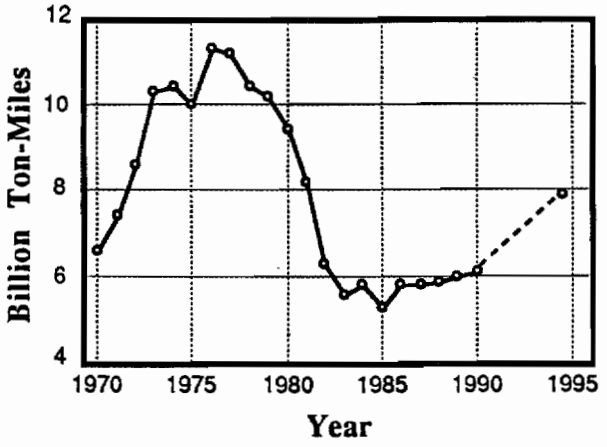

Figure 4. Existing and expected trends in the worldwide seaborne oil trade. Compiled from Tanker Advisory Center data.

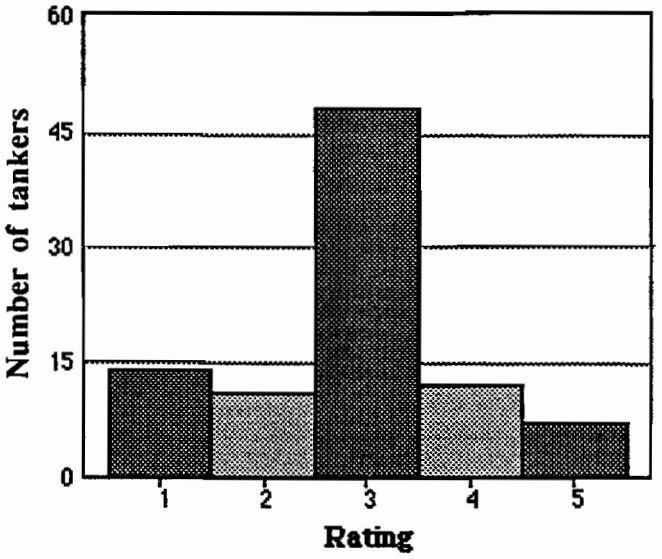

Figure 5. Tanker Advisory Center ratings of 94 tankers in the regular Alaska trade. Compiled from data presented in S. Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A9 col. 3.

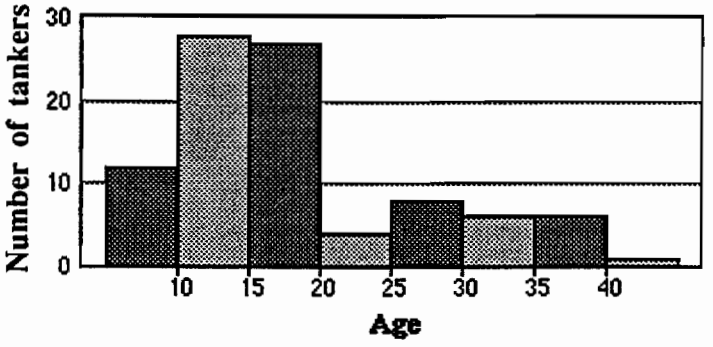

Figure 6. Age in years of the 94 tankers in the regular Alaska trade. Compiled from data presented in S. Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A9 col. 3.

The U. S. Coast Guard has the primary responsibility to oversee petroleum shipping in Alaskan waters.[9] The agency is charged to carry out its responsibilities by inspecting both vessels and shore transfer facilities and by boarding tankers from time-to-time to ensure that regulations are not violated. It also oversees and regulates tankers traveling within the Prince William Sound Vessel Traffic System. It sets standards for ship construction and design as well as for minimum vessel crew size. In cooperation with other State and Federal agencies, the Coast Guard prepares spill prevention and contingency plans.

Is Coast Guard standard setting and enforcement sufficiently stringent, or do deficiencies and pro-industry bias exist? Many observers feel that the Coast Guard maintains too close a relationship with the shipping industry it has been charged by the U. S. Congress to regulate. The late Senate Commerce Committee Chairman Warren Magnuson, in a 1974 letter to the Secretary of Transportation, stated: "I am...concerned that the rules [promulgated by Coast Guard for design of tankers for the Alaska trade] were developed in a manner that relied too heavily on the input of special interests..." U. S. Representative George Miller charged that an overly close relationship between the oil shipping industry and the Coast Guard hampered objective consideration of tanker safety during discussions on the feasibility of the proposed Trans-Alaska Pipeline: "The close bonds between the Coast Guard and oil companies that had formed--and the combined technical expertise of these two groups--made it difficult, if not impossible, for the States and environmental groups to effectively challenge tanker safety requirements and regulations." Anchorage reporter Stan Jones charged, "...the Coast Guard is more often partner than policeman to the shipping companies it is supposed to regulate."[10]

9. See National Response Team, The *Exxon Valdez* oil spill, a report to the President, May 1989, at 11.

10. See Congressional Record, April 25, 1989, and Stan Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989, at A1, col. 5.

STATEMENT OF OBJECTIVES

The objectives of this report to the Alaska Oil Spill Commission are to:

• describe Coast Guard responsibilities for ensuring marine safety and environmental protection in Alaska and elsewhere;

• describe the thoroughness with which the Coast Guard carries out its responsibilities to enforce regulations and such pro-industry bias as may occur;

• describe the effects of Coast Guard performance on safety of marine oil transport in Alaska; and

• recommend remedies to such problems as may exist to the State of Alaska.

STUDY METHODS

To prepare this report, I interviewed current and former Coast Guard personnel at Portland, Oregon, Seattle, Washington, Valdez, Alaska, and Washington, D. C.; crew members of oil tankers in the regular Alaska trade; journalists; researchers; State of Alaska officials; and others. I examined Coast Guard documents, including training manuals, briefing books, and research and investigation reports. I inspected documents prepared by other Federal and State agencies; newspaper reports and interview transcripts; relevant portions of the Code of Federal Regulations, the U. S. Code, and the Federal Register; and other reports, as well as shipping company, maritime union, and Coast Guard memoranda and letters.

Because of the short length of time available for preparation, this report should not be considered an exhaustive study, but instead a preliminary summary of available information.

U. S. COAST GUARD: BACKGROUND INFORMATION

COAST GUARD RESPONSIBILITIES

Congress has charged the U. S. Coast Guard with a broad array of mandates.[11] Over the course of U. S. history, the Coast Guard has gradually become "the chief agent for the promotion of a whole range of national purposes in the maritime arena" (U. S. Dept. of Transportation 1983).

In the late 1700s, the Lighthouse Service and Revenue Cutter Service, both Coast Guard predecessors, were assigned to maintain lighthouses, collect revenues for the new Federal government, and provide for the national defense. In 1838, after a series of shipping accidents, a third predecessor, the Steamboat Inspection Service, was created by Congress to perform vessel safety inspections. In 1848, a fourth predecessor, the Life-Saving Service, was charged by Congress to perform maritime search and rescue and to establish and maintain a chain of coastal rescue stations. The Coast Guard was formally created in 1915 when Congress merged the Life-Saving Service and Revenue Cutter Service. By World War II, the agency had acquired responsibilities of other predecessors and had assumed its modern form (Mangone 1988). Originally organized within the Department of Commerce, the Coast Guard was moved in 1967 to the Department of Transportation, where it remains today.

The agency has the following traditional duties: "promoting safe and efficient marine transportation; promoting the collection of national revenues; promoting measures to enhance national security; and promoting the preservation of life and property following maritime accidents" (*ibid*). Its mandate to protect the marine environment is its most recent. Although this duty may appear to differ from its traditional responsibilities, the agency has had a long-standing responsibility for the safety of merchant vessels, their crews, and their cargo. It is the responsibility to protect the environment from spilled cargo which is new.

Eight formal Coast Guard missions represent the major operations of the agency. These include: Merchant Marine Safety, Aids to Navigation, Search and Rescue, Maritime Law Enforcement, Military Readiness, Boating Safety, Port Safety, and Marine Environmental Protection (U. S. Dept. of Transportation 1983).

Most Coast Guard responsibilities to ensure safety of oil tankers in the Alaska trade are included in two of these formal missions: Marine Environmental Protection and Merchant Marine Safety. Additional responsibilities are included in Aids to Navigation and Port Safety.

THE MARINE ENVIRONMENTAL PROTECTION MISSION

During the past several decades, the U. S. government has become concerned about the increasing number of vessels entering U. S. ports, increasingly frequent marine transport of

11. In several recent studies, reviewers have examined whether the Coast Guard's budget and resources are sufficient to meet its broad range of mandates (National Advisory Committee on Oceans and Atmosphere, 1983). These studies have included:

U. S. Department of Transportation. 1982. Coast Guard roles and missions. Washington, D.C.

General Accounting Office. 1980. The Coast Guard–limited resources curtail ability to meet responsibilities. GAO Report No. CED-80-76. Washington, D. C.

Committee on Merchant Marine and Fisheries. 1981. Semi-paratus: the United States Coast Guard, 1981. U. S. House of Representatives Report No. 97-355. Washington, D. C.

U. S. Senate Committee on Commerce, Science, and Transportation. 1982. The Coast Guard. Washington, D. C.

hazardous cargo, and increases in the tonnage and draft of cargo vessels, especially tankers (Mangone 1988). Congressional legislation enacted during the 1970s established a Coast Guard mandate to protect the marine environment from vessel-produced pollution. The most important of this legislation is the Ports and Waterways Safety Act of 1972 (PWSA), 33 U. S. C. § 1221 et seq.; 46 U. S. C. § 391a, and the Port and Tanker Safety Act of 1978, Pub. L. No. 95-474, 92 Stat. 1471. These two acts established and then expanded the Coast Guard's responsibility to regulate both design and construction as well as movement of tank vessels in order to protect the marine environment. The acts also empower Coast Guard Captains of the Port to control operations at waterfront facilities.

The Coast Guard also enforces all U. S. laws at sea, including those intended to restrict marine pollution by vessels. The Federal Water Pollution Control Act of 1972 (FWPCA) or "Clean Water Act", 33 U. S. C. § 1321, is the main Federal legislation restricting spills of oil and other hazardous substances into the sea and inland waterways. This act includes provisions for Coast Guard enforcement and directs the Coast Guard to promulgate regulations to prevent pollution from vessels. Under provisions of this act, the Coast Guard established regulations for U. S. oil tankers in 1976, prescribing segregated ballast tanks and slop tanks for certain tankers, setting standards for cargo tank arrangement and size, and restricting discharge of cargo residue (U. S. Department of Transportation, 1986).

The Act for the Prevention of Pollution by Ships was passed by Congress in 1980 to implement the International Convention for the Prevention of Pollution from Ships of 1973, amended by the Protocol of 1978, and known generally as MARPOL 73/78 (*ibid*). This act gives the Coast Guard authority to enforce laws restricting vessel discharge of pollutants and includes enforcement provisions.

MERCHANT MARINE SAFETY MISSION

Objectives of the Coast Guard under the Merchant Marine Safety Mission are to minimize deaths and injuries, property losses, and damage to the environment resulting from commercial shipping casualties (General Accounting Office 1985), including tanker accidents. Two primary Merchant Marine Safety programs exist: the Commercial Vessel Safety (CVS) program, operated by the Office of Merchant Marine Safety, and the Port and Environmental Safety (PES) program, run by the Office of Marine Environment and Systems.

About 8 percent of Coast Guard personnel (3,700 people) and 7 percent (about $185 million) of the total agency budget were allocated to Marine Safety operations in 1985 (*ibid*). A Marine Safety Division exists in each of the 12 Coast Guard District Offices. A Coast Guard Captain of the Port (COTP) and staff are stationed at all commercially important U. S. ports; COTP offices have vessel and facility inspection responsibilities.

Under the Marine Safety Program, the Coast Guard is also responsible for participating in development of international maritime safety agreements, and ensuring that foreign-flag vessels entering U. S. ports meet adequate safety standards for design, construction, and operation. About 95 percent of all cargo vessels entering U. S. ports are foreign-flag (*ibid*).

Commercial Vessel Safety U. S. flag vessels are periodically inspected by the Coast Guard from the planning and construction stages until they are scrapped. Nationwide, the Coast Guard inspects about 600 plans and vessels under construction as well as about 20,800 U. S. flag vessels each year; it also inspects about 5,600 foreign vessels (*ibid*).

Commercial cargo vessels in service, including tankships, must be inspected biennially by Coast Guard inspectors for adherence to safety and seaworthiness standards described in 46 CFR (Shipping), Chapters 31 to 43. Vessels which pass inspection are each issued a Certificate of Inspection (COI). A less-detailed reinspection to ensure that the vessel remains in compliance with the terms of its COI is made between recertification inspections.

Vessels need not be in drydock for recertification inspections. Drydock inspections of tankers, at a frequency of 2 every 5 years, are required in addition to recertification inspections. Inspectors evaluate deterioration and damage to cargo tanks, hulls, piping, tail shafts, and rudder assemblies.

Most tankers serving the Port of Valdez are inspected for recertification at Los Angeles, California, Portland, Oregon, and Honolulu, Hawaii. Drydock inspections are made at one or another of the few remaining American shipyards with sufficient drydock and repair facilities. Nearly all tankers in the Alaska trade undergo drydock inspections at Portland, Oregon.

Major deficiencies identified during an inspection must be corrected before a COI is issued or reissued. A vessel cannot legally sail without a current COI. When minor deficiencies are found, an inspector issues a Notice of Merchant Marine Inspection Requirements, listing observed deficiencies and the time periods allowed for correction. If problems are not corrected during the designated time or a vessel sails without a current COI, enforcement options available to the agency range from issuing a letter of warning to processing a civil penalty case through a Coast Guard hearing officer (General Accounting Office, 1985).

Coast Guard vessel inspectors maintain a "close working relationship" with the American Bureau of Shipping (ABS) (*ibid*). The Coast Guard Commandant normally serves as a member of the ABS Board of Managers, and other agency representatives serve on ABS committees (*ibid*). ABS is a vessel classification society; similar societies exist in most industrialized nations. ABS surveyors approve the design and construction of new merchant vessels according to ABS rules. Like Coast Guard inspectors, ABS surveyors also examine merchant vessels for soundness. Such inspections are performed for insurance purposes and to ensure that vessels meet safety standards described in international conventions. The Coast Guard agreed under several memoranda of understanding to accept ABS reviews of vessel plans and of new construction or modifications of certain hull components and machinery (U. S. Department of Transportation, 1986). Coast Guard marine inspectors are to oversee ABS surveys.

Port and Environmental Safety Coast Guard inspectors board U. S. and foreign-flag vessels and inspect shore transfer facilities periodically to ensure compliance with regulations promoting vessel and navigation safety and environmental protection[12]. Each year, Coast Guard personnel at each commercial U. S. port must also supervise 5 percent of all vessel-to-shore transfers of bulk liquid cargo such as crude oil. Coast Guard inspectors board about 40,300 cargo vessels and barges annually and perform about 35,600 inspections of shore facilities (General Accounting Office, 1985).

A Coast Guard Oil Spill Coordinator has been assigned to each COTP area; each must prepare a plan for oil spill response under 40 CFR § 300.32. Coast Guard estimates that in most cases, plans are adequate for response to moderate-sized spills, of between 100,000 and one million

12. See Coast Guard Boarding Authority, 14 U. S. C. § 89, authorizing boardings for several purposes including enforcement of pollution control legislation. See also 33 U. S. C. 1161 (m), authorizing boardings and inspections under the Water Quality Improvement Act of 1970 (Publ. Law No. 91-224), as well as 46 U. S. C. § 3307 and 3308, authorizing boardings and inspections required for issuance of a Certificate of Inspection.

gallons.[13]

A Coast Guard Captain of the Port is stationed at Valdez, Alaska. Circumstances at the Port of Valdez are different from those at other American ports because it and the Louisiana Offshore Oil Port (LOOP) are the only two supertanker ports in the U. S. At other ports, supertankers must offload oil relatively far from shore. The Coast Guard maintains a Vessel Traffic Surveillance (VTS) system in Prince William Sound, as well as in Puget Sound, Washington; Berwick Bay, Louisiana; San Francisco Bay, California; and Houston and Galveston, Texas. The Trans-Alaska Pipeline Authorization Act (43 U. S. C. § 1651 to 1655) required the Coast Guard to establish the Prince William Sound VTS system in order to oversee movement of oil tankers to and from the Valdez pipeline terminus. Ships operating in the Prince William Sound, Puget Sound, and Berwick Bay systems must check in with control operators. Operator check-in under the other systems is voluntary, and no other U. S. ports have radar surveillance systems.[14]

13. See Oil Spill Intelligence Report, May 18, 1989 at 6.

14. See Oil Spill Intelligence Report, April 10, 1989 at 2.

QUALITY OF COAST GUARD REGULATORY ENFORCEMENT

Since World War II, dramatic increases have been made in oil tanker length and beam as well as in tonnage carried. During the same period, engine horsepower-to-deadweight ratios have declined, and other major design changes have been implemented, generally as cost-cutting measures. In apparent response to economic pressures, tanker crew sizes have been reduced during the past several decades to roughly two-thirds of postwar levels. Many safety precautions, such as implementation of inert gas systems, have also been taken. But the magnitude, direction, and rapidity of changes in tanker design and operation clearly called for careful Federal scrutiny of the effects of these changes on tanker safety.

During this period, however, as the following discussions show, Coast Guard inspections became less rather than more frequent. Deficient vessel inspection and enforcement procedures and insufficient staffing and training of inspection personnel have been observed in many Coast Guard districts nationwide. In the 1983 case of the sinking of the *Marine Electric*, inadequate inspections by insufficiently trained personnel were identified by a Coast Guard Marine Board of Investigation as a chief cause of an accident which caused the deaths of 31 crew members. In the 1972 sinking of the *Texaco Oklahoma*, incomplete internal cargo tank inspections were identified by a Marine Board of Investigation as a possible contributing factor in the accident, in which 31 lives were also lost.

The U. S. General Accounting Office found that the Coast Guard has rarely fined violators to enforce compliance with pollution prevention regulations. Follow-up on outstanding vessel deficiencies is often poor. Coast Guard field units continue to routinely approve reductions in tanker manning levels, despite great controversy and lack of information about the effects of such reductions on safety. In Alaska, the Coast Guard failed to carry through on announced intentions to ensure stringent oversight of tanker traffic in Prince William Sound, and along with the Alaska Department of Environmental Conservation failed to enforce preparedness for a large oil spill at the Alyeska Service Company shore transfer facility, despite a series of spills in Alaskan waters during the months previous to the *Exxon Valdez* grounding.

VESSEL INSPECTIONS : STAFFING AND INSPECTION PROCEDURES

Information from several sources, described below, suggests that Coast Guard vessel inspection procedures are at least sometimes deficient, staffing is inadequate, and personnel overworked. Two teams of General Accounting Office researchers identified weaknesses in inspection procedures and staffing problems; Marine Boards of Investigation found Coast Guard inspection procedures to be an important cause of the loss of a merchant vessel and 31 crewmembers and possibly to have contributed to loss of a second vessel; and vessel inspectors report inadequate staffing at Portland, Oregon, where most Alaska tankers undergo drydock inspections.

General Accounting Office reviews and findings The U. S. General Accounting Office (GAO) conducted two reviews of the Coast Guard Commercial Vessel Safety Program. These reviews were initiated after a series of several oil tanker accidents during the 1976-77 winter. In a 1979 study (General Accounting Office, 1979), GAO researchers visited field units in 3 Coast Guard districts to observe inspection and enforcement procedures. In 1985, GAO researchers visited 12 of 54 field units in five of the 12 Coast Guard districts.

The 1979 research team noted a shortage of vessel inspection personnel at every location visited, and found that many inspections were being performed either by insufficiently trained Coast Guard inspectors or by trainees. Field units examined had too few inspectors to accomplish

the necessary vessel inspections without working extensive amounts of overtime. At one field unit, for example, 16 people were assigned as vessel inspectors, but only four were considered to be fully qualified. The annual inspection workload at this station was estimated to be 17,700 hours; a year of work completed by the four qualified inspectors represents 6,750 hours. The large workloads and shortages of trained inspectors resulted in delays of up to a month in submission of inspection reports, which are normally to be completed within 5 days of an inspection.

Researchers also noted that quality of vessel inspections varied among field stations from very good to inadequate. Although most inspectors appeared conscientious, many had not completed required training and hence were still considered to be trainees. Researchers found that Coast Guard policy of rotating staff among duty stations every 2 or 3 years resulted in too few fully qualified inspectors, and in few inspectors who performed consecutive inspection duties.[15] In one field unit, officers were assigned to vessel inspection for only 18 months, a period that included a 3-month basic training course.

Researchers found that tankers commonly traveled among U. S. ports with safety deficiencies left outstanding and uncorrected for long periods, and that Coast Guard inspectors were not reboarding such vessels to check whether repairs had been made. They also noted that some inspections were performed in a cursory manner. Findings of Coast Guard inspectors at different field units were often inconsistent. For example, three deficiencies were found in one tanker at one field unit, but at another unit 8 days later, no deficiencies were observed; at another unit 2 days later the vessel was again boarded and the same deficiencies were identified, along with four additional problems.

The 1979 GAO team found that the Coast Guard had made very little use of monetary penalties to enforce compliance with pollution prevention regulations. For example, one district had processed 59 cases of violations of hazardous cargo regulations; only one penalty of $250 was assessed although each violator could have been assessed up to $10,000. At another district, 39 cases were processed and no penalties were assessed.

The 1985 study team noted frequent misreporting of data; at one unit, inspectors reported 281 tanker oil cargo transfers during a 4-month period while the local marine exchange had recorded 439. The Coast Guard uses a nationwide database, the Marine Safety Information System, to select vessels to be boarded and for rechecking to ensure that outstanding deficiencies have been corrected. Researchers identified frequent data errors and omissions in the information on past inspections put into the system. The study team also found that 10 of 11 field units evaluated were not following up on deficiency notices issued. One unit, for example, had issued 55 notices and had failed to follow up on 39.

Observations made in 1989 by *Seattle Times* reporter Eric Nalder corroborate the earlier GAO findings.[16] Nalder noted that 102 inspectors have been cut from the Coast Guard since 1981, nearly a quarter of the 413 inspectors employed during the late 1970s. Cuts were made in response to overall reductions in the Coast Guard budget and reallocation of funds previously used for marine safety functions to drug interdiction. An additional reason for the cuts is a decline in U. S. ship construction; since 1987, no large merchant vessels have been built in this country. However, Coast Guard responsibilities to inspect the aging U. S. tanker fleet and growing numbers of foreign vessels have resulted in a remarkably heavy workload for remaining inspection personnel. Nalder

15. Portland vessel inspection personnel reported (personal communication, Nov. 1989) that duty tour length had been increased to 4 years by Coast Guard Headquarters, but recently has been reduced back to 3 years.

16. See Eric Nalder, *Coast Guard is short on staff and expertise*, Seattle Times, Nov. 15, 1989 at A1 cols. 3 and 4 and A4 cols. 5 and 6.

also noted that the Coast Guard has no uniform process for certifying inspection personnel, and that most inspectors have had little or no previous experience with merchant vessels.

Sinking of the Marine Electric In July 1984, a Coast Guard Marine Board of Investigation submitted a report to the Coast Guard Commandant on the February 1983 capsizing and sinking of the merchant freighter *Marine Electric*[17]. Thirty-one crew members were drowned when the foundering vessel suddenly rolled, throwing crew members into the water before a lifeboat could be lowered.

In their accident report, the Board cited inadequate Coast Guard investigation procedures as a chief cause of the accident. Coast Guard inspectors had failed to notice the deteriorated condition of the vessel's hatch covers during a June 1981 inspection for certification and again during a mid-period examination in June 1982. Flooding through wasted portions of these hatch covers was identified as the cause of the vessel casualty. The Board noted that "The inspections made were incomplete and misleading. Inspectors cited certain examinations as being made and found to be satisfactory when, in fact, they were never made, and indicated that the vessel was in full compliance with the applicable regulations."

The Board also reported that inexperienced personnel had performed the June 1981 certification inspection of the *Marine Electric*, the June 1982 mid-period inspection, a drydock examination completed in February 1981 and a drydock extension inspection in December 1982. Members noted that the drydock extension examination was insufficient to justify granting of an extension which had been approved. The Board recommended in its report on the *Marine Electric* casualty that the Coast Guard convene a panel to review the Commercial Vessel Safety Program and prepare recommendations for changes to the program.

Inadequate inspections were also cited by a Marine Board of Investigation as a possible contributing cause of the sinking of the oil tanker *Texaco Oklahoma* in March 1971. Thirty-one crew members were also lost in this accident. Because the vessel, which split in two and sank, was not recovered, the Board reported that it was not possible to observe whether the vessel had pre-existing structural defects or deterioration. However, it noted that Coast Guard inspectors had examined only 'representative' cargo tanks for defects and corrosion during the previous drydock inspection, so that any internal damage the vessel may have had would not have been detected.[18]

Drydock inspections of Alaska tankers Nearly all tankers in the Alaska trade undergo drydock inspections at Portland, Oregon.[19] As was the case at other field units evaluated by GAO research teams, the Portland Coast Guard station is reported to be understaffed with vessel inspectors. Five qualified inspectors are assigned to the shipyard, and another four inspectors work elsewhere in the port. (Alaska State ferries, many Navy vessels, cruise ships of companies such as

17. See U. S. Coast Guard Marine Board of Investigation, report addressed to Coast Guard Commandant (G-MMI), and dated 25 July 1984. Subject: *SS Marine Electric, ON-245675; Capsizing and sinking in the Atlantic Ocean, 30 miles east of Chincoteague, Virginia, on 12 February 1983, with multiple loss of life.* Report provided by William P. Coughlin, *Boston Globe* maritime reporter.

18. See *Marine Casualty Report on the loss of the Texaco Oklahoma*, including the U. S. Coast Guard Marine Board of Investigation Report and Commandant's Action, and the action by the National Transportation Safety Board, July 26, 1972. U.S Coast Guard, Washington, D. C.

19. This port is favored by shipping companies because it is the largest drydock on the West Coast, and because three independent vessel repair contractors working at the port have developed reputations for providing good service. Since closures of nearly all other major West Coast shipyards and until recently, U. S. tankers were commonly inspected overseas, primarily in Japan and Korea. Because of declines of the U. S. dollar during the past several years, drydock inspections and repairs of Alaska tankers have been switched to Portland.

Princess Cruises, fish processors, barges, jetboats, and other types of vessels are also inspected at Portland.) There is no terminal at Portland for the Marine Safety Information System, the national Coast Guard database which contains inspection, casualty, and violation records of merchant ships. Such terminals exist at other Coast Guard stations with less important marine safety duties.[20] Portland inspectors sometimes must work 7 days a week. A minimum of two or three more qualified inspectors are estimated to be needed at the port.[21] A staffmember suggested that improving allocation of existing people and resources among field units would resolve problems at Portland as well as at Los Angeles and San Francisco, where staffing shortages also exist.

FREQUENCY OF VESSEL INSPECTIONS

American ships were at one time inspected annually by the Coast Guard, usually while in drydock where the most thorough inspections of both hull and engine room can be made.[22] Since World War II, regular certification inspections of tankers have been reduced in frequency from once annually to once every 2 years.[23] Annual reinspections of tankers are made, but are more superficial (U. S. Department of Transportation 1986). Drydock inspections, which include thorough examinations of condition of the hull, rudder assembly, and other fittings, have been reduced in frequency to two every 5 years.

During the late 1970s, the Coast Guard reduced the frequency of boardings of tankers to perform periodic safety inspections from every 90 days to once annually (General Accounting Office 1979). Coast Guard headquarters had initiated a tankship safety examination program in January 1977. Original instructions from headquarters did not specify frequency of boardings, but at least some districts established procedures to board every 90 days. In instructions issued by headquarters in 1978, however, frequency of boardings was reduced to once every year (*ibid*). GAO researchers suggested that because most deficiencies result from corrosion and wear and can occur or recur during short intervals, that annual tanker inspections are too infrequent to ensure minimal hazard to U. S. ports (*ibid*). They noted that the same deficiencies are constantly found on vessels during repeat boardings, and suggested more frequent boardings of tankers which showed frequent deficiencies.

These increases in inspection cycle length were approved at a time when new tankers were increasing dramatically in size, and while major design alterations were being made. Over the past several decades, the largest oil tankers have increased in size from 120,000 dwt to 550,000 dwt[24]; the largest tankers, such as the *Esso Atlantic*, are nearly one-quarter mile long and draw up to 90 feet (Dane 1989). During the same period, horsepower-to-deadweight ratios declined from about one engine horsepower per three tons of deadweight to about one horsepower per six or eight tons at present.[25] The ratio of hull weight to cargo weight has also decreased; the weight ratio of steel to cargo in the case of the *Exxon Valdez* is about one to six (*ibid*). Collision bulkheads were moved forward toward bows of new tankers under construction to increase cargo space, and the amount of oil in each cargo compartment was doubled as compartment number was cut to about half. [26]

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20. See Eric Nalder, *Coast Guard is short on staff and expertise*, Seattle Times, Nov. 15, 1989 at A4 col. 5.

21. Coast Guard vessel inspector, Portland, Oregon (Nov. 1989): personal communication.

22. George F. Reinhard, maritime arbitrator (Oct. 1989): personal communication.

23. George F. Reinhard: letter to J. P. Petrich, U. S. House Interior Committee staffmember, Sept. 10, 1989.

24. Arthur McKenzie, Director, Tanker Advisory Center (Nov. 1989): personal communication.

25. G. F. Reinhard, as cited above.

26. G. F. Reinhard, as cited above.

Results of a series of inspections of 32 large oil tankers initiated by Exxon Corporation in 1981 corroborate the conclusion of GAO researchers that inspections should be more, rather than less frequent.[27] Exxon survey teams found higher-than-expected rates of corrosion and fatigue-related structural failures, especially pitting and cracking of hull plating. Researchers identified average rates of corrosion of between 0.5 and 1.0 millimeters per year in the immersed and splash zones of segregated ballast tanks. Much higher rates of corrosion were observed in some areas, such as areas of high flow rates of ballast water and cargo, and along weld seams. Newer tankers, which were built according to revised Classification Society Rules, have thinner hulls and smaller corrosion margins than older vessels. The corrosion margin for vessels built according to the new rules, which have bottoms about 23 mm thick, is only 4 to 5 mm. Exxon researchers concluded that monitoring of vessel structure deterioration should be stricter, and should become increasingly strict as the fleet ages.

Adequacy and frequency of vessel inspections is of particular concern because of important questions about the condition of tankers in the Alaska fleet and because of the age of the fleet. The frequent hull cracks and engine power losses sustained by tankers in the regular Alaska trade may be at least partly preventable by increasing frequency of inspections, as well as increasing the number of qualified inspectors examining these tankers.

Coast Guard decisions to increase inspection cycle length probably represent an attempt to optimally allocate personnel and resources during a time of budget cutbacks and increasing responsibilities. Since few tests were made of most major oil tanker design changes before they were implemented, however, Coast Guard decisions to both approve major changes and reduce inspection frequency probably reflect flawed judgment.

COAST GUARD DECISIONS TO REDUCE MINIMUM MANNING LEVELS

At the home port of each merchant ship, the Coast Guard Officer in Charge, Marine Inspection (OCMI) establishes crew qualification standards and minimum manning levels for the vessel. Such decisions are made on a case-by-case basis; no minimum levels applicable to all merchant vessels are included in Coast Guard regulations.[28] Minimum approved manning levels are displayed on each vessel's Certificate of Inspection, and a tanker cannot legally sail from a U. S. port with fewer crewmembers.

There is a strong trend in the shipping industry to automate tankships and cargo vessels as much as possible and to reduce crew sizes accordingly. Exxon Shipping Company President Frank Iarossi stated in June 1988, for example, that the company intends to obtain Coast Guard consent to allow reduction of its standard crew size on automated diesel tankers to 16 by 1990.[29] Examples of minimum crew sizes approved by Coast Guard for oil tankers include: a total of 15 officers and crew for the *Exxon Valdez* and sister ship *Exxon Long Beach*, and of 18 for the *ARCO Anchorage*, *Exxon Wilmington*, and *Exxon Philadelphia*.[30]

An important economic incentive to reduce manning levels exists. Cost of maintaining an American crew on a 265,000 dwt U. S. flag tanker is estimated to be about $3.5 million/year, 52%

27. See, generally, Exxon Corporation, *Large oil tanker structural survey experience, a position paper*, June 1, 1982.

28. See 46 U. S. C., Chapters 81 to 93, and 46 C. F. R. § 15.501-525; § 15.801-915.

29. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 82.

30. Various Certificates of Inspection provided by William P. Coughlin, *Boston Globe* maritime reporter.

of the operating cost of almost $7 million/year, and about one-quarter of the $14.3 million/year total operating and capital costs (McKenzie, 1989). Crew maintenance costs include not only salaries, pensions, and payment of injury claims, but also cost of transporting crew members to and from ships at the beginning and end of duty tours, construction and maintenance of crew quarters, maintenance of safety equipment such as life boats, food and fuel, and other costs.[31]

Oil tanker manning levels already have been reduced considerably during the past decade. Gaffney (1989) notes that these reductions, which have occurred worldwide, have been stimulated by economic difficulty. Growth of maritime trade has been slower than growth of available tonnage, due primarily to expansion of fleets of newly industrialized countries. Ship operators in all industrialized countries have used manning reduction as an economy measure.

Although Coast Guard is continuing to issue approvals for reductions in tanker manning levels, great uncertainty and controversy over the effects further reductions may have on tanker safety exist. The issue is highly politicized; shipping companies such as Exxon favor further reductions[32]; representatives of at least two maritime unions do not.[33]

Arthur McKenzie, Director of the Tanker Advisory Center, has suggested that manning reductions, at least down to some threshold of safety, should improve safety because human error is by far the commonest cause of vessel casualties.[34] He reports that Japanese tankers have impressive safety records (Table 2), and that Japanese shipowners and government have recently embarked on a pioneer program to reduce manning. Two hundred bulk carriers, including tankers, will be manned with 10 officers and one cook, and with no unlicensed seamen. The Japanese officers will do seamen's work when necessary. Most tankers in the world carry only eight officers.[35]

Opponents of manning reductions state, however, that reducing manning below current levels can lead to increased crew fatigue and greater accident likelihood. About one-quarter of Exxon Shipping Company crew members contacted in a recent survey reported concern about inadequate maintenance of tankers since crew sizes have been reduced.[36] Ottar Kjeggestad, Head of the Norwegian Maritime Directorate, charged in 1980 that automation and crew reductions have reduced safety of navigation because too few experienced people have been retained on vessels and because too much reliance has been placed on automated navigation aids.[37]

Several power losses sustained since April 1989 in Alaskan and Pacific Northwestern waters by automated tankers[38] suggest that accident probabilities are in fact too high and that both vessel automation and manning policies require review:

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31. George Reinhard (Nov. 1989): personal communication.

32. Not all shipping companies favor further reductions. ARCO Marine, Inc., intends to make no further cuts, according to President Jerry Asplund. See E. Nalder, *Tankers full of trouble*, Seattle Times, Nov. 12, 1989 at A16, col. 5.

33. See John Hillman, Board of Governors, Exxon Seamen's Union, letters to F. J. Grady, U. S. Coast Guard, March 23 and May 3, 1989, and Clyde Dodson, Treasurer, District 1, MEBA/NMU, comments in M. E. Gaffney, 1989, Effective Manning at American President Lines.

34. Arthur McKenzie (Oct. 1989): personal communication.

35. Arthur McKenzie, Director, Tanker Advisory Center (Nov. 1989): personal communication.

36. See Katherine Esty, Robert Gandossy, and Jack Williams, *Survey of Exxon Shipping Company, June 1987.* Unpubl. company document at *v*.

37. See Ottar Kjeggestad, *Automation in navigation.* In A. B. Aune and J. Vlietstra, *Automation for safety in shipping and offshore petroleum operations.* Proceedings of the IFIP/IFAC Intl. Conference, Trondheim, Norway, June 17-18 1980 at 455-457.

38. See William P. Coughlin, the *Boston Globe*, Article manuscript, Sept. 29, 1989.

• The 12-year-old, 176,000 dwt Keystone Shipping Company tanker *Atigun Pass* lost power in September 1989 while fully loaded with 46.2 million gallons of cargo and drifted near Bligh Reef. The tanker was towed to Knowles Head by escort response vessels, in place only since the Exxon Valdez grounding.

• The 21-year-old, 78,000 dwt *Exxon San Francisco* has lost its main propulsion power twice since 1981, once at Valdez and again in September 1989 in the Strait of Juan de Fuca, Washington after a fire broke out in its automated engine spaces. The tanker sailed to Valdez in late September 1989 with a Coast Guard COI approving a reduced engine room crew.

• The 19-year-old, 76,000 dwt *Exxon Philadelphia* lost power in April 1989 while fully loaded off the Olympic Peninsula, Washington, when fuel leaked into the feedwater system and a fuel sensor failed. It carried no radio electronics officer as is required by Federal regulations. All tankers in the Exxon Shipping Company fleet have been granted waivers of this requirement by the Federal Communications Commission.[39] Repair of such electronic equipment is a duty of radio electronics officers. The engine room crew had also been reduced in number several weeks before the breakdown.[40]

In at least one well-documented case, Coast Guard methods to identify appropriate minimum manning levels for tankers appear to be seriously flawed. The Coast Guard field unit at Long Beach, California, mistakenly issued a COI allowing a substantial cut in size of the *Exxon Valdez* crew, before completion of a mandatory review process. Decisions to reduce manning must be approved by personnel of the Merchant Vessel Branch at Coast Guard Headquarters in Washington, D. C. Coast Guard Commander Paul Larson explained that the Long Beach field unit had reduced manning requirements for the *Exxon Valdez* in 1987 after evaluating its machinery plant and personnel.[41] Coast Guard personnel later realized that "...the evaluation was insufficient to support the decision we made." Because the Valdez had been operating with a reduced crew and without problems for a short period, however, Commander Larson allowed the reduced manning level to stand. A COI allowing reduced manning was also granted to the *Exxon Long Beach*, sister ship of the *Exxon Valdez*, for the stated reason that such a COI had already been granted to the *Valdez*. This COI was also allowed to stand.

Few data on the safety aspects of demanning exist. Former Coast Guard Admiral William Benkert noted in August 1989[42] that "Much of the available casualty information in data bases and maritime safety information services reveals no information about the number of crew members of the vessel involved, nor about the relevance of the number of crew members to the vessel's or crew's ability to manage or survive an emergency. In addition, many of the automation and crew changes are so recent that the experiments are still underway and public reports are unavailable."

The uncertainty about safety of further demanning suggests that initiating impartial evaluations of existing data, meanwhile imposing a moratorium on further reductions in minimum crew size would be the most responsible course of action for the Coast Guard to take.

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39. See H. J. Borgen, Exxon Shipping Company memo entitled *Exempted/waivered vessel requirements*, March 16, 1989 at 1. Memo provided by William P. Coughlin, *Boston Globe* maritime reporter.

40. See William P. Coughlin, *Ship cutbacks stir safety fears*, Boston Globe, Sept. 18, 1989 at A1.

41. See P. Larson, letter to Paul Myers, Exxon Shipping Co., Jan. 28, 1988. Letter provided by W. P. Coughlin, Boston Globe.

42. See William M. Benkert, Chairman, Committee on Effects of Smaller Crews on Maritime Safety, letter to John Hillman, Exxon Seamen's Union, Aug. 11, 1989, at 1.

In its report on the sinking of the *Marine Electric* in 1983, a Coast Guard Marine Board of Investigation recommended that the Coast Guard and the Federal Communications Commission conduct tests of the reliability of an emergency radio beacon which had failed to function properly.[43] Conducting a similar evaluation of the reliability and performance of automation systems would be one appropriate response to current controversy over demanning effects and observed tanker power losses. Such an evaluation should be made under existing field conditions in the northern Gulf of Alaska, and engine room crew members should be extensively surveyed for information.

An 18-month study of the effects of crew reductions is being done for the Marine Board of the National Research Council, the principal operating agency of the National Academy of Sciences, at the request of the Coast Guard. Results of the study are due to be released in December 1989. The impartiality of the committee selected to conduct this study has been questioned. John Hillman, Exxon Seamen's Union official, requested that the committee conducting the study include a representative from the Independent Maritime Unions. He was told that committee members had already been selected. Exxon Shipping Company President Frank Iarossi was selected as a committee member. Hillman suggested that inclusion of Iarossi is inappropriate because he has submitted numerous requests for manning reductions, now pending, to the Coast Guard.[44]

Table 2. Percent of total tanker losses worldwide sustained by the fleets of five nations.[45]

Nation	Percent of average annual losses			
	1965-69	1970-74	1975-79	1980-84
Japan	0.13	0.09	0.22	0.16
U. S.	0.11	0.25	0.07	0.52
Liberia	0.64	0.76	0.69	0.44
Norway	0.51	0.30	0.00	0.10
Greece	0.96	0.92	1.88	1.38

MISLEADING DATA ANALYSES

Unbiased evaluation of available data and of the potential risks and benefits of alternative decisions are the only means of identifying solutions to complex, highly politicized tanker safety problems. In two cases, however, Coast Guard evaluations do not appear to have been sufficiently impartial.

Coast Guard evaluation of the effects of double bottoms on tankships The Coast Guard

43. See U. S. Coast Guard Marine Board of Investigation, report addressed to Coast Guard Commandant (G-MMI), and dated 25 July 1984. Subject: *SS Marine Electric, ON-245675; Capsizing and sinking in the Atlantic Ocean, 30 miles east of Chincoteague, Virginia, on 12 February 1983, with multiple loss of life.* Report provided by William P. Coughlin, *Boston Globe* maritime reporter.

44. See John L. Hillman, letter to Eric Sager, National Transportation Safety Board, July 11, 1989 at 3. Letter provided by William P. Coughlin, *Boston Globe* maritime reporter.

45. These data were obtained from Arthur McKenzie, Tanker Advisory Center Director (Nov. 1989).

Marine Safety Center presented estimates in May 1989 of the expected size of an oil spill had the *Exxon Valdez* been fitted with an 11' 5" double bottom.[46] Researchers concluded that the spill of March 24, 1989 would have been reduced in extent from between 25 to 60%. The study examined both the expected effects on the *Exxon Valdez*, fitted with a double bottom, from a grounding of the severity of the March 24 incident, as well as from a collision with a tanker of similar dimensions. In the event of a collision, the researchers concluded, the hull of a double-bottomed tanker would be penetrated 33 feet, and would outflow 52% more oil than would a single-hulled tanker.

Maritime arbitrator George Reinhard noted several weaknesses in this study.[47] First, he suggested that effects of a collision as well as grounding were included in this study in order to draw attention away from the protective benefits of a double bottom. Reinhard stated that groundings occur far more often than collisions, and suggested that groundings are especially more likely to occur than collisions between vessels in an area such as Prince William Sound, where a vessel traffic system including designated, separated inbound and outbound shipping lanes is in place. He concluded that evaluating the potential effects of both types of accidents without making note of the differential in likelihood is misleading.

Second, Reinhard noted that no mention was made in this study of the great likelihood of fire and explosion resulting from a collision between tankers traveling at normal speeds; the researchers assumed that fire and explosion would be absent when evaluating what was described as a "worst-case" collision scenario.

Third, Reinhard estimated an expected 33-foot hull penetration to be unrealistically low, in the case of two large tankers moving at normal speeds of 12 to 15 knots. The expected speeds of the two vessels were not reported in the study. He suggested that this figure was arrived at because, by ABS rules, the forward edge of the collision bulkhead of the *Exxon Valdez* and similar tankers can be located 32 feet, 8 inches aft of the bow. He noted that in the event of penetration through the bulkhead, the center tanks of either a single- or double-bottomed tanker would be opened, most likely causing fire and explosion, or else great oil outflow.

Coast Guard oil spill frequency estimate made for Alaska tankships Some observers state that the Coast Guard, as well as other public agencies, exhibited bias by supporting oil industry proposals made during the early 1970s for a trans-Alaska oil pipeline route and Valdez pipeline terminus. U. S. Representative George Miller reported that "The environmental impact statement for the trans-Alaska pipeline glossed over the sea leg portion of the oil transportation system".[48] Charles D. Evans, then a fish and wildlife biologist/administrator for the U. S. Department of the Interior, believes that the several Federal agencies charged with evaluating the pipeline project, including the Coast Guard, paid inadequate attention to alternative routes.[49]

The Coast Guard prepared an estimate for the Draft Environmental Impact Statement for the trans-Alaska pipeline showing a low probability of oil spills along the proposed tanker route. Evans noted that the agency considered only data from 1970, however, omitting consideration of the San Francisco Bay collision between the Arizona Standard and Oregon Standard in January 1971, and apparently deliberately understating the probability of major accidents. Use of only a year's data to evaluate probability of a low-frequency event when more data are readily available represents, at best, poor statistical practice

46. See Commanding Officer, Coast Guard Marine Safety Center, memorandum to Commandant (G-M), May 25, 1989 (entitled *Double Bottom Designs*).

47. See George F. Reinhard, letter to Jeffrey P. Petrich, Sept. 10, 1989 at 19 to 23.

48. See Congressional Record, April 25, 1989.

49. See Charles D. Evans. 1989. *The 1989 oil spill in Prince William Sound--why did it happen?* Unpubl. report.

POOR PREPAREDNESS FOR THE *EXXON VALDEZ* GROUNDING

Both the State of Alaska and the Federal Government, as well as industry, have responsibilities for ensuring readiness for an oil spill in Prince William Sound. Evidence demonstrates that neither government agencies, including the Coast Guard, nor industry were sufficiently prepared for the Exxon Valdez oil spill.

The National Response Team (NRT), is composed of representatives of 14 Federal agencies responsible for coordinating Federal planning and preparedness for oil spills. In a 30-day report on the grounding, team members noted: "Complacency is a major enemy. The fact that more than 8,700 successful oil shipments passed through Prince William Sound without serious incident lulled Exxon, the Alyeska Pipeline Consortium, the State of Alaska, and the Federal government out of a state of full readiness for a spill."[50]

Series of 1988-89 marine spills The grounding of the *Exxon Valdez* in late March 1989, however, was preceded by an unusual series of spills in Alaskan and Pacific Northwest waters. The worst oil spill of the 1988-1989 winter in U. S. waters occurred in late December off Gray's Harbor, Washington State, when the tank barge *Nestucca* collided with its tug and spilled 70,000 gallons of bunker C oil. Stormy winter weather caused an unusually large number of vessel ruptures and groundings in the Bering Sea and North Pacific during late 1988 and early 1989. The U. S. Coast Guard Pacific Oil Spill Strike Team transferred members from California to Alaska to assist with the unusual number of vessel casualties along the Alaskan coast.[51] Among ships involved in the most serious accidents were a few vessels carrying petroleum products: the Japanese cargo vessel *Aoyagi Maru* was damaged on December 10 when 70-knot winds in Akun Harbor forced the ship to break its connections to the dock; *American Barge 283* began to sink near Shumagin Harbor on December 26, and had leaked an estimated 1 million gallons of crude oil by January 13 when U. S. Coast Guard vessels had arrived on scene; the Korean cargo vessel *Chilbo San #6* lost power and grounded near Dutch Harbor, leaking 65,000 gallons of diesel fuel, and the Japanese motor vessel *Swallow* grounded near Dutch Harbor, rupturing 9 out of 12 tanks and spilling an unknown amount of diesel fuel.

The Thompson Pass incident On January 3, 1989, the Interocean tanker *Thompson Pass* leaked an estimated 70,000 gallons of crude oil into Valdez harbor during an attempted loading.[52] The tanker had previously reported a leak from Puerta Morellas, Panama; a diver checking the hull in murky waters off San Diego was unable to find the reported crack. On arrival at Valdez, the *Thompson Pass* was boomed, under agreement between Alyeska managers and Coast Guard representatives; it is the first vessel to have been pre-boomed at the Port of Valdez.

All oil leaked on loading was retained within the containment boom. Transferring this oil up about 30 feet to the adjacent facility dock required several weeks and cost Alyeska Service Company an estimated $1 million.[53] Hydraulic hoses had rotted and were unusable, and replacement hoses were obtained; gear required sorting and about 6 feet of snow was cleared from the deck of the Alyeska contingency barge.

Coast Guard readiness The *Thompson Pass* incident should have demonstrated clear-

50. See letter from EPA Administrator William K. Reilly and Transportation Secretary Samuel K. Skinner to President George Bush, (May 18, 1989) (prefacing National Response Team, The *Exxon Valdez* oil spill, a report to the President, May 1989).

51. See Oil Spill Intelligence Report, January 23 and March 6, 1989.

52. See P. Epler, *Too little, too late*, Anchorage Daily News, Oct. 29, 1989, at A4.

53. See P. Epler, *Too little, too late*, Anchorage Daily News, Oct. 29, 1989, at A4.

ly to spill responders that sufficient containment equipment was not available and that much available gear was in poor repair. Under the Ports and Waterways Safety Act, assuring that shore transfer facilities have "ready access" to such equipment is a Coast Guard responsibility.[54] It is also a responsibility of the Alaska Department of Environmental Conservation.[55] The Coast Guard must ensure that all containment equipment mandated by the approved contingency plan for the facility can be accessed within a reasonable length of time.

That these problems had not yet been corrected by late March indicates remarkable negligence on the part of both regulatory agencies as well as of Alyeska facility managers. Yet the Alyeska transfer facility at Valdez, which is one of only two supertanker ports in the U. S., remained very poorly prepared for a major spill in late March when the *Exxon Valdez* grounded. The only barge used by Alyeska Service Company to deploy cleanup gear was not certified by Coast Guard to receive oil, and was only able to carry bladders on deck (National Response Team, 1989). The barge had been unloaded and was not at a dock where a heavy crane could be used for reloading; about 50,000 pounds of contingency equipment had to be moved to it by truck, crane, and forklift.[56] Workers had to dig protective boat fenders out from under an estimated 14 feet of snow, and thousands of feet of containment booms were buried under stacks of other equipment in a warehouse; boats required refueling and booms required repair.[57]

Coast Guard unpreparedness for a major spill is not a problem only in Alaska. Senator Brock Adams of Washington noted in May 1989 that no Coast Guard contingency plan exists for Puget Sound, an area of constant tanker traffic, that insufficient containment equipment exists, and that blind spots and shadow areas exist in radar coverage of tanker traffic lanes. He stated in a letter to constituents, "...the Coast Guard has been unwilling to exercise its existing authority. As Secretary of Transportation, I fought to force the Coast Guard to address tanker safety issues in Puget Sound...Years later, I find that the regulatory effort is still weak".[58]

INADEQUATE VESSEL TRAFFIC SYSTEM IN PRINCE WILLIAM SOUND

The Trans-Alaska Pipeline Authorization Act, 43 U. S. C. § 1651-1655, required the Coast Guard to establish and operate a Vessel Traffic Service (VTS) in Prince William Sound. Coast Guard VTS personnel, according to the Coast Guard's 1975 Environmental Impact Statement describing the proposed system, were to "monitor [via radar and radio communications] progress of participating vessels and give timely direction when needed, thus providing checks against error".[59]

In fact, inadequacy of the existing Coast Guard radar system may significantly constrain VTS oversight of tanker traffic in the Sound. Shortly after the *Exxon Valdez* grounding, the Coast Guard stated that it has been unable to track vessels as far from the Port of Valdez as Bligh Reef[60], and in fact, on March 24 the radar operator at the Vessel Traffic Center was unable to clearly track

54. See 33 C. F. R. § 154.545 (1988).

55. See 18 AAC § 75.320(b)(1)-(13).

56. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 73-74.

57. See Patti Epler, *Too little, too late*, Anchorage Daily News, Oct. 29, 1989, at A4.

58. See letter from Senator Brock Adams to constituents in Washington state (May 5, 1989)(Discussing provisions of the Puget Sound Tanker Safety Act of 1989).

59. See Stan Jones, *Empty promises*. Anchorage Daily News, Oct. 15, 1989 at A10, col. 1.

60. See Oil Spill Intelligence Report, April 10, 1989 at 1.

the *Exxon Valdez* to Bligh Reef.[61] Coast Guard Commandant Paul Yost announced shortly after the grounding that the agency would not participate in Federal investigations into the *Exxon Valdez* grounding. One reason stated for this relinquishment of authority is the controversy over the Coast Guard radar tracking system.[62]

For all three 8-hour shifts at the Valdez Vessel Traffic Center, the position of watchstand supervisor has been added to existing positions of radar and radio watchstanders, so that three people now oversee tanker traffic at all times. No upgrading of the radar system is now planned, however, according to staff members.[63]

RELINQUISHMENT OF COAST GUARD AUTHORITY TO INVESTIGATE THE EXXON VALDEZ GROUNDING

The Coast Guard Commandant is empowered to convene a Marine Board of Investigation to conduct an investigation of a serious marine casualty[64]. Under a September 28, 1981, Memorandum of Understanding between Coast Guard and the National Transportation Safety Board (NTSB), NTSB may also investigate major marine casualties. An NTSB investigation is automatically initiated when a casualty involves a collision of a Coast Guard ship and another vessel with lives lost, or involves "significant safety issues relating to Coast Guard safety functions."[65]

Initiation of an NTSB inquiry does not preclude a Marine Board investigation. Under 46 C. F. R. § 4.40-3, "the Coast Guard's responsibility to investigate marine casualties is not eliminated nor diminished" by regulations empowering the NTSB to conduct an inquiry .

The two types of investigations are very different. In particular, a Marine Board is empowered to refer parties to the U. S. Attorney General for prosecution. A Marine Board is empowered to administer oaths, summon witnesses, and require that testimony be made and relevant documentation be produced.[66] Marine Board investigations include cross-examinations of witnesses represented by attorneys. NTSB inquiries, in contrast, are primarily fact-finding procedures. There are no cross-examinations, witnesses are not represented by attorneys unless they so request, and, most important, the NTSB is not empowered to refer parties for prosecution. Instead, it is charged to determine probable cause of an accident and to issue a report and recommendations.

A Coast Guard Marine Board was not convened to investigate the *Exxon Valdez* grounding.[67] The reason given by Commandant Yost for deciding to relinquish authority to investigate the accident was that inadequacy of the Coast Guard radar system may have been a contributing factor.

Boston Globe maritime reporter William P. Coughlin has noted, however, that Coast Guard Marine Boards of Investigation have conducted investigations of cases in which inadequate Coast

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61. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 92.

62. See Oil Spill Intelligence Report, April 24, 1989 at 3.

63. Coast Guard personnel at the Vessel Traffic Center, Valdez (Nov. 1989): personal communication.

64. See 46 C.F.R. § 4.09-1 (1988).

65. See 46 C. F. R. § 4.40-45.

66. See 46 C. F. R. § 4.09-5.

67. NTSB personnel (Nov. 1989): personal communication.

Guard enforcement was implicated in merchant vessel loss.[68]

Loss of the MARINE ELECTRIC A Coast Guard Marine Board of Investigation was convened to investigate the February 1983 capsizing and sinking of the merchant vessel *Marine Electric*[69]. In the report of this investigation, the Board identified inadequate Coast Guard investigation procedures as a chief cause of the accident. Coast Guard inspectors had failed to notice the deteriorated condition of the vessel's hatch covers during two inspections made in 1981 and 1982. Flooding through wasted portions of these hatch covers was identified as the cause of the vessel casualty. The Board also reported that inexperienced personnel had performed four previous inspections of the vessel.

The Board recommended in its report on the *Marine Electric* casualty that the Coast Guard convene a panel to review its Commercial Vessel Safety Program and prepare recommendations for changes to the program. It recommended specific changes in Coast Guard inspection procedures, and proposed a policy to improve inspection and testing of hatch covers as well as criteria to use in deciding whether to grant an extension of a vessel's assigned date of drydock inspection. It proposed regulations to improve merchant vessel safety procedures, recommended that an investigation of an apparently faulty emergency radio beacon be made, and referred the vessel's permanent master and repair and maintenance supervisor to the U. S. Attorney General for prosecution.

Loss of the TEXACO OKLAHOMA A Marine Board of Investigation was convened to investigate the loss of the *Texaco Oklahoma* off Cape Hatteras on March 27, 1971. The *Oklahoma*, a 632-foot oil tanker, split into two sections and eventually sank while experiencing gale conditions and 60 to 65-knot winds. Thirty-one crew members were lost. The Marine Board identified the cause of the casualty, as far as could be determined, to have been a "massive structural failure due to stresses imposed on the hull girder as the ship labored in extremely heavy seas."[70]

The Board reported that structural weaknesses in internal cargo tanks may have existed, but that not all tanks had been examined internally by Coast Guard inspectors. The Board also speculated that inadequate procedures for collecting and analyzing inspection and repair records prevented timely identification of any vessel deficiencies that may have existed.

The Board recommended in its report that inspection regulations be revised to mandate internal inspections of all cargo tanks during the year of the fifth biennial inspection. It recommended that the Coast Guard and Federal Communications Commission together evaluate an apparently defective lifeboat radio transmitter. It recommended that a centralized information management system be developed by the agency. This final recommendation resulted in the Marine Safety Information System database in use nationwide by the Coast Guard today.

Clear benefit was derived from Coast Guard investigation of its own role in both the *Texaco Oklahoma* and *Marine Electric* casualties. It allowed the agency an opportunity to evaluate and remedy weaknesses in its programs and policies. Such an investigation of the *Exxon Valdez* grounding would have allowed the Coast Guard a similar opportunity to review adequacy of its

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68. William P. Coughlin (Nov. 1989): personal communication.

69. See U. S. Coast Guard Marine Board of Investigation, report addressed to Coast Guard Commandant (G-MMI), and dated 25 July 1984. Subject: *SS Marine Electric, ON-245675; Capsizing and sinking in the Atlantic Ocean, 30 miles east of Chincoteague, Virginia, on 12 February 1983, with multiple loss of life.* Report provided by William P. Coughlin, *Boston Globe* maritime reporter.

70. See *Marine Casualty Report on the loss of the Texaco Oklahoma*, including the U. S. Coast Guard Marine Board of Investigation Report and Commandant's Action, and the action by the National Transportation Safety Board, July 26, 1972. U.S Coast Guard, Washington, D. C.

Vessel Traffic System in Prince William Sound as well as appropriateness of its procedures for approving reductions in minimum crew complements, and to propose modifications of policies and procedures.

Further, rejection of this opportunity by the Coast Guard was unfortunate in light of reported friendship between Coast Guard Commandant Paul Yost and Exxon Shipping Company President Frank Iarossi. Exxon tanker crewmembers state[71] that President Iarossi and Coast Guard Commandant Paul Yost are long-time personal friends. Whether or not such friendship exists, and regardless of whether influence has been misused, certainly a strong appearance of misconduct is presented by the Commandant's decision to relinquish his authority to investigate the grounding. This appearance of misconduct could have been avoided by convening a Marine Board to investigate the casualty.

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71. Statements made to William P. Coughlin, *Boston Globe* maritime reporter, and in interviews with the principal investigator (Nov. 1989).

POSSIBLE CAUSES OF INADEQUACIES IN COAST GUARD ENFORCEMENT

Inadequacy of Coast Guard enforcement practices may result from several factors, described below. First, the oil industry is large and powerful, and actively promotes its interests to U. S. policymakers. It is able to do so through channels unavailable to most Americans. Second, members of the Coast Guard and of the merchant marine share common backgrounds and concerns, and in some cases have trained and worked together. The social and professional bonds that exist between Coast Guard and industry personnel may hamper enforcement. Third, employment opportunities in industry exist for retired Coast Guard personnel; knowledge of such opportunities may affect enforcement decisions. Fourth, the Coast Guard has been charged with a diverse set of missions. Some of its responsibilities may conflict, and in some cases, traditional missions may be weighted more heavily by decision-makers than the much more recently acquired mission of environmental protection.

DIFFERENTIAL BETWEEN POLITICAL PRESSURES EXERTED BY INDUSTRY AND BY THE PUBLIC

The oil industry is large and well-funded, and energetically promotes its positions to policymakers both in the U. S. and abroad. Several examples illustrate the variety of channels through which industry exerts political pressure.

- The oil industry contributed more than $1.7 million to U. S. congressional campaigns in 1988.[72] This total includes more than $23,000 given to Representative W. J. "Billy" Tauzin, author of a recently-defeated provision to preempt states from imposing unlimited liability for marine spills; as well as $18,000 to Representative Walter B. Jones, Chairman of the House Merchant Marine and Fisheries Committee.[73]

- The American Petroleum Institute (API) and other advocacy groups maintain staff lobbyists in Washington, D. C. API lobbyist John Iannone stated in 1978 that he had received advance notice of many Department of Energy actions, in one case obtaining for review a DOE letter to Senator Edward Kennedy before it was mailed.[74] Iannone reported that he had been able to effect changes in DOE plans for gasoline price monitoring before they were released for public comment. The API confirmed this report.

- The Exxon Corporation admitted in a September 1977 report filed with the U. S. Securities and Exchange Commission that it had made about $1.25 million of unreported bribes and illegal political payments in about a dozen countries during the period between 1963 and 1975.[75]

- Exxon Shipping Company Fleet Manager S. W. McRobbie in two November 1988 memoranda, ordered masters of the *Exxon Baton Rouge*, *Exxon Philadelphia*, and *Exxon San Francisco* to deliberately reduce the number of overtime hours reported, apparently in order to gain Coast Guard approval of reduced minimum manning lev-

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72. See Eric Nalder, *The outlook: are changes on horizon?*, Seattle Times, Nov. 17, 1989 at A12, col. 1.

73. See Jack Anderson and Dale Van Atta, *Big oil cleans up in Congress*, The Washington Post, Oct. 26, 1989 at 13, cols. 4 and 5.

74. See *Oil lobbyist reports early access to U. S. information*, The New York Times, May 16, 1978.

75. See *Unreported additional payments abroad are admitted by Exxon*, The New York Times, Sept. 28, 1977.

els for those tankers.[76] McRobbie noted that it was "imperative that Engine Department unlicensed overtime be essentially nonexistent" because previous requests for Coast Guard approval of reductions in manning levels had been denied "due to the volume of unlicensed engine room overtime."

Industry representatives apparently allocate substantial resources and personnel to affect regulatory decisions. Quirk (1981) notes that in contrast, the stake any individual member of the public may have in a regulatory decision usually is small, and most people direct a correspondingly small amount of attention to the issue. This creates an asymmetry between public and private interest and attention (*ibid*).

PROFESSIONAL AND SOCIAL TIES BETWEEN COAST GUARD AND INDUSTRY PERSONNEL

Fradkin (1977) observed a "commonality of style" between Coast Guard and shipping industry personnel, which he believed to result primarily from a similarity in work experiences. In some cases, Coast Guard members train at industry schools. The Merchant Marine Industry Training Program, for example, allows Coast Guard officers working in marine safety to train with some of the nation's largest marine industries. Marine safety personnel have primary responsibility for enforcing tankship safety regulations, by performing regular inspections and vessel boardings, and assessing monetary penalties for pollution violations. The training program began in 1948; about 170 officers have so far been graduated, including Vice Admiral Clyde T. Lusk, current Vice Commandant of the Coast Guard.[77] The program allows officers to gain experience in operation and management of the marine industry and is intended to improve communications between Coast Guard and industry; one of the stated areas of interest covered during training is "the problems associated with being a profitmaking enterprise."

Under these circumstances, a degree of familiarity may exist between members of Coast Guard and of the regulated industry. When *Exxon Valdez* Master Joseph Hazelwood communicated with the Valdez COTP, for example, he addressed Commander Steve McCall by his first name.[78] Use of first names by professionals in frequent contact is not unusual. But the familiarity which this communication reflects may hinder effective regulation. It may be easier to sympathize with friends and business acquaintances in the shipping industry than with the "unseen many" members of the public (Quirk 1981).

THE "REVOLVING DOOR" BETWEEN THE COAST GUARD AND THE OIL SHIPPING INDUSTRY

Coast Guard members can find themselves regulating former shipmates or coworkers who have left the service to take positions in the shipping industry. For example, Exxon Shipping Company President Frank Iarossi spent 8 years in the Coast Guard, including 4 years as head of

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76. See S. W. McRobbie, *UMS/MOA demanning of 75K DWT Class 11/3/88, and 75K DWT Class UMS and Fleet Engine Department Unlicensed Manning*. Memoranda provided by William P. Coughlin, *Boston Globe* maritime reporter.

77. See Proceedings of the Marine Safety Council, Jan.-Feb., 1989.

78. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 41.

the marine engineering division; he retired to join Exxon Shipping Company in 1968.[79]

Exxon tanker crew members state[80] that President Iarossi and Coast Guard Commandant Paul Yost are long-time personal friends. Coast Guard Commandant J. W. Kime, former head of the Coast Guard Marine Safety Office and present Commandant of the 11th District, is also reported to be a close friend of President Iarossi.[81] The two men graduated from the U. S. Coast Guard Academy within 2 years of each other in the mid-1950s. Commander Kime coordinated the U. S. delegation to the International Conference on Tanker Safety and Pollution Prevention in London in 1978, and served as U. S. negotiator for drafting of the IMO Code for Liquefied Gas Ships. While Chief of the Coast Guard Office of Marine Safety, Security, and Environmental Protection, he also recently served along with Iarossi as a co-chairman of a joint industry/government/labor Statutory and Regulatory Subcommittee convened to propose revisions to Federal statutes governing vessel manning.[82] Revisions proposed by the subcommittee, which were not eventually promulgated, appear to have been designed primarily to facilitate vessel demanning.

Employment opportunities for Coast Guard personnel appear in fact to be common in industry. In the field of political science, establishment of such a "revolving door" between a regulating agency and the regulated industry is considered to be a first step in agency "capture" by industry.

Boston Globe maritime reporter William Coughlin notes that he can document about a dozen cases of shoreside company managers, vessel operations managers, and maintenance and repair supervisors who previously served in Coast Guard Marine Safety offices. Former Rear Admiral John B. Hayes, Coast Guard Commandant between 1978 and 1982, was recently hired by Alyeska Consortium to work with communities affected by the *Exxon Valdez* spill.[83]

One of the most prominent Coast Guard officials, former Admiral William M. Benkert, retired after 35 years of service with the agency to become President of the American Institute of Merchant Shipping (AIMS).[84] AIMS is an advocacy group representing the shipping industry. Along with seven individual shipping companies, it filed suit against the State of Alaska in 1977 to block a new state law providing for strict liability and full reimbursement by tanker owners for damages resulting from a spill.[85]

Former Coast Guard Admiral R. Y. Edwards also joined AIMS on retirement; he had served on a 1974 API study group which recommended against incorporation of double bottoms on tankers.[86] Both former Admirals, while still members of the Coast Guard, were instrumental in developing U. S. tanker design standards in the 1970s and took industry positions shortly afterward. Former Admiral Benkert is currently Chair of a National Academy of Sciences Marine Board committee examining the effects of reduced manning levels on tanker safety.

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79. See Stan Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A8, col. 3.

80. Statements made to William P. Coughlin, *Boston Globe* maritime reporter, and in interviews with the principal investigator (Nov. 1989).

81. William P. Coughlin, *Boston Globe* maritime reporter (Nov. 1989): personal communication.

82. See Frank Drozak, Frank J. Iarossi, and Rear Admiral. J. William Kime, untitled memorandum with attached proposed statutory revisions sent to subcommittee members, dated Jan. 26, 1988.

83. See Jones, *Empty promises*, at A10, col. 1.

84. See *Journal of Commerce*, Sept. 3, 1978.

85. See Robert F. Morison, *U. S. groups moving against Alaska oil spill rule*, Journal of Commerce, Sept. 21, 1977.

86. See George F. Reinhard, letter to the *New York Times*, Aug. 4, 1989 at 23.

PROLIFERATING COAST GUARD MANDATES

During the 1970s, the Ports and Waterways Safety Act, the Clean Water Act, and other legislation charged the Coast Guard with a new environmental protection mandate. During the same period, additional responsibilities were also being added to a long list of Coast Guard duties. About 30 pieces of legislation designating new Coast Guard responsibilities were enacted during the 1970s (National Advisory Committee on Oceans and Atmosphere 1983). During the past few years, drug interdiction has required an increasing proportion of the agency budget. The Coast Guard has been charged with so many missions that it may have become unrealistic to expect the agency to carry out all of them successfully. The Coast Guard itself reported that it was unable to fulfill all of its legislated responsibilities within the limits of its resources (*ibid*).

COAST GUARD PROMOTION OF MARINE COMMERCE

Marine safety personnel are directed during their initial training (U. S. Department of Transportation 1986) to "carefully balance safety and environmental concerns against the economic impact felt by those we regulate, the private marine industry...The Coast Guard is dedicated to facilitating commerce to the extent that such action will not prejudice safety of life, property, and the environment. Marine safety personnel must remain flexible, and sensitive to the needs of the marine industry."

An emphasis on this perceived need to take economics into account is often evident in statements made by Coast Guard representatives, as is a related concern for maintaining competitiveness of U. S. flag vessels. For example, Frank Drozak, Frank Iarossi, and Coast Guard Rear Admiral William Kime, co-chairmen of a joint industry/government/labor subcommittee, proposed revisions to U. S. statutes governing vessel manning which they deemed "necessary to accommodate a more competitive approach to the future manning of U. S. flag merchant vessels."[87] They did not discuss the controversial safety effects of crew redictions which would have been facilitated by the proposed revisions. A recent Coast Guard decision to increase the interval for inspection of cargo handling gear from 4 to 5 years was made, according to the agency report, in order "not to place the U. S. flag vessels at a competitive disadvantage by requiring more frequent inspection."[88] The infrequency with which Coast Guard marine safety personnel impose monetary penalties for pollution violations also suggests that perceived economic needs of the industry are being weighted more heavily than responsibilities for environmental protection.

Limited storage space for surplus oil at the Valdez terminus and fear of oil shortages in a nation heavily dependent on petroleum may weight the objective to "facilitate commerce" more heavily in Alaska than elsewhere. These present an incentive to minimize restrictions on tanker traffic to the Port of Valdez, and to keep the port open to tanker traffic, even when navigation hazards exist.

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87. See Frank Drozak, Frank J. Iarossi, and Rear Admiral. J. William Kime, untitled memorandum with attached proposed statutory revisions sent to subcommittee members, dated Jan. 26, 1988, at 1.

88. This Federal Register, Feb. 6, 1989, notice was reported in the Oil Spill Intelligence Report, Feb. 13, 1989 at 6.

COAST GUARD TANKER DESIGN DECISIONS

Besides enforcing existing regulations, the Coast Guard is responsible for preparing new regulations and for modifying existing regulations according to the intentions of Congress. One of the most critical considerations in ensuring tanker safety is ship design.

Oil tankers are among the few ships that are not required to incorporate some type of double hull design, although many double-bottomed oil tankers exist. About 18 percent of the tankers traveling to Valdez have double bottoms; about 9 percent have double bottoms and sides.[89]

The question of whether double bottoms or hulls should be required on oil tankers is controversial, in part because vessel construction costs would increase. Estimates of the cost of incorporating a double bottom on a new tanker of average size range from 5 to 30 percent of total construction costs.[90]

Evidence from two studies suggests that either double bottoms or double hulls, if incorporated on oil tankers, would substantially reduce the amount of oil spilled in most tanker accidents. Perhaps the most systematic study of the protective effects of double bottoms was completed in 1975 by James Card, a Coast Guard naval architect. Card had reported that between 1969 and 1973, of 30 tankers grounded in U. S. waters and discharging oil, 27 would not have lost oil if they had been fitted with double bottoms.[91] Battelle Laboratories found in a 1974 study that both hulls of tank barges with double bottoms or sides were punctured in only 14 of 268 casualties examined; single-hulled barges were completely punctured in 295 of 311 cases examined.[92]

REVERSALS OF COAST GUARD SUPPORT FOR DOUBLE BOTTOMS ON OIL TANKERS

The Coast Guard has twice in the past supported requirements for double bottoms on new American tankers, but has reversed its position both times. The circumstances of both reversals suggests that the agency responded to pressure from the shipping industry. The question of whether the Coast Guard should have mandated double bottoms on oil tankers traveling to Alaska has become especially pertinent since the *Exxon Valdez* grounding. The distance by which the tanker failed to clear Bligh Reef was 5 feet, much less than the margin of more than 11 feet which would have been provided by a double bottom constructed according to standard formulas.[93]

Current U. S. requirements for tankship design were developed during two international conferences, held in 1973 and 1978 by the Intergovernmental Maritime Consultative Organization (IMCO), now the International Maritime Organization (IMO). The agency, a specialized arm of the United Nations based in London, has prepared multilateral conventions on pollution prevention, tanker design, training and certification standards for seafarers, and safety of life at sea.

Although IMCO, and now IMO, was intended to be consultative and advisory in function, and positions taken by the organization are not binding in the U. S. unless ratified by the U. S.

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89. See Stan Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A9, cols. 1 and 3.

90. See Eric Nalder, *Bottom line: safety runs skin deep*, Seattle Times, Nov. 14, 1989 at A5, col. 6.

91. See James C. Card, *Effectiveness of double bottoms in preventing oil outflow from tanker bottom damage incidents*, in Serial 95-80, U. S. Senate, 1978 IMCO Protocols, April, 1978 at 132 to 139.

92. See Nalder, *Bottom line*, at A4, col. 1.

93. See Matthew Wald, *A split on the value of 2-hull tankers*, the New York Times, May 15, 1989. The Exxon Valdez was drawing 55 feet, 11 inches at the bow and 56 feet 1 inch at the stern, and grounded at a point covered with about 51 feet of water, according to Coast Guard calculations.

Senate, the Coast Guard usually follows its recommendations for vessel design and safety features. For an IMO convention to come into force internationally, it must be ratified by a percentage of member nations. This process may take years.

Under the Ports and Waterways Safety Act of 1972, the Secretary of Transportation, via the Coast Guard, was charged with developing minimum standards for design, construction, maintenance, and operation of all vessels carrying hazardous cargoes in the navigable waters of the U. S, including petroleum tankships. Under these provisions, the Coast Guard was given until January 1, 1974, to prepare a set of appropriate regulations (Mangone 1988). In January 1973, an Advanced Notice for Proposed Rulemaking published in the Federal Register reported that the Coast Guard was considering requiring double bottoms and segregated ballast tanks on new tankships.

At the International Conference on Marine Pollution, held by IMCO in London in October 1973, Coast Guard representatives reported to the conference the U. S. position, prepared by the agency, favoring segregated ballast and double bottoms for tankers over 20,000 dwt. However, conference delegates approved an International Convention for the Prevention of Pollution from Ships without requirements for double bottoms on petroleum tankships, and requiring segregated ballast on new tankships of at least 70,000 dwt. This requirement was only for tankships built after January 1, 1976.

That IMCO proposals for restrictions on oil tanker design were so lenient is surprising; IMCO codes, as well as Coast Guard regulations, require double bottoms on certain chemical tankers and liquefied flammable gas tankships. In fact, double bottoms of various constructions have been designed into nearly all of the 60,000 merchant ships currently in service, except for oil tankers (Dane, 1989).

A reason for the nonrestrictive position taken by conference delegates may have been economics; only a minority of member nations are highly industrialized.[94] A second reason was probably lobbying by the shipping industry, which has opposed requirements for double bottoms for many years. IMCO granted consultative status to more than 40 nongovernmental organizations with interests in maritime shipping. These organizations have been able to attend IMCO meetings and present technical contributions to IMCO committees. They included, in the 1970s, the International Chamber of Shipping and the Oil Companies International Marine Forum (OCIMF)[95], organizations formed to promote the interests of shipping companies. It was reported that shipping company representatives lobbied 22 countries before the vote was taken.[96]

In July 1974, the Coast Guard essentially adopted the formal IMCO position in presenting new regulations for design and construction of American coastal oil tankers, including tankers built for the Alaska trade, although the IMCO position was not binding and was not ratified by the U. S. Senate. Final changes to Title 33 of the Code of Federal Regulations, written by the Coast Guard, required segregated ballast tanks only in new tankers over 70,000 dwt and did not mandate double bottoms.[97]

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94. IMO membership consists of more than 125 states (Mangone, 1988). Only about one-quarter are highly-industrialized, and several, such as Switzerland and Malawi, are completely land-locked.

95. See Exxon Marine, Summer 1978, vol. 23, no. 2

96. See U. S. Representative George Miller, testimony before the U. S. House of Representatives, Nov. 1989, reported in Oil Spill Intelligence Report, Nov. 16, 1989 at 3; and Philip Fradkin, *The Valdez Connection*, Audubon Magazine, May 1977..

97. See, generally U. S. Department of Transportation, Coast Guard, *Final Environmental Impact Statement: Regulations for tank vessels engaged in the carriage of oil in domestic trade*, Aug 15, 1975, and *Final*

Risk of creating a competitive disadvantage for U. S. tankers in the world shipping trade, and the need to remain consistent with international standards were the two main reasons cited by the Coast Guard in proposing its regulations.[98] In 1972, Interior Secretary Rogers C. B. Morton had reported to Congress that new tankers built to transport oil from Valdez would be required to have double bottoms.[99] Although the Jones Act almost entirely prohibits participation of foreign-flag vessels in American coastwise trade, including the Alaska trade, so that coastal tankers need not remain consistent with international standards, no stricter provisions were made for these tankers.

The U. S. Interior Department, White House Council on Environmental Quality, and the U. S. Environmental Protection Agency objected to the regulations and an accompanying environmental impact statement, as did the Governors of Washington and Alaska and U. S. Senators Edmund Muskie, Chairman of the Senate Subcommittee on Environmental Pollution, and Warren Magnuson, Chairman of the Senate Commerce Committee. Reason for the objections was that the proposed regulations did not include requirements for double bottoms on tankers built for the Alaska trade.[100] Russell Peterson, Chairman of the White House Council of Environmental Quality, noted that most tankers in the coastal trade in 1973 were under 70,000 dwt in size. The Coast Guard had previously supported segregated ballast tanks for tankers at least 20,000 dwt in size.[101]

Eight of the nation's largest conservation organizations charged in a letter to the Coast Guard that the regulations had been prepared with the assistance of a study group organized by the American Petroleum Institute, including six members from major oil companies, one from a petroleum shipping company, one an independent tanker operator, as well as three government representatives (Fradkin 1977). The study group had been organized, the groups charged, without public notice, and had met in private to review the proposed regulations after the public comment period had closed (*ibid*).

In March 1977, President Jimmy Carter proposed a new set of tanker safety rules, including requirements for incorporating double bottoms on all new tankers and retrofitting existing U. S. tankers with segregated ballast tanks. In April 1977, shortly before the trans-Alaska Pipeline was scheduled to begin operation, Coast Guard Rear Admiral John Hayes reported to a fishermen's convention in Cordova, Alaska, that the agency planned to propose to IMCO that double bottoms be required on tankers traveling through Prince William Sound.[102] However, U. S. Transportation Secretary Brock Adams reported in a January 1978 keynote speech to the Oil Companies International Marine Forum in Washington, D. C., that the U. S. had retreated somewhat in its support of double bottoms, and was prepared to consider substitution of protectively located, segregated ballast tanks.[103]

Environmental Impact Statement: Regulations for U. S. tank vessels engaged in the carriage of oil in foreign trade and foreign tank vessels that enter the navigable waters of the United States, Nov. 12, 1976.

98. See E. W. Kenworth, *Tanker construction rules called lax*, The New York Times, Aug. 29, 1974.

99. These statements were made in testimony at hearings of the Joint Economic Committee in 1972, and at hearings on the Trans-Alaska Pipeline Authorization Act, 43 U. S. C. § 1651 et seq., in 1973. See S. Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A8, col. 1.

100. See Congressional Record, April 25, 1989. (Statements made by U. S. Representative George Miller).

101. See E. W. Kenworth, *Tanker construction rules called lax*, The New York Times, Aug. 29, 1974.

102. See Stan Jones, *Empty promises*, Anchorage Daily News, Oct. 15, 1989 at A1, col. 1 and 2.

103. See R. F. Morison, *U. S. softens its stand on double bottoms*, the Journal of Commerce, Jan. 18, 1978, at 31.

IMCO held a Tanker Safety and Pollution Prevention Convention in London in February 1978. Such a conference had been suggested by President Carter in light of a series of tanker accidents, including the December grounding of the *Argo Merchant*, off U. S. coasts the previous winter.[104] Conference delegates decided to require a combination of protectively located, segregated ballast tanks and Crude Oil Washing (COW), a tank washing method designed to minimize oil released during deballasting, rather than double bottoms. They prepared an international agreement on new standards for crew training. Head of the IMCO Council in 1978 was former Coast Guard Admiral R. Y. Edwards, representing AIMS. Former Admiral Edwards had previously served as Coast Guard representative in the 1974 API study group which had recommended against double bottoms.[105] The U. S. later adopted the 1978 IMCO Protocols.

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104. See *IMCO has "cheaper" tanker safety plan*, Lloyd's List, Oct. 22, 1977.

105. See George F. Reinhard, letter to the New York Times, Aug. 4, 1989 at 23.

POSSIBLE CAUSES OF SENSITIVITY TO INDUSTRY PRESSURE

FEDERAL CONCERN WITH DECLINING COMPETITIVENESS OF U. S. MERCHANT MARINE

During the last several decades, the U. S. government has taken a variety of important measures to strengthen the nation's declining merchant marine. By the late 1960s, only about 6.3% of tonnage in the U. S. trade was being moved on American ships (Mangone 1988). Only one-quarter of the worldwide commercial fleet, but three-quarters of the U. S. commercial fleet consisted of vessels 20 or more years old (*ibid*). Federal provisions to counteract observed declines have included direct construction and operating subsidies, tax deferrals, cancellation of interest payments, and appropriation of funds for training and research (*ibid*).

Perhaps in response to federal actions, the U. S. merchant marine has expanded during the last two decades, but at a much slower rate than those of some other countries.The tonnage of the U. S. merchant marine increased from 14 to 22 million tons from the mid-1960s to the mid-1980s. During that time, the tonnage of the merchant marine of the Soviet Union increased from 7 to 25 million tons, and that of Japan from 12 to 61 million tons (*ibid*).

Hence, federal policymakers retain a concern to maintain competitive status of the U. S. merchant marine. For that reason, the U. S. government at least sometimes opposes measures to regulate U. S. tankers more strictly than foreign flag vessels are regulated. The National Advisory Committee on Oceans and Atmosphere (NACOA), for example, in a report on Coast Guard problems and potentials (1983), recommended that "the Coast Guard move to accept design and construction standards established by the world's leading classification societies and take particular care not to promulgate regulations unilaterally applying to U. S. ships or ports that might seriously impair their competitive position in world trade".

FEDERAL PROMOTION OF INTERNATIONAL COOPERATION IN SETTING TANKER DESIGN AND SAFETY STANDARDS

Industry analysts have noted that because of the international nature of shipborne oil trade, controls enacted by one country will affect tankers worldwide.[106] In summer 1977, for example, shortly before the second IMCO Convention, other IMCO member nations expressed concern over U. S. consideration of tanker design standards stricter than those of other members.[107] The U. S. government attempts to cooperate with other maritime nations in the setting of regulations, in part to promote uniformity of regulations, and probably also because unilateral decisions are opposed by other IMO member nations. U. S. Representative John M. Murphy, for example, explained his opposition to tanker design rules, including a requirement for double bottoms, proposed by the White House in 1977, during the Coast Guard hearings on the rule proposals. "...for the United States to unilaterally attempt to impose this requirement not only for U. S. tankers but for foreign-flag vessels calling at our ports flies in the face of all reason. To take such a route...threatens to introduce complete chaos into that part of our foreign trade involving oil.[108]

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106. See *Reducing tanker accidents*, Exxon Marine, Vol. 22, no. 1, May 1977.

107. See *IMCO: setting rules for the high seas*, Exxon Marine, vol. 23, no. 2, summer 1978 at 12.

108. See *Tanker construction rules hit by Murphy*, the Journal of Commerce, June 22, 1977.

CONCLUSIONS

Pressures from several sources–the shipping industry, the Federal Government, and the international community of maritime nations–operate to minimize Coast Guard regulation of the U.S. tanker fleet, at least in many cases. Some of these pressures originate from positive national goals, including the desire to support a declining American merchant marine and to promote consistency of international regulation of maritime trade, and probably from a desire to minimize both costs and complexity of industry regulation as well. Others probably originate from industry promotion of its interests.

Several pieces of evidence–reversals of support for double bottoms on oil tankers, biased analyses, and willingness to issue approvals of crew reductions without careful analysis of safety effects–strongly suggest that the Coast Guard is sensitive to industry pressure. Other evidence demonstrates that the Coast Guard can be surprisingly inattentive in its enforcement of existing regulations. Examples are inadequacies in vessel inspection practices and in staffing and training of inspectors, and unwillingness to assess fines for violations of pollution prevention regulations. Inattention to responsibilities for vessel inspection and enforcement of pollution prevention regulations may be explained in part by funding restrictions and a proliferation of other duties imposed by Congress on the Coast Guard. It may also be partially explained by poor allocation by agency decision-makers of staff and resources among field units, and flawed assessment of relative priorities of agency mandates.

Coastal states, including Alaska, should note both the magnitude and sources of existing pressures on the Coast Guard. Much of the pressure for minimal regulation originates from the Federal Government, the oil industry, and even the international community of nations, all organizations much more able to influence Coast Guard decisions than any single coastal state. Hence the State of Alaska should consider organizing with other coastal states to promote shared interests in protecting the coastal zone. As a single state with a small population of voters and small Congressional delegation, Alaska is unlikely to succeed in ensuring safety of its marine environment by acting alone.

To ensure readiness for an oil spill in Prince William Sound and elsewhere, the State of Alaska may at least partially counteract Coast Guard inattentiveness by taking direct actions of its own. For example, it may be able to use consistency provisions of the Coastal Zone Management Act to impose restrictions on tanker traffic in Prince William Sound and elsewhere in State waters, especially if it acts in concert with other coastal states to propose uniform regulations. The State can only remedy most weaknesses in Coast Guard tanker safety enforcement, however, by applying political pressure, either directly on the Coast Guard, or indirectly on the U. S. Congress or the IMO. In these cases, concerted action by an association of coastal states is likely to be the most effective strategy. Following are some specific technical and policy recommendations to the State.

POLICY RECOMMENDATIONS

• The State of Alaska should consider petitioning the U. S. Congress for modifications of statutes pertaining to investigations of major vessel casualties.

Major marine casualties should be investigated by a Federal agency empowered to conduct a complete investigation into all circumstances surrounding an accident and to refer responsible parties to the U. S. Attorney General for prosecution when necessary. Only the Coast Guard has both the authority and the expertise to conduct such investigations. Whenever the Commandant chooses not to convene a Marine Board to investigate an accident, however, as he did in the case of

the *Exxon Valdez* grounding, only an NTSB investigation is made. Such an inquiry is fact-finding in nature, and the NTSB is neither empowered to indict parties nor to compel witnesses to testify or documents to be supplied. Neither does it have the maritime expertise of the Coast Guard. Exxon Valdez master Joseph Hazelwood is reported to have refused to testify before the NTSB during its May 1989 hearings in Anchorage, Alaska.[109] Chief engineer of the Exxon Valdez, Jerzy Glowacki, reported to the NTSB during the May hearings that he had drunk numerous beers and gins and tonics between 2:00 and 7:45 p.m. on March 23, resuming duty on board the tanker at 9:30 p.m. The Coast Guard has not acted to discipline Glowacki; a Coast Guard spokesman reported that Coast Guard regulations prevent use of NTSB testimony at a Coast Guard hearing.[110]

There are two alternative means to ensure that a comprehensive criminal investigation will be made of major marine casualties by a Federal agency empowered to refer parties for prosecution. First, existing statutes could be modified to restrain the Coast Guard from relinquishing its authority to investigate a major casualty. The advantage of this alternative is that a Marine Board investigation allows the agency the opportunity for through self-evaluation when its own safety procedures may be flawed. Second, other Federal agencies may be empowered to refer parties for prosecution in a marine casualty case. Additional empowered agencies could include not only the NTSB but also the Environmental Protection Agency (EPA) or the U. S. Fish and Wildlife Service (USFWS), both of which have marine environmental protection responsibilities. A Law Enforcement Division already exists within the USFWS and a Criminal Investigations Office exists within the EPA. An advantage of this alternative is that the Coast Guard would not of necessity pass judgment on itself in cases in which its procedures are found to be at fault. The State of Alaska should promote a Congressional examination of these alternative remedies and modification of existing statutes.

• The State of Alaska should consider petitioning the U. S. Congress for modifications of existing conflict-of-interest legislation.

Existing Federal conflict-of-interest statutes impose post-government employment restrictions on retirees from the Coast Guard, as well as other former Federal employees. No abuses of existing legislation were identified during the course of this study, but it is clear that a substantial "revolving door" exists between the Coast Guard and the regulated oil shipping industry. Given the large number of former Coast Guard employees who have obtained industry jobs, a potential for improper use of influence exists. The frequency with which Coast Guard officials at the highest levels within the agency move to industry is of particular concern. Although no clear proof exists, such movement is likely to influence Coast Guard decisionmaking.

Not all potential abuses of influence are prohibited by existing statutes. The State of Alaska should consider promoting two particular modifications of existing statutes to the U. S. Congress.

"Cooling-off period" Provisions of 18 U. S. C. § 207 prohibit any former agency official from representing parties other than the United States in matters in which he or she was personally involved or over which he or she had responsibility while a Federal employee. Provisions of 18 U. S. C. § 207(c) bar Federal employees, including Coast Guard officers, from representing any party before their former agency with intent to influence agency decisions on any old or new matter pending before the agency or in which it has an important interest. This one-year bar, however, has been interpreted in Federal regulations as not applying to broad policy issues, technical areas, or

109. See Oil Spill Intelligence Report, May 25, 1989 at 1.

110. See William P. Coughlin, *Exxon keeps Valdez hand who drank*, the Boston Globe, Dec. 1, 1989.

conceptual work.[111] The bar has been interpreted to apply only to matters similar to examples cited in the statute, which include judicial or rulemaking proceedings, applications, requests for rulings or other determinations, claims, contracts, and other particular matters.

These regulations should be modified to cover policy and technical issues. The oil shipping industry has a stake of millions of dollars in Coast Guard decisions on technical matters such as oil tanker design restrictions, ship manning levels, designation of load line zone boundaries, and administration of VTS systems. This statute is intended to bar senior officials from lobbying former colleagues in favor of decisions favoring a special interest. Former high-ranking Coast Guard officers have left the agency and taken positions with the shipping industry or with organizations promoting industry interests. Hence, in the case of Coast Guard regulation of the shipping industry, an important potential for legal misuse of influence will continue to exist unless section 207(c) is modified.

Restriction of "behind-the-scenes activity Provisions of 18 U. S. C. § 207 generally preclude representation of special interests before a Federal employer, but do not bar former Federal employees from "behind-the scenes" activity. An amendment to 207(a), H. R. 5043, was passed by the 100th Congress but vetoed by President Reagan on November 23, 1988.[112] This legislation would have restricted former Federal employees from "aiding or advising" any private party in a matter before the government. Imposing such a ban for a period of one or two years would effectively prevent use of information and influence gained while in Federal employment to aid a special interest such as the oil shipping industry. As in the case of 207(c), matters covered by such a ban should include technical and policy decisions. Such an amendment is particularly important in the case of interaction between the Coast Guard and the oil shipping industry because members of both organizations already share technical expertise not possessed by others.

• The State of Alaska should promote modifications of existing Coast Guard institutional structure.

Too many responsibilities may have been placed on the Coast Guard and it may have been allocated too small a budget. Responsibilities such as vessel inspection and environmental protection appear to have been accorded too low a priority by the agency. Increasing responsibilities for drug interdiction have exacerbated previous budget constraints on Coast Guard marine safety functions. The State of Alaska should petition both Congress and the Coast Guard to examine and remedy this problem.

Organizational modifications The State of Alaska should encourage the U. S. Congress to evaluate the existing organizational structure of the Coast Guard. In particular, it may be appropriate to move marine environmental response, commercial vessel safety, and port and environmental safety functions to a branch within the agency separate from law enforcement and military readiness functions, but equal in importance. Such a change would be intended to elevate vessel and environmental safety functions in importance within the agency.

Budget limits An upper limit should be placed by Congress on percentage of the total Coast Guard budget allocated for drug interdiction, which has increased from 13.1 to 24 percent between 1982 and 1989.[113] The budget for marine safety programs, especially staffing and training

111. See U. S. Dept. of Justice. *To serve with honor: report of the President's Commission on Federal Ethics Law Reform.* March 1989. Report and recommendations to the President at 55.

112. See U. S. Dept. of Justice, as above, at 61.

113. See Nalder, *Coast Guard is short*, at A4 cols. 2 and 3.

vessel inspectors, should be increased.

Vessel inspection staffing Vessel inspection procedures and policies in particular should be modified. Adequate Coast Guard inspections of oil tankers traveling to Alaska is increasingly important as these vessels age. Coast Guard uniformed personnel rotation policies adversely affect adequacy of vessel inspections, and too few resources and personnel have been allocated to certain inspection offices. Coast Guard stations at Portland, Oregon, Los Angeles, California, and elsewhere where Alaska tankers undergo both drydock and recertification inspections should be better staffed. Not only should additional inspectors be added at these stations, but more inspectors should be civilian. Such personnel should be permanently stationed at inspection sites.

Because a surplus of tankers exists worldwide, some oil shipping companies are reducing size of their fleets and number of fleet employees. Exxon Shipping Company, for example, has instituted a voluntary early retirement program.[114] The Coast Guard should be encouraged to recruit experienced former crew members from shipping company fleets to fill civilian vessel inspection positions. Such people are familiar with tanker design and operation, as well as likely problem areas. Such recruitment is done in Europe, where vessel inspectors are usually former ship captains or chief engineers.[115]

TECHNICAL RECOMMENDATIONS

• The State of Alaska should use provisions of the Administrative Procedures Act, 5 USC § 553 (e), to petition the U. S. Coast Guard for the following changes in regulations affecting tanker safety:

a. Add a regulation requiring double hulls on all U. S. oil tankers.

Liquefied natural gas cargos are required to be transported in vessels with double hulls. Certain hazardous chemicals, such as chlorosulfonic acid and phosphorus, are required to be transported in Type I double-hulled tankships. Type I hulls must have double bottoms of dimensions of breadth divided by 15, or 6 meters, whichever is less, and double sides of breadth divided by 5 or 11.5 meters, whichever is less. These chemicals are highly toxic but also volatile; a spill will evaporate within several days. Non-soluble fractions of less-toxic crude oils remain in the marine environment far longer. Crude oils are at least as hazardous to marine environments as chemicals required to be transported in Type I double-hulled tankships, when evaluated over a long term.

Bunker tanks are commonly located forward of the collision bulkhead on existing oil tankers. Bunker fuel oil is a common type of marine fuel. Bunker tanks, as well as cargo tanks, should be protected by a double hull.[116]

Two of the largest LNG carriers suffered severe groundings without loss of cargo (McKenzie 1989; Dane 1989). The *El Paso Paul Keyser*, traveling at 17 to 18 knots, ran aground on a rock ledge in the Strait of Gibraltar in June 1979, ripping

114. See Katherine Esty, Robert Gandossy, and Jack Williams, *Survey of Exxon Shipping Company, June 1987.* Unpubl. company document at 4.

115. See Eric Nalder, *Coast Guard is short on staff and expertise*, Seattle Times, 89 at A4, col. 4.

116. Arthur McKenzie, Director, Tanker Advisory Center (Nov. 1989): personal communication.

open the outer bottom from four of six cargo tanks but losing no gas cargo. The *LNG Taurus* ran aground in the Sea of Japan in December 1980, causing leakage in about 40% of the double-bottom space but no loss of cargo.

The Oil Pollution Liability and Compensation Act of 1989 passed by the Senate last summer incorporates a provision originally proposed by Senator Brock Adams of Washington. This provision requires the Coast Guard either to produce regulations mandating double bottoms in new U. S. tankers or explain why such a design is not necessary.[117] A similar House bill, passed November 9, 1989, requires that double bottoms be incorporated on all tankers and tank barges operating in U. S. waters within 7 years and double hulls within 15 years, and that all new foreign and U.S.-flag tankers traveling in U. S. waters be equipped with double hulls.[118] The State of Alaska should promote incorporation of provisions requiring double bottoms for oil tankers in this legislation and should carefully monitor eventual Coast Guard response.

b. Add a regulation requiring that scantlings of new oil tankers be at least 130 percent of the full load draft.

Design weaknesses common among tankers in the Alaska trade may speed deterioration of vessel condition. Fatigue cracking is apparently most common in the midships region of vessels, suggesting that the constant up-and-down working of tanker hulls in heavy seas is the primary stress factor. Coast Guard researchers noted that most hull failures occurred on tankers more than 700 feet long.

These study results suggest that oil tankers built under current design standards are not strong enough to withstand stresses of frequent travel through the Gulf of Alaska. Arthur McKenzie recommends that additional structural strength be incorporated into new tankers by requiring that scantlings of new oil tankers be at least 130 percent of the full load draft.[119] Scantlings are the dimensions of steel structural parts used to build a vessel. Vessels built according to this recommendation would have a hull-to-cargo weight ratio of about 1:4.5 or 1:5, rather than 1:6 as is common among existing tankers. Cargo tank compartments should be smaller, with internal tank steel of sufficient thickness to withstand at least 30 to 40 percent corrosion wastage before being condemned.[120]

c. Modify the regulation requiring "ready access" to containment gear mandated by approved contingency plans for shoreside facilities, 33 C. F. R. § 154.545 (1988).

Both the *Thompson Pass* incident, in January 1989, and the *Exxon Valdez* grounding have demonstrated the inadequacy of the current regulation. A probable reason for the nonspecific language of this regulation is that cooperatively-owned contingency gear is maintained by several facilities in some areas, such as Puget

117. See U. S. Senator Brock Adams, letter to constituents, Aug. 11, 1989, at 1.

118. See C. Hanson, Tough oil spill protection bill sails through House, Seattle Post-Intelligencer, Nov. 10, 1989 at A3, col. 3.

119. Arthur McKenzie, Tanker Advisory Center Director (Nov. 1989): personal communication.

120. This recommendation was made by maritime arbitrator George F. Reinhard (Nov. 1989, personal communication).

Sound, Washington, and in California. This regulation should be made more stringent by adding specific provisions for regular equipment checks at the Alyeska Service Company transfer facility. Frequent unscheduled drills at this facility, conducted in both daytime and nighttime conditions, should be mandated by Federal regulation.

Note that the Alaska Department of Environmental Conservation also has responsibilities for promulgating regulations necessary for ensuring adequate oil spill preparedness, for inspection of oil transfer facilities, and for review and approval of oil spill contingency plans for these facilities. Alaska Statutes § 46.04 and 18 AAC § 75.305 to § 75.395.[121] State of Alaska methods of evaluating preparedness should also be reviewed and deficiencies corrected.

d. Add a regulation requiring licensing of all tankship owners and operators and of all shoreside transfer facilities.

Condition of tankers traveling to the Port of Valdez varies widely: some are built to high standards and are well maintained; nearly 20% have been fitted with double bottoms or hulls; but others have been designated as high risk for charterers. Arthur McKenzie, Director of the Tanker Advisory Center, recommends licensing owners and operators of tankships as one means to promote the safety interests of Alaska and other coastal states.[122] Owner/operator licenses should be renewed only when minimum safety and pollution standards have been met. Such standards should be described specifically in the Code of Federal Regulations.

e. Prepare regulations requiring checking of pilot and engine officer competence, preferably using simulators, before each license renewal.

A GAO research team suggested in 1979 that Coast Guard standards for merchant marine personnel applying for licenses or renewals be made more stringent (General Accounting Office 1979). The team suggested that personnel should demonstrate competence by providing evidence of recent training or experience. The Coast Guard may choose not to renew a merchant mariner's license, but rarely does so.[123]

The *Exxon Valdez* grounded because several specific errors in navigation were made.[124] Arthur McKenzie, Director of the Tanker Advisory Center, recommends regular testing under conditions resembling reality as closely as possible to

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121. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 63-64.

122. See, for additional discussion of this recommendation, A. McKenzie, *Petroleum Tankship Operations*, at 24-10 (1989), and *Federal marine spills review: scoping exercise and recommendations*, prepared for Environment Canada, June 1989 at 4-2.

123. See The Washington Post, March 29, 1989 at A, 9:1.

124. See, generally *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska.

minimize the likelihood of future errors.[125] Current methods of licensing and renewing licenses of pilots don't require demonstration of competency, but the GAO (*ibid*) noted Coast Guard statistics showing that human error either contributes or is a fundamental factor in about 80 to 85% of vessel casualties.

f. Prepare a regulation mandating use of electronic chart systems to track vessel position.

It is not clear from existing evidence whether *Exxon Valdez* Third Mate Gregory Cousins was sure of the tanker's position as it approached Bligh Reef.[126] Improved technology for precise identification of vessel position has recently become available. Arthur McKenzie, Director of the Tanker Advisory Center, recommends that these systems be mandated for tankships.[127] Electronic charts use data from loran, satellite positioning receivers, radar, and other instruments as well as digitized nautical charts to produce a video readout of vessel position. Electronic chart systems include alarms triggered when a hazardous condition exists. The best known chart system is the Precise Integrated Navigation System (PINS) produced by Offshore Systems of Vancouver, Canada. When on-shore radar reflectors are available, vessel location can be identified to within 6 or 8 feet with such a system (*ibid*).

The Certificate of Inspection for the *Exxon Valdez*, which is equipped with only a single rudder and propeller, shows her to be a highly automated tankship. At the time of the March 24 grounding, the vessel was operating under the control of a computer program which gradually increases engine speed up to sea speed full ahead. The ship's speed was increasing on approach to Bligh Reef, and engine RPMs were continuing to increase during and after the grounding.[128] Such highly automated tankers are in increasingly common use in Alaskan waters and elsewhere. The circumstances of the *Exxon Valdez* grounding demonstrate that such ships, in particular, should be equipped with electronic chart systems.

•The State of Alaska should petition the Coast Guard to make the following modifications of existing guidelines and Federal regulations for the Prince William Sound VTS system.

a. Local pilots should oversee radar surveillance operations at the Coast Guard Valdez Vessel Traffic Center.[129] The position of watchstand supervisor has

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125. See, for additional discussion of this recommendation, A. McKenzie, *Petroleum Tankship Operations*, at 24-10 (1989) and *Federal marine spills review: scoping exercise and recommendations*, prepared for Environment Canada, June 1989 at 4-1.

126. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 30-31.

127. See, for additional discussion of this recommendation, A. McKenzie, *Petroleum Tankship Operations*, at 24-10 (1989) and *Federal marine spills review: scoping exercise and recommendations*, prepared for Environment Canada, June 1989 at 2.2.

128. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 26-27 and 37.

129. This recommendation was made by Jim Woodle, Coast Guard Captain of the Port at Valdez from July 1979 to April 1982. Personal communication (Nov. 1989).

been added to existing positions of radar and radio watchstanders, so that three people now oversee tanker traffic during all three daily shifts. All three positions are currently filled by Coast Guard personnel. This supervisor position should be made permanent, and should be filled by local pilots. Oversight by local pilots of radar operators would ensure that tankers are monitored by people experienced in local procedures and conditions. Such oversight by pilots is regular procedure at the Port of Rotterdam.[130] Procedures at this port should be used as a model for Valdez.

b. Provisions of 33 C. F. R. § 161.356 should be modified. Under this regulation, tankers may join, cross, or leave a lane of the Prince William Sound Traffic Separation Scheme (TSS) after notifying the Coast Guard Vessel Traffic Center. In the first few years of operation of the VTS system, tankers were not able to make such course changes without obtaining Coast Guard permission, and were then required to make frequent reports to the Center. A requirement that permission be obtained, rather than that Coast Guard should be notified, should be incorporated in this regulation.

c. Timing of watch changes at the Valdez Vessel Traffic Center should be staggered from those on oil tankers monitored by the Center.[131]

d. All tankers arriving at the Alyeska transfer facility should be boarded by the Coast Guard.[132] Such a "100% boarding" policy was in force during the first few years of pipeline operation. During that time, camaraderie developed between tanker crews and Coast Guard boarders. Jim Woodle, former COTP at Valdez, found that in these circumstances, tanker crew members often notified Coast Guard members of problems, such as cargo tank cracks, which otherwise a boarding party would have been unlikely to find.[133] It is more common at other ports to board a much smaller percentage of merchant vessels; Seattle inspectors, for example, board about 15 percent of all ships entering port. Circumstances at Valdez are unique, however, it is feasible to board all tankers arriving at this port, as it is not elsewhere. A 100% boarding policy should be written into VTS system guidelines.

e. Special restrictions on tanker speed within Valdez Narrows are described in 33 C. F. R. § 161.376. Under this regulation, loaded tankers must not traverse the Narrows from Middle Rock to Potato Point at a speed greater than 6 knots; unloaded tankers must not travel faster than 12 knots. A restriction on tanker speed during periods of darkness, when floating ice is present in Valdez Arm, or whenever a tanker diverts from established traffic lanes should be added to the existing provision. The Exxon Valdez was traveling at a speed of 12 knots in darkness as it maneuvered across traffic lanes in order to avoid ice shortly before grounding on Bligh Reef.[134] The area of restricted speed should extend past the point at which tankers normally turn south after passing Bligh Reef.

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130. Jim Woodle (Nov. 1989): personal communication.

131. This recommendation was made by Jim Woodle.

132. This recommendation was made by Jim Woodle.

133. Jim Woodle (Nov. 1989): personal communication.

134. See *In the Matter of the Investigation of the Accident Involving the Grounding of the Tankship Exxon Valdez in Prince William Sound, on March 24, 1989*, Hearings before the National Transportation Safety Board, July 1989, Proposed probable cause, findings, and recommendations of the State of Alaska at 24.

f. Specific guidelines for restriction of tanker travel and especially for port closure when hazardous conditions exist should be prepared by the Coast Guard for Prince William Sound. Such guidelines may be difficult to prepare because of weather and wind conditions in the Sound. That is, it may prove difficult to quantify conditions under which daylight-only travel should be mandated, or conditions under which the port should be closed. It may even be necessary to place additional wind instruments at strategic points within Valdez Arm.

However, evidence suggests that meaningful guidelines would be of benefit in cases when Coast Guard staff are pressured to make specific decisions. For example, the *Exxon New Orleans* was allowed to dock and receive a partial load of oil at Valdez in February 1989, with the wind clocked at between 50 and 90 miles an hour, the air temperature estimated by a crew member at about -20° F, and with winches, scupper plugs, and other gear coated with an estimated 4 inches of ice. The Captain of the Port had closed the port due to hazardous weather, but allowed at least two tankers to dock after both representatives of Alyeska Consortium and the local pilots association pressured him to allow tanker travel.[135] Developing specific guidelines mandating closure during periods of extremely hazardous weather, and disallowing exceptions, should eliminate cases of port reopening due to industry pressure.

g. Tankers leaving the Port of Valdez are now accompanied by Alyeska escort vessels equipped with containment gear. The Coast Guard should recommend to Alyeska managers that these vessels be equipped with infrared detectors. Such detectors are more effective than radar for detection of ice, and are useful not only for locating ice but for roughly establishing its direction and rate of travel, since an iceberg leaves an infrared 'shadow' of cold water as it moves.[136] Information obtained by an escort boat so equipped could be reported both to the tanker and to the Vessel Traffic Center.

• The State of Alaska should join with other coastal states to test its consistency rights under the Coastal Zone Management Act of 1972.

In *Ray vs. Atlantic Richfield* , 435 U. S. 151 (1978), the State of Washington was denied the right to impose restrictions on size and design of tankers traveling in state waters largely because of a need for uniformity of regulation. Coastal states acting together to promulgate similar state regulations to promote tanker safety will maximize the likelihood of court recognition of CZMA consistency rights.

• The State of Alaska should join with other coastal states:
a. To develop mechanisms for oversight of U. S. Coast Guard vessel and shoreside facility inspection procedures and vessel boardings.

The GAO noted in 1979 and again in 1985 that Coast Guard field units often fail to follow up on outstanding vessel deficiencies to ensure that identified problems have been corrected. State oversight will be most effective if conducted cooperatively, since vessels inspected in one state travel in waters of other states. This is especially true for Alaska: tankers traveling to the Port of Valdez undergo dry-

135. William P. Coughlin, *Boston Globe*. Article manuscript, Aug. 31, 1989.

136. Jim Woodle (Nov. 1989): personal communication.

dock and recertification inspections elsewhere. Findings should be tabulated and made available to the public.

b. To develop state-level mechanisms for oversight of classification societies.

The Coast Guard relies increasingly on the American Bureau of Shipping (ABS) for inspection and certification of vessels and vessel plans, but provides little formal oversight of the society. Memoranda of Understanding between ABS and Coast Guard specifies that Coast Guard shall oversee ABS inspection procedures; the General Accounting Office (1985) noted that only 8 of 12 Coast Guard field units examined had formal oversight programs. Classification societies worldwide, including the ABS, have been criticized for inadequate inspection procedures (McKenzie 1989).

• The State of Alaska should join with other coastal states to promote impartial studies of the safety effects of demanning and a concurrent moratorium on reductions in tankship crew size.

The exact cause of the errors leading to the grounding of the *Exxon Valdez* has not been positively identified. It is likely, however, that crew fatigue was an important contributing factor. The cost of maintaining personnel on vessels is a large part of total operating costs. Competition from foreign flag vessels has been most often cited by the shipping industry as a reason for reducing manning. However, tankers in the coastwise U. S. trade are largely protected from such competition (46 U.S.C. § 883).

No further requests for demanning should be approved by the Coast Guard until the effects of previous crew reductions have been carefully examined. Such inquiries should include investigation of reports by experienced crew members both of problems with automation devices (including reports that not all engine components are linked to the Bailey Network 90 automation control and alarm system[137]) and inadequate maintenance of reduced-crew vessels.

Because of the excellent safety record of Japanese oil tankers, the results of current Japanese reduced-crew experiments should also be evaluated. Japanese methods for selecting crew complements and choosing number of crew members for oil tankers should be compared with American methods.

Powerful statistical quality control procedures are used by Japanese manufacturers to engineer extremely reliable products.[138] It is likely that Japanese automation equipment is more reliable than American systems, and that American systems could be improved by evaluating Japanese counterparts and the methods used to produce them. Automation equipment used on Japanese tankers should be compared with the Bailey Network 90, the automation system in commonest use on American tankers. The series of recent power losses by oil tankers in the regular Alaska trade this year suggests that improvements could be made in American automation technology. The Coast Guard has in the past conducted evaluations of safety devices; it should initiate

137. From notes provided to William P. Coughlin, *Boston Globe* maritime reporter.

138. See, generally, George E. P. Box and Soren Bisgaard, *The scientific context of quality improvement*,, Quality Progress, June 1987, at 54 to 61.

such a study of automation systems.

• The State of Alaska should join with other coastal states to campaign for improvements in tanker design standards and anti-pollution measures at future IMO assemblies and conferences.

More than 40 nongovernmental organizations with interests in maritime shipping have been granted consultative status by IMCO, now IMO; representatives have attended IMCO meetings and presented technical contributions to IMCO committees. They included, in the 1970s, the International Chamber of Shipping and the Oil Companies International Marine Forum[139], organizations formed to promote the interests of shipping companies. Representatives of coastal states should also be present at IMO conventions to promote state interests. An IMO conference to consider a convention on oil spill preparedness and response is expected to be held next year.[140]

• The State of Alaska should institute mechanisms and allocate personnel and funds for permanent, formal oversight of both Coast Guard decision-making and oil shipping industry operations in Alaska.

Such oversight should be conducted by a unit of the State government charged only with responsibility for inspecting and reporting on petroleum transport operations. Formal provisions describing inspection and oversight procedures in specific language should be adopted by the State. The State should consider contracting with independent, unbiased experts to conduct on-site evaluations. Charles Hamel, of Charles Hamel and Associates, suggests that inspectors should board ships and inspect shore transfer facilities sporadically, rather than regularly, and that all observations should be made public. Placing all inspection reports in public libraries and other public sites would maximize public access to reliable information and facilitate citizen oversight.

• The State of Alaska should recruit experienced members of the merchant marine and people experienced in tankship design, construction, and operation for oversight programs. It should commit funds for frequent technical training of oversight staff.

U. S. Representative George Miller and other observers have noted that states operate at a disadvantage when they attempt to challenge Coast Guard decision-making, because Coast Guard and shipping industry personnel have greater expertise than other people.[141] Such a disadvantage can be overcome if the State of Alaska is willing to actively seek out experienced personnel, and to commit funds for their training.

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139. See Exxon Marine, Summer 1978, vol. 23, no. 2.

140. See Fairplay, Sept. 28, 1989, at 7.

141. See Congressional Record, April 25, 1989.

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APPENDIX A

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