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Proceedings of the National Fishing Industry Safety and Health Workshop



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

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PROCEEDINGS

of the

NATIONAL FISHING INDUSTRY

SAFETY AND HEALTH WORKSHOP

Edited by

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and

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PREFACE

An average of 45 boats go down off the coast of Alaska each month. Last year, 35 workers died while working in Alaskan seas. For the 51,000 fishers in this nation, a day at work frequently means facing conditions of extreme cold, high winds, and treacherous seas. During peak fishing seasons, many of these workers labor continuously and without sleep. Moreover, workers are often asked to use extremely hazardous machinery on a work surface that is continuously moving. All of these factors combine to make commercial fishing in Alaska nearly 30 times more hazardous than the average job in the United States.

This is a workforce at exceptionally high risk. Protecting these men and women from occupational injury and death will undoubtedly require a unified effort by all who can effect prevention. The National Institute for Occupational Safety and Health (NIOSH) is the federal research agency charged with assuring "safety and health at work for all people." In the spirit of fulfilling that promise to workers in the fishing industry, NIOSH convened the Fishing Industry Safety and Health Workshop in 1992.

By bringing together interested parties, NIOSH hopes to make progress in preventing further injury and death at sea. At this workshop we endeavored to clarify what is known and to determine what must be done if we are to protect these vulnerable workers.

These Proceedings mark a step forward in documenting problems that have received little attention in the past. They are a substantial contribution to what has been written about prevention of injury and death in the fishing industry around the world. We hope this document will serve as a resource for those who will join our fight for prevention and as a constant reminder of this all too often forgotten population.

Finally, I would like to congratulate and thank all of those who participated in this workshop, and extend my gratitude to three people who were instrumental in organizing it and publishing these proceedings. I applaud the efforts of CAPT Thomas R. Bender, CAPT Melvin L. Myers and Mr. Michael Klatt, all of whom contributed significantly to making this workshop a success.

Richard A. Lemen

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FOREWORD

In 1990, the Congress established a national initiative in safety and health that applies to the men and women who fish for their living in the United States. The Congress directed that this initiative:

> *"when sustained over a period of time, would result in a significant and measurable impact on . . . health effects among rural Americans."*

The initiative addresses the agriculture, forestry, and fishing industries. As part of the initiative, the Congress appropriated funds for the National Institute for Occupational Safety and Health (NIOSH) to convene a Surgeon General's Conference on Agricultural Safety and Health. NIOSH convened this Conference in 1991, and it principally addressed farming.

Ancillary to the Surgeon General's Conference, NIOSH convened the National Fishing Industry Safety and Health (FISH) Workshop in Anchorage, Alaska, on October 9-11, 1992, to address commercial fishing safety and health. Consistent with the Surgeon General's Conference, the objectives of the FISH Workshop were to raise consciousness, build coalitions, disseminate information, and encourage action to prevent injury and disease in fishing. At the FISH Workshop, these objectives were achieved as follows:

- *Raise Consciousness.* A broad range of concerned parties described injury problems among fishers and suggested solutions to these problems.

- *Build Coalitions.* A network of individuals representing governmental agencies, fishers, employers, and vessel owners convened and spoke to the common concern of preventing injuries, illnesses, and deaths related to the fishing industry.

- *Disseminate Information.* We have disseminated these *Proceedings of the National Fishing Industry Safety and Health Workshop* to participants and key prevention leaders across the nation and internationally, particularly to leaders in the circumpolar nations.

- *Encourage Action.* The participants overwhelmingly encouraged action to improve safety for fishers. Some participants identified preventive actions that can be implemented now, and others identified research actions that are needed to discover the causes of, and the solutions to, these problems.

Peggy Barry, in her keynote address, spoke of moving from a glass half empty, to a glass half full. She was referring to the change from a fatalist attitude about fishing safety to an attitude of preventing injuries and fatalities among

fishers. Many participants echoed her metaphor and encouraged movement to fill the glass by preventing the injuries and fatalities that needlessly occur far too often in the fishing industry. They spoke of the need and the willingness to keep the communication lines open between all parties concerned with improving safety in commercial fishing.

This is certainly the aim of NIOSH. We are committed, as attested by the convening of the FISH Workshop, to keeping these communication lines open so that we can all move forward with a shared strategy in which all parties win. As focal point for this commitment to communication and prevention nationally, NIOSH has established a vision statement:

> "*Delivering on the Nation's Promise:*
> *Safety and Health at Work*
> *For All People . . .*
> *Through Prevention.*"

These *Proceedings of the National Fishing Industry Safety and Health Workshop* offer a major step forward in building an understanding of the many partners who must be involved, and the issues that must be considered, in making fishing vessels safer and fishing more healthy. Please join us in the coming months and years in helping to fulfill our shared vision of prevention.□



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EXECUTIVE SUMMARY

By Melvin L. Myers, Michael L. Klatt, and George A. Conway

INTRODUCTION

A recent article published in *Fortune* entitled "The Most Dangerous Job in America" described the environment that commercial fishers face.[1] The author of that article quoted a fisherman, "*But fatigue can get to people*," and continued to describe some of the dangers that the commercial fisher faces:

"So can the ocean. Rogue waves swamp boats without warning. Ice collects on the pilothouse and on stacked gear, raising the center of the ship's gravity, redrawing naval architecture, until the vessel suddenly capsizes. Crews must attack the ice with baseball bats and crowbars, a fight to the death. Even water sloshing around on deck can create what is called a free-surface effect that inhibits stability. Equipment dislodged by the ocean's roll — modern-day loose cannon — is perilous."

To consider how to prevent the injuries and deaths, which result from exposure to these kinds of dangers, the National Institute for Occupational Safety and Health (NIOSH) convened the National Fishing Industry Safety and Health (FISH) Workshop in Anchorage, Alaska, on October 9–11, 1992. The purpose of the FISH Workshop was to increase awareness, build coalitions, share information and experiences, and encourage action to prevent injury and disease as related to work in the commercial fishing industry.

Working conditions have long been a concern among fishers dating back to colonial America. In 1602, Cape Cod gained its name from the great numbers of cod caught there. By 1664, 14,300 men from Boston were engaged in fishing. By 1717, 1,300 fishers from Newfoundland had migrated to New England, not only for better fishing, but for better working conditions.[2]

In 1970, the U.S. Congress addressed working conditions for all Americans when they enacted the Occupational Safety and Health Act, and in 1988 they enacted the Commercial Fishing Vessel Safety and Health Act. To aid in the rule making process by the U.S. Coast Guard (USCG), the National Research Council engaged in a study and offered these recommendations:[3]

- Basic safety and survival training for fishers.
- Skills development for vessel operators.
- Some form of certificate or license to validate that essential skills have been acquired and to motivate attention to safety.
- An inspection program for vessels to ensure that they are fit for service.

It was in the wave of this interest that NIOSH convened the FISH Workshop. This Executive Summary summarizes the *Proceedings* of the FISH Workshop.

First, an overview of the FISH Workshop follows this introduction. The overview summarizes each presentation in the order that they appeared on the program. Generally, the flow of that program was first to define the problem of fishing-related injuries and deaths, then to describe possible solutions. Each session cor-

responds to a chapter in these *Proceedings*. Second, we describe prevention measures that emerged from the *Proceedings*. These measures provide important insights and the elements of a strategy for the prevention of injuries and diseases in the fishing industry.

OVERVIEW

When the Division of Safety Research at NIOSH established the Alaska Activity in Anchorage in 1991, the staff soon introduced the idea for the FISH Workshop. It was apparent from early investigations by the Alaska Activity[4] and from former investigations[5] that perhaps the most significant and unique injury problem in Alaska was fatalities within the fishing industry. The unique situation in Alaska is graphically illustrated by Figure 1.

In 1989, NIOSH published a report that described traumatic occupational fatalities for the years 1980 through 1985.[6] When the rates were calculated for separate industries by state, the highest rate for a state among all industries was 293.6 fatalities per 100,000 workers.

This rate was for the agriculture, forestry (which excludes logging), and fishing industrial sector in Alaska. In Alaska, this industrial sector is dominated by the fishing industry.

Session 1. Opening of the Workshop

Dr. Peter Nakamura moderated Session 1, which provided an introduction, a welcome, a keynote address, and a charge to the participants. These speakers established injuries as the most urgent health problem in commercial fishing today.

In his *Introduction* to the FISH Workshop, Dr. Thomas Bender reviewed evidence that serious occupational traumatic injuries in Alaska were a special problem in the United States, and the foremost problem was the high fatality rates among fishers in Alaskan waters. He reviewed the reasons for establishing the Alaska Activity in Anchorage.

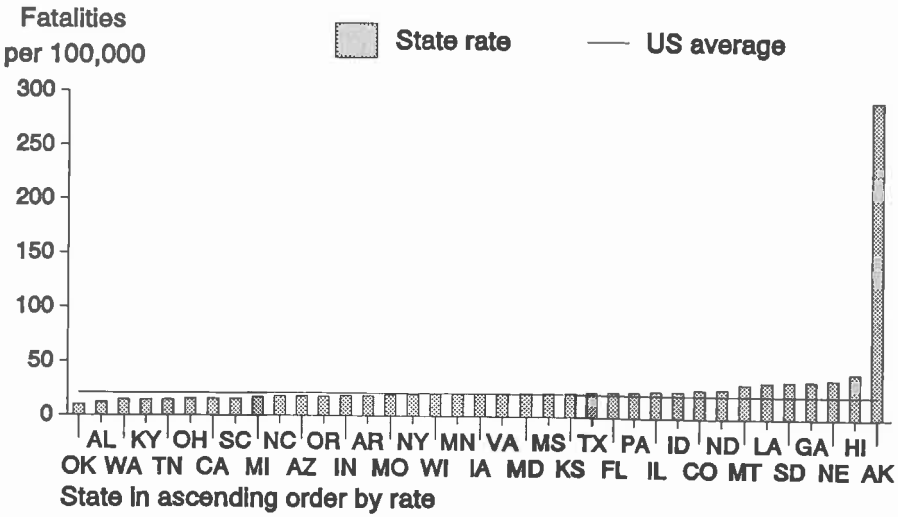


Figure 1. Occupational Fatality Rates by State for the Agriculture, Forestry, and Fishing Industrial Category. — Source: National Traumatic Occupational Fatalities Database.

Senator Ted Stevens delivered his *Welcome* to the participants at the FISH Workshop. He addressed the role of law in controlling the injuries and fatalities that are produced by the fishing industry. He spoke about the need to balance the law against its burden on the industry. He also emphasized the need to license captains of fishing vessels.

Ms. Peggy Barry presented the *Keynote* for the FISH Workshop, entitled *The Long Haul*. She said that safety must be part of a healthy and economically secure workplace. She expressed the need to license skippers, for stability tests and training, and for training programs and safety drills.

Dr. Richard Lemen presented the *Charge* to the FISH Workshop participants to increase the awareness about fishing safety, build coalitions, share information and experiences, and encourage action to prevent injury and disease that result from working in the commercial fishing industry. He described problems such as crab workers' bronchitis, but he charged the conference to address the most urgent problem in the fishing industry, injuries. He also noted that most fatalities in fishing were related to vessel instability.

Problem Definition

The participants who opened the FISH Workshop identified the most urgent health problem among commercial fishers as injuries including fatalities. The FISH Workshop defined the problem of injuries in the commercial fishing industry through three sessions. The presentations from these sessions are summarized below.

Session 2. Definition of the Problem

Ms. Kathleen Johnson moderated Session 2, which defined the injury problem among U.S. commercial fishers in the United States. The first two presentations address fishing safety and health at the national level. The next two presentations deal with non-fatal injury problems among fishers in Alaska and its waters.

Dr. Gunnar Knapp spoke on the *Commercial Fishing Record: A National Perspective,* in which he established that there is a serious safety problem nationwide in commercial fishing. He also addressed the complexity of understanding the many interactions of cause and effect; thus there is no single solution to serious injuries in the fishing industry. He said that we will be unable to understand these complex problems until we have better data.

Dr. Thomas Bender addressed *Commercial Fishing Fatalities: U.S. Regional Comparisons*. He reported that during the period of 1980 to 1988, 517 commercial fishers lost their lives in the United States and its waters. Drowning was described as the most common cause of death among fishers. In 15 percent of all of the cases, hypothermia was a contributing cause of death. The most significant cause of drownings was related to vessel casualties, and the second principle cause was person overboard (POB). Struck by objects was the second leading cause of deaths at 5 percent of the cases.

Ms. Paula Trapp addressed *Non-Fatal Injuries in the Alaska Commercial Fishing Industry*. She reviewed data from the Alaska Fishermen's Fund for the years 1982–1984. She found the leading injuries that were either recorded or reported were strains and sprains of the spine. Lacerations were the second most frequently reported injuries. The fishery with the highest rate of non-fatal injury was power-troll salmon fishing.

Ms. Barbara Simonsen spoke on the injuries recorded in the *Alaska Trauma Registry*. Her review of injuries covered three Alaskan hospitals for the period of March 1988–February 1992 and included fish processing as well as fish harvesting. Of 272 fishing-related injuries treated, 79 percent occurred on board a vessel and the other 21 percent occurred on shore. The leading mechanism of injury was machinery at 38 percent. Falls accounted for 20 percent of the injuries.

Session 3. Identifying the Population at Risk

Ms. Bernice Carmon moderated Session 3 that builds on the previous session by identifying the population at risk.

Dr. George Conway addressed *Surveillance for Work-Related Fatalities in the Alaska Commercial Fishing Industry*. He reviewed methods for determining the size of the workforce in commercial fishing, estimating annual employment, surveillance for injuries among these workers, the calculation of injury rates, and ways to interpret those rates. He reported that available data strongly support the assumption that personal flotation devices (PFDs) save lives.

Mr. "Corky" McCorkle spoke on *Harbormaster Record Keeping*. He reviewed the history of his records of fatalities of residents as harbormaster in Kodiak, Alaska. The sources for his data were news reports, the USCG, and family and friends of the deceased. He highlighted the annual memorial service held for those who have died while fishing.

Mr. Richard Kennedy reviewed *Alaska Commercial Fishing Fatalities by Fishery, January 1991–September 1992*. He identified shellfish as being the fishery with the highest fatality rate in Alaska, 480 deaths per 100,000. He identified halibut as having the second highest rate, 300 deaths per 100,000, and groundfish and salmon about 100 per 100,000 each. The fatality rate for all Alaskan fishers is 200 deaths per 100,000.

Session 4. Trends in the Commercial Fishing Industry

Mr. Jan Manwaring moderated Session 4. Previous presentations drew mostly from historical data. The presenters in this session offered some projections into the future based upon trends.

Dr. Ben Muse spoke on *Changes in the Distribution of the Alaska Fisheries*. Employment in the shellfish fishery in Western Alaska has increased, while elsewhere in Alaska it has declined. Salmon fishery trends varied. Employment in both the drift and set gillnet salmon fisheries grew. In the seine salmon fishery it remained stable, and in the troll salmon fishery it declined. As to groundfish, employment rose in factory trawlers, freezer longliners, and delivery operations to motherships.

Dr. Clarence Pautzke reviewed the history of *Fishery Management*. Generally the trend has been increasingly too many fishing vessels for the available fish. As a result, the various overseeing agencies use different management approaches to conserve fishing stock. To conserve these stock, they control the fisheries by setting harvesting quotas, seasons, gear restrictions, or time and area closures. The government is moving toward individual quota systems, which will provide more flexibility over the conditions under which one could choose to fish.

Dr. Gunnar Knapp spoke on *Safety Implications of Derby*

Fisheries. He said that it had not been proven statistically that derby fisheries are associated with higher fatality rates. However, he concluded that it is reasonable to assume that derby fisheries do result in more vessel losses, injuries, and fatalities. The halibut fishery season lasts for 24 hours or 48 hours. During this season bad weather may become a factor. Fishers put in long hours with no sleep, and the vessels have an incentive to overload because hauling a load back to port takes time away from fishing.

Problem Solution

The most urgent problems identified in the first part of the FISH Workshop were injuries. The most significant mortality problem was drownings. Drownings were overwhelmingly associated with either vessel instability or with person overboard incidents.

The most significant morbidity problem that was identified was musculoskeletal disorders. The second most significant problem was lacerations. An unattended laceration could result in an infection. In four sessions, the FISH Workshop addressed control through interventions. The presentations from these sessions are summarized below.

Session 5. Safety and Health: Whose Responsibility Is It?

Mr. Richard Arab moderated Session 5, which provided a balance of views from the Occupational Safety and Health Administration (OSHA) and the USCG and from a fisherman and a safety official from a large corporation engaged in fish harvesting and processing.

Mr. Barry Noll from OSHA spoke about *OSHA and the Alaskan Fishing Industry*. He explained that USCG regulations preempt those of OSHA. However, OSHA enforces its regulations aboard fishing vessels that are not covered by USCG regulations. OSHA's jurisdiction is limited to the State's territorial waters. In Alaska this is 3 nautical miles. Beyond those waters, the vessels are essentially unregulated, but OSHA and USCG cooperation is expanding. As an example, both agencies have conducted joint inspections aboard crab-processing vessels.

LCDR Glenn Sicks, USCG, reviewed *U.S. Coast Guard Requirements for Fishing Vessels*. He reviewed the regulations that were being promulgated pursuant to the Commercial Fishing Vessel Safety Act of 1988. Generally the larger the vessel and the further out that it fishes, the more regulations apply. Regulations include training and drills, maintaining safety and survival equipment, inspections, and reporting.

Mr. Jim Herbert brought *A Fisher's Perspective on Federal Requirements for Fishing Vessels* to the FISH Workshop. He illustrated the harsh conditions at sea and gave examples of how different vessel captains will take the seriousness of safety in different ways. He also talked about the cost of a lot of the requirements for safety gear, but he noted that fishers spend a lot of money for electronics to find fish and for communications. He encouraged all to keep their lines of communications open and to find alternatives to adversarial approaches.

Mr. Tony Ford spoke on *Safety from Management's Perspective*. He reviewed the success of a safety program at a large commercial fishing enterprise. He emphasized training as a critical factor in preventing injuries and the costs of catastrophes. In addition, he explained the value of training on

stability. Not only did it provide for safer operation of a vessel, but it allowed the potential for hauling heavier loads of fish through the proper management of stability.

Session 6. Protection and Intervention Strategies

Mr. Spike Walker addressed the participants at an evening reception. Although his remarks are not recorded in these proceedings, a full account of his story about the fishing vessel, the *St. Patrick*, can be found in his book, *Working on the Edge*.[7] A significant observation from this tale was that all the crew jumped overboard even though the vessel survived. Only two of the crew survived; nine did not. Not only must a vessel be stable, which this one was, but the skipper and the crew must know and believe that it is stable.

Ms. Jennifer Lincoln moderated Session 6, which addressed strategies for protection and intervention. The strategies dealt with protecting workers from environmental factors and varied from financial support to the use of knowledge about vessel stability in preventing injuries and fatalities. Personal protective equipment as a guard against drowning and hypothermia were also addressed.

Ms. Dorothy Bostic discussed an upcoming regulation for the *Fishing Vessel Capital Construction Fund*. This fund will allow vessel owners to defer income for investments in vessel safety.

In his remarks on *Vessel Stability*, Dr. Bruce Adee said training is an important oversight by many vessel owners. The creation of a stability curve for each vessel is critical, and the curve needs to be recreated at least every five years to account for changes made to the vessel. Sponsons added to a vessel can improve its stability. Fuel and fish load, flooding, and icing all affect stability. Some actions that could be taken include maintaining the water-tight integrity of the vessel, not depending upon gravity drains, keeping holds closed, and learning about stability.

Mr. Kenneth Coffland addressed *Survival Equipment Usage*. He pointed out that protective equipment are tools and should be considered as one would consider tools. Having the right equipment for the individual is important. In addition, people need to be educated to make informed decisions. He placed a responsibility upon the equipment manufacturer to educate the public about their equipment and its use.

Dr. Alan Steinman discussed *Protective Clothing in Cold Water Survival*. He classified cold water survival into (1) avoiding drowning and (2) controlling hypothermia. Survival depends upon maintaining one's mouth above the water, wearing the right survival clothing, and maintaining one's senses. In addition, the more obese a person, the slower he or she lose body heat. In an answer to a question, Dr. Steinman said that a person who drowns in cold water could be resuscitated up to an hour after drowning.

Mr. Ronald Perkins described a *Community-Based Drowning Intervention Program* among Alaskan Natives. To prevent drowning, he chose to emphasize the wearing of a PFD. The problem was that nobody wore life preservers, and just having them available did not ensure that they would be worn when someone fell overboard into the water. To encourage the wearing of PFDs, he focused on alternatives that would be worn all of the time. One alternative is float coats, which also provide insulation.

Session 7. Promoting a Safe and Healthy Commercial Fishing Industry

Mr. Michael Klatt moderated Session 7, which emphasized ways to change the behavior of fishers so that they would be better able to survive in the harsh environment aboard the vessel or in the water.

Mr. Jerry Dzugan, in his review of *Marine Safety Instructor Training*, observed that most of the world's fishing fleet is comprised of small boats. He also noted that the human factor was a common one in vessel casualties. A noteworthy observation was that marine survival training led to the purchase of safety equipment. Hands-on training has been found to be critical. He also noted that survival required a systems approach and that training was only one part of it; a lot of people need to be involved.

Mr. Hank Pennington reviewed the importance of *Shipboard Drills for New Deckhands*. He stressed the importance of conducting realistic drills. Not only do these train crew members — they also reveal the conditions on the boat and of the safety gear for service in an emergency. Orientation of new crew members and visitors such as observers is critical. They may leave holds open or position items in the way of emergency action.

Mr. William Gossard discussed *Education, Training, and Survival*. He spoke of the sinking of the fishing vessel, *Aleutian Enterprise*, on which eight crew members and one fishery observer died. He discussed one rescue operation involving the sinking of the fishing vessel *Amazing Grace* in the Atlantic Ocean in 1985. The search and rescue for that one incident cost $12 million. An Emergency Position Indicating Radio Beacon (EPIRB) would have located that vessel, but one was not aboard. For the cost of this one rescue, 13,000 EPIRBs could have been purchased. He spoke of the need to require the licensing of captains of commercial fishing vessels, including a requirement that they demonstrate minimum understanding of how to handle safety problems they may confront, including instability, fire fighting, and use of life-saving equipment.

Ms. Leslie Hughes discussed a *Vessel Safety Program* conducted by the North Pacific Fishing Vessel Owners' Association. This association chose to deal exclusively with safety in the fishing industry. She reviewed several safety and survival classes that they conduct. She concluded by observing that safety must be an integral part of a vessel owner's and operator's business planning. In addition to survival classes, factory safety has become a priority.

Session 8. Preventive Safety and Health Services

Mr. Gary Bledsoe moderated Session 8, which emphasized preventive services that provide information or assistance in preventing injury or death.

Mr. Reuben Eaton spoke of the opportunities for *Marine Weather Forecasting* in Alaska's fisheries. A weak link in this system is the lack of weather-observation reporting from fishing vessels, presumably because they do not want to disclose their fishing "spot" to others. Satellites, electronics, and linkages with other countries are improving the capacity for the National Weather Service to forecast weather. Forecasts are now reliable within a 2-day period.

LCDR Glenn Sicks, USCG, explained how *USCG Auxiliary Voluntary Dockside Examinations* could save a lot of inspection time at

sea. The exams may also prevent expensive civil penalties as well. The Auxiliary utilizes fishers, so that they can relate to the fishers' problems as they undergo a safety examination.

Mr. Emmet Heidemann emphasized the voluntary nature of dockside examinations. He also said that it was good business to use the dockside examination to assure that the vessel is safe and that the crew will be protected. It is more of a problem to deal with these issues at sea for both the USCG and those on the vessel.

CDR Roger Whorton addressed *Search and Rescue* by the USCG. In his remarks, he noted that three Coast Guardsmen had lost their lives in the 1980's during search and rescue missions. He also looked forward to the day when safety and training would be as common as gear on a vessel. He also reported that the USCG saves 5,000 lives per year.

Mr. George Angus addressed *First Aid and Emergency Medical Services*. He reviewed factors that affect the urgency of treating injuries, the need to be able to treat injuries on board vessels, and the need to understand how to get help.

Session 9. Directions for the Future

CAPT Max Miller, USCG, moderated Session 9, which included the concluding remarks.

Dr. John Middaugh provided an *Alaska Perspective.* When taking the long view, infectious diseases were a major problem in Alaska, but public health programs have successfully controlled them. The problem in Alaska that has emerged is injuries, and the fishing industry is the major setting for occupational injuries.

RADM Roger Rufe, USCG, with his *Regional Perspective,* emphasized the need for a customer focus in our prevention efforts. He saw that we needed to bring together the concerns of an economically viable fishing industry and commercial fishing safety and health. He serves on the North Pacific Fishery Management Council from which he said he would commit to safety as an agenda item for fishery management.

Mr. Carl Hild summarized superbly the workshop in his *Circumpolar Perspective*. He drew from several presenters' points to emphasize the need to share information internationally and consider economics as the way to influence improvement in fishing safety and health. His points bear mentioning and are outlined here:

- Profits get the attention of the seafood industry.
- The three major worker safety concerns are (1) vessel stability, (2) training, and (3) legislation, regulations, and policy issues.
- A stable vessel not only provides a safer work platform, but enhances the vessel's speed and ability to carry more product.
- Policies need to be reviewed, ranging from harvest season time limits to rest facilities for the crew.
- A trained worker is a safer and more efficient worker.
- NIOSH should bring in expertise from either Norway or Iceland to address the problems of licensing or vessel redesign.

Mr. Melvin Myers in his *Closing Remarks* emphasized the need to focus on prevention. He also identified non-fishing occupations in which lives have been lost, but they are related to fishing:

- Rescuers▸ Four USCG rescuers were killed in 1979 during a rescue.
- Fishery observers▸ A Federal fishery observer drowned in 1990 when a vessel sank.
- Fish-tender workers▸ A college student working during the summer

of 1991 drowned when a loaded fish-tender swamped.
- Fish spotters▸ A pilot who was spotting fish was killed in 1991 after a mid-air collision.
- Subsistence fishers▸ Two women were killed in 1992 while landing a whale.
- Cargo pilots▸ A pilot flying clams from their harvesting site and a pilot carrying aquaculture fertilizer both crashed and were killed in 1991.

PREVENTION MESSAGES

Mr. Myers also echoed three prevention messages:
- Drownings can be substantially reduced by improving the stability of vessels.
- Drownings can also be substantially reduced by preventing falls overboard and by protecting those fishers who do fall overboard through the wearing of PFDs.
- On-board fatalities and injuries can be reduced by redesigning the work around the fisher through ergonomics.

Vessel Stability

The majority of vessel casualty-related fatalities are drownings and are associated with unstable vessels. The single most preventable problem related to drowning in the fishing industry is vessel instability. Fishing involves some vessels that have not been designed with the task of fishing in mind and for which the stability curve is unknown.

The stability curve is a necessary tool for operating a vessel safely. Moreover, many captains are untrained in recognizing and managing the dynamics of stability. Several factors affect vessel stability:
1. Vessel Design — Fishing vessels need to be designed for stability, and nautical architects should have qualifications to provide this design. Dr. Steinman told of the existence of a USCG vessel that can with stand a 360° roll. Dr. Adee explained how sponsons improved a vessel, although adding weight, enhanced stability and provided more space for fuel loading.
2. Vessel Loading — Fishing vessels are affected by their weight and the location of their fuel, cargo, gear (i.e., crab pots), and fish.
3. Weather — High seas, wind, and icing can affect stability. Refraining from fishing during hazardous weather should be a fishing-management criterion.
4. Openings in the Vessel — Open hatches and their location on vessels can affect the stability of vessels. Open hatches at the wrong locations on a vessel can result in the vessel's flooding and sinking.
5. Training — Captain and crew must be trained about vessel stability. Understanding how to manage, load, and operate the vessel based upon its design and weather conditions can save lives and can also offer rewards through carrying heavier loads safely.
6. Understanding Instability — It is important to know when an unstable situation exists. In the case of the fishing vessel *St. Patrick*, 9 of 11 fishers drowned unnecessarily because they abandoned a stable vessel.

Person Over-Board

POB is another major cause of drowning fatalities related to fishing:
1. PFDs work, and having them readily available is not preventive when a person falls overboard. Data indicate that survival is higher when they are worn than when they are not worn.
2. In cold water, a person can be resuscitated up to an hour after he

or she goes overboard and drowns.[8] A PFD may buy the time needed to retrieve a drowned POB victim who can be successfully resuscitated.

3. To focus primary prevention efforts, research is needed to understand the risk factors that are associated with POB.

Ergonomics

Ergonomics is the study of a person interacting with an engineered environment[9] and may include environmental elements such as weather and temperature as well as tools and equipment.[10] Fishing vessels are unstable work platforms: their stability presents a special challenge to ergonomists.

1. Strains and sprains, especially related to the back, are a leading morbidity problem among fishers. Ergonomics provides an important strategy in preventing strains and sprains and can be used as well to prevent lacerations.
2. Ergonomics can address a problem called jumbo wrist, or fisher's tenosynovitis of the wrist. It is inflammation in the wrist caused by prolonged repetitive movements of the wrist, such as the gutting of fish.
3. Ergonomics can also address the traumatic injury problem. According to data from the Alaska Fishermen's Fund, lacerations were the second most frequent problem reported. Other serious traumatic injuries, such as amputations, were also reported from the Alaska Trauma Registry.

   The FISH Workshop participants heard of the potential for infections that may result from unattended injury. The World Health Organization (WHO) has documented such problems.[11] These problems include whitlows, or infectious sores on the fingers, lymphangitis, and fisher's erysipeloid.
4. Variables such as weather conditions affect the design of the fishing work environment. As an example, the phenomena of rogue waves resulted in a fatality in 1991 when such a wave washed a crab pot against a fisherman. He died of the resulting injuries. It is also appropriate to note that the prediction of these waves is a peculiar challenge and research issue for meteorology.

Survival

When a fisher is injured or is in the water either as a result of a vessel casualty or a POB incident, taking the appropriate first aid or survival action is important. Fishers and employers must work together to ensure that the following safety precautions are taken:

1. Train all crew members in the use of safety and survival equipment.
2. Know where safety equipment is located and be sure that it is in proper working order.
3. Conduct safety drills.
4. Ensure vessel stability and proper vessel and equipment maintenance.
5. Use PFDs.
6. Maintain skills among the crew in first aid and cardiopulmonary resuscitation techniques.

Other Health Problems

Mr. Tony Ford invited NIOSH to convene experts to deal with the problem of "crabbers' asthma." This would help the fishing industry better understand this problem and ways to prevent it. Two other health problems that attack fishers are cancer and dermatological conditions.

1. Fishers may experience elevated risk for certain kinds of cancer. One of these is myeloma or a pri-

mary tumor of the bone marrow. In one study, the risk to fishers for this type of tumor was found to be 3.41 times higher than expected.[12] Another study found an elevated risk for testicular cancer among the occupational category of sailors, deckhands, pilots, and fishermen.[13] Neither study associated these observations with a potential etiologic agent.

The December 1992 issue of a trade journal, *National Fisherman*, addressed the problem of skin cancer among fishers, which is associated with solar radiation.[14] This cancer principally attacks skin that is unprotected from solar radiation. In fishing, the radiation problem is aggravated by the reflection of ultraviolet light off the water surface onto the fisher. According to this article, 85 percent of solar radiation is reflected. Only the ultraviolet portion of this radiation would be associated with skin cancer.

2. The WHO has identified several dermatological problems among commercial fishers.[15] Salt-water boils are infections acquired through minute abrasions of the skin caused from sand and grit that has lodged on the cuffs of waterproof clothing. The sand and grit can be hauled aboard in the fishing nets, and the bacteria that infects the abrasions can come aboard with the fish. Contact dermatitis, or "curly weed" rash, is a form of dermatitis that results from skin contact with a seaweed that grows in shallow North Atlantic waters. In addition, fisher's conjunctivitis is acute inflammation of lining membranes of the eye when certain fluids from marine organisms squirt into the eye.

CONCLUSION

A number of presenters referred to the concept of continuous improvement called Total Quality Management (TQM). NIOSH has adopted this concept and has set forth its commitment to TQM in this vision statement:

"Delivering on the Nation's Promise—
Safety and Health at Work
For All People . . .
Through Prevention."

This vision drives the efforts at NIOSH through a system of continuous improvement that:

- Seeks to optimize the system through a win-win strategy. Everyone should gain. For example, changes from the "derby" approach of fishery management both may save lives and provide for a more even supply of fresh halibut on the tables of customers.
- Understands whether the system is at fault or there is a special cause. Mr. Robert Nelson observed that a solution to possible false reporting of injuries aboard processing vessels would be to provide a return ticket home for workers if they choose to quit before their contract period ends. This could be an example of changing the system to correct the problem.
- Links actions to effects. For example, Dr. Conway spoke about the potential of personal flotation devices saving lives and being able to measure that connection.
- Understands the psychology of those involved. Fishers like to buy a lot of electronics to give them an edge in the fishing business. Perhaps there are ways to add the capability of monitoring stability into those electronics.

In the first part of this Executive Summary, we quoted from an article

in *Fortune* magazine. Based upon data from NIOSH,[16] that article reached a solemn conclusion:[17]

"By that calculus, Alaskan fishermen have the most lethal job in the country . . ."

Changing this calculus so that the job of Alaska fishers is less likely to be lethal is the priority drawn from the efforts of the FISH Workshop participants. □

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SESSION 1: OPENING OF WORKSHOP

October 9, 1992

Moderator: Peter M. Nakamura, M.D.
Director, Division of Public Health
Department of Health and Social Services, State of Alaska

Dr. Peter M. Nakamura is the Director of the Division of Public Health for the Alaska Department of Health and Social Services. Dr. Nakamura received his Medical Degree from the University of Oregon Health Science Center and his Masters in Public Health from the University of Hawaii School of Public Health. He has held several different positions with the Peace Corps and the Indian Health Service. Also, Dr. Nakamura was, at one time, a commercial fisherman.

QUOTES FROM THIS SESSION

"Let us learn what can be done to always bring these hard-working men and women home safe from their work at sea." — Thomas R. Bender, M.D.

"I am hopeful that the program will soon develop to the point where participation in a safety training program will be a prerequisite of becoming a member of a crew of any of these fishing vessels."
— Senator Ted F. Stevens

"I loved hearing a lobster man from Maine say that, on the three boats he owns, there are three licensed skippers. Two years ago, there were no licensed skippers." — Peggy Barry, B.A.

"Our purpose at this workshop is to increase the awareness about fishing safety, build coalitions, share information and experiences, and encourage action to prevent injury and disease that result from working in commercial fishing." — Richard A. Lemen, Ph.D.

INTRODUCTION

By CAPT Thomas R. Bender, USPHS

Dr. Peter M. Nakamura: This is Session One of the National Fishing Industry Safety and Health (FISH) Workshop. First on the agenda is the *Introduction* to the FISH Workshop by Captain Bender of the United States Public Health Service. Thomas R. Bender, M.D., M.P.H., Director, Division of Safety Research since May 1988, joined CDC as a Medical Epidemiologist in 1969. He directed the Anchorage Field Station of the CDC from its establishment in 1970 through 1981. Dr. Bender was a CDC/ASPH adjunct professor at the School of Public Health and the School of Medicine, University of Hawaii (1981-1986), where he also was the Director of the Preventive Medicine Residency Program. During his last two years in the Pacific (1984-1986) he was Special Advisor to the Assistant Director for International Health, CDC. From 1986-1988, he was the Senior Epidemiological Research Advisor to the Office of Health, Bureau of Science and Technology, Agency for International Development. Dr. Bender received his M.D. from Hahnemann Medical School and Hospital; and his M.P.H. from The Johns Hopkins University School of Hygiene and Public Health. He is certified by the National Board of Medical Examiners, the Board of Medical Examiners of Alaska, and the American Board of Preventive Medicine. Dr. Bender has authored numerous publications and has held a wide variety of advisory appointments. CAPT Thomas Bender:

On February 9, 1991, it was bitter cold on the Bering Sea, with blowing snow, winds at 30 to 44 knots, and seas at 15 feet. The fishing vessel *Barbarossa* cast off from its mooring near the coast of St. George Island, and turned south. Ice was already forming on the crab pots on the deck of the 98-foot ship as it headed into the open sea, an hour before midnight. Top heavy with 80 pots and an empty hold, the *Barbarossa* pitched and yawed through the rough seas toward its fishing grounds, the rich crab waters off the Pribilof Islands.

Two hours later, several vessels in the area received a stark radio message —"I don't have time, I'm going over." That message is believed to have come from the *Barbarossa*; no sign of the ship or her crew has ever been found. The Coast Guard believes the boat capsized and sank in 300-foot waters, some 13 miles southeast of St. George Island. Six men were lost and presumed drowned.

The loss of the *Barbarossa* and six men was not a single, isolated tragedy. Eleven months later, in January of this year, another fishing incident in the Bering Sea took the lives of six men. In 1991, there were 35 occupation-related deaths in Alaska involving commercial fishermen; thus far, through September 1992, there have already been 29 deaths. During 1991 and 1992 about 60 percent of the deaths occurred in multiple-fatality incidents. As many as six died in each of these incidents. All were men.

Commercial fishing in Alaska is one of the most dangerous occupations in the country, according to NIOSH data for 1980 through 1988. For the Alaskan agriculture, forestry, and fishing-industry division, which includes the commercial fishing sec-

tor, the rates of occupational deaths were seven times the national average—132 per 100,000 workers in Alaska, compared to 19 for the nation as a whole.

The overall Alaska fatality rate for workers in all segments of the private sector for these years was nearly five times the national average — 33.1— with a national average of 7.2 deaths per 100,000 workers.

> In 1991 there were 35 occupation-related deaths in Alaska involving commercial fishermen; thus far, through September 1992, there have already been 29 deaths.

These high rates of death among Alaskan commercial fishers, plus two other high-risk occupations — air transport and logging — were one of the principle reasons NIOSH established its Alaska Activity. While the markedly elevated occurrences of work-related traumatic injury were well known to local researchers and other health and safety professionals, both at the state and federal level, we hoped that NIOSH could serve as a catalyst for occupational injury prevention in this setting. Our group in Alaska is the only NIOSH-maintained state-located field station in the country.

Recently, LCDR George Conway, a physician and epidemiologist, has become the Chief of the Alaska Activity. Mike Klatt, a public health advisor, served as Acting Chief during the past year. I would like to take this opportunity to welcome George and to thank Mike for his efforts, especially in coordinating the plans for this National Fishing Industry Safety and Health Workshop. With Dr. Conway here, Mike will now assume major responsibility for public health communication and information dissemination aspects of our program.

Dr. Conway, who moved here last week from CDC in Atlanta, Georgia, has worked extensively in Alaska over the past several years. This conference will offer the first opportunity for many of you to meet him. He will be addressing the second session this afternoon, and will be available throughout the FISH Workshop. He is taking on a big job, and he is the right man for that job.

George knows how serious his new responsibility will be. He will be addressing one of the most important public health situations in the country, and will be developing a program that will serve as a model for other locales. Fortunately, he will be building on the excellent work already preformed by numerous other agencies and non-government entities, and by the professionals of our Alaska Activity.

This is a small group, first formed a little over a year ago, but a group that in a short time has been very productive. They have been especially effective in building up our surveillance and data-collection capacity. Dr. Conway will continue to improve our program in this area. More importantly, he will take responsibility for encouraging and developing intervention and prevention programs that will help to save lives in Alaskan waters, as well as in the Alaskan timber industry, in air transport, and in other industries.

Any success the program will have will be based on the cooperation of all the parties in the Alaskan public health and safety field: Federal OSHA and Alaska OSH, Alaska DHSS, the Coast Guard, Alaska DOL, National Transportation Safety Board, and public safety officers

from municipalities and the State. All have welcomed our ideas and have already been active partners with NIOSH and the Alaska Activity. When intervention and prevention efforts are planned, tested, and implemented, we anticipate that all of these parties will continue as partners. In addition, we will attempt to develop cooperative agreements and effective working arrangements with industry, unions, universities, health and safety organizations, and other local, state and federal agencies, to participate in the entire range of data collection, analysis, intervention, and information dissemination activities.

We always need good data to identify high priority areas and to monitor progress. LT Richard Kennedy is the Activity statistician. Part of his duties include close collaboration with my epidemiologists and researchers in Morgantown. You will be hearing a presentation from him later today.

An important national fatality database with data collected and analyzed in Morgantown, is NTOF—the National Traumatic Occupational Fatality database. This is a surveillance system that attempts to monitor all occupational fatalities in the nation. It is based on death certificates for which there is an external cause of death, the person who died was 16 years or older, and the "injury at work" item on the death certificate is marked in the affirmative. This data has been gathered for the 10-year period 1980 through 1989.

As I have indicated, NTOF is a national program. One contribution of our Alaska Activity will be in increased accuracy in determining and coding information on occupational fatalities that occur here. They have been very successful in increasing the accuracy of this information for 1991 and 1992, and we anticipate further refinements in the data and the system for collecting data. Thus, these efforts provide valuable lessons for our national program.

A second national program is known as FACE, an acronym for Fatality Assessment and Control Evaluation. This is an investigative program that gathers detailed information on the various factors which have contributed to a particular fatality or cluster of deaths. I believe many of you have met our FACE investigator, LCDR Jan Manwaring, who will be moderating the final session today.

LTJG Jennifer Lincoln, a relatively new addition to our staff, works with Jan to conduct investigations. I encourage each of you to meet Jan and Jennifer during the conference.

I would like to conclude my remarks with a comment on the remarkable nature of this conference. We have a wealth of personal knowledge, professional skills, and expertise of every kind in the audience today. Our participants will include — to name a few — fishers and their families, a Senator, scientific researchers and epidemiologist, storytellers, and harbormasters. All of these persons have come together, sharing their experiences and skills, for a single purpose: to make Alaskan waters safer for the men and women who work there.

The remarkable diversity of this group is like the remarkable diversity of the Alaskan experience. It is a shared experience of a sometimes unusual group of people, each with the individual ideas, strengths, and skills needed to work and live in a difficult environment.

Each of us, in our own way, is troubled by the continuing loss of vessels like the *Barbarossa*, by the heavy loss of life on the Alaskan seas, and elsewhere in the country.

We must help alleviate these losses. So, in our diversity, we have come together today to do what we can. I am tremendously heartened that this conference will make a real contribution when I look out over this audience. I truly believe that we can accomplish much. The seas are beautiful yet forbidding, and in Alaska especially, cold and difficult—and fishing men and women have the courage to face them. Surely we need far less courage to face this task of preventing death, as difficult as it may be. Let us learn what can be done to always bring these hard-working men and women home safe from their work at sea. □

WELCOME

By Senator Ted F. Stevens

Although scheduled at this time in the FISH Workshop, Senator Stevens arrived during a later session that was moderated by Ms. Bernice W. Carmon.

Ms. Bernice W. Carmon: Next on the agenda is the *Welcome* to the FISH Workshop by Senator Ted Stevens. Now ranked 9th in seniority in the U.S. Senate and 3rd among Republicans, Ted Stevens has been a member of the Senate since December, 1968. Born in Indianapolis, Indiana, Ted Stevens has been an Alaskan since the early 1950's. A graduate of UCLA and Harvard Law School, Senator Stevens was U.S. Attorney in Fairbanks, Alaska. He also practiced law in Anchorage and Fairbanks, and served two terms as a representative in the Alaska State Legislature, holding positions of majority leader and speaker pro-tem. During World War II, Senator Stevens was a pilot with the 14th Air Force in China. In the Eisenhower Administration, he was assistant to the Secretary of the Interior and Solicitor of the Interior Department. Senator Stevens served eight years as the Senate's Assistant Republican Leader (the Whip), from 1977 to 1985. In the 102nd Congress, Senator Stevens serves on five full committees: Rules, where he is ranking Republican; Appropriations; Commerce; Governmental Affairs; and Small Business. He is also vice-chairman of the board, Office of Technology Assessment; and co-chairman of the Senate Observers Group to the Arms Control talks. Senator Ted Stevens:

I really did plan to be here this morning. But, it was not possible for me to be here because we were in session late last night as you probably know.

I want to welcome you, and I was glad I was here to catch the last part of your presentation (LT Richard D. Kennedy). As I am sure some of you know, I am the father of a fishing boat captain in that king crab fishery operating out of Dutch Harbor, and I have known a lot of Ben's friends and some of them who did not come back.

We are most interested in this process that you are in right now. It is one that is highly significant to us with the accident statistics that we have through the industry, but particularly in terms of fishing and timber in Alaska. I am pleased that you all are taking the time to start to implement the Fishing Vessel Safety Act and to try to see if we can develop systems now that will give greater protection to those Alaskans who are involved in these dangerous industries.

My mind right now, unfortunately, is not where yours is in terms of the program that you are in. I do congratulate you for it. I have just gotten off the plane. We have wound up this session of the Congress with some good news for the fishing industry.

We have passed legislation to implement the salmon treaty. That will provide a commission of 14 people, 7 of whom will be Alaskans. This is a treaty that now prevents the taking of salmon on high seas and has significant sanctions for those who do. It will also provide a means to implement the agreement among the six nations of the North Pacific to close the donut hole, which I am sure

you know, is about 45 nautical square miles out there that is not within the Russian 200-mile limit or ours. It has provided a real haven for those who wanted to take our fish illegally even within the 200-mile limit.

Now, we have got to bring about a greater understanding in the government circles of the problems that the industry faces.

We have had a series of problems develop that have affected our industry, and my job is to try and keep the legal framework for a means to deal with them. In working with the Centers for Disease Control, and now its new Center that is dealing with injuries, we have undertaken to provide substantial funding in the bills that have just passed to increase the processes with which you deal. This funding will assure that we provide the training and the incentives for those who operate and man these boats to comply with the laws so as to assure greater protection for them.

I was to welcome you all here. I wanted to be here to thank you for taking the time. At one time, Admiral Hayes, who is the commander of the Coast Guard, and I as the chairmen of the committee dealing with both the Coast Guard and marine fisheries at the time in the Senate, had our two sons serving on the same boat out of Dutch Harbor. They went out once with three vessels, and theirs was the only one that came back. Ben sent me some films. Seeing one film of the stirring of that one vessel, I have got to tell you when I showed them to some friends of mine in the Senate, several of them thought they were going to get seasick just watching the film that he had taken from the bridge.

Now, we have got to bring about a greater understanding in the government circles of the problems that the industry faces. We are not trying to burden the industry to the point that we destroy it. The fishing industry is a very vital industry to this state.

I am hopeful that the program will soon develop to the point where participation in a safety training program will be a prerequisite for becoming a member of a crew of any of these fishing vessels. We should have annual checks on captains of vessels just like we have annual checks on captains of airlines. We should know that the people keep up with the state of the art as far as accident prevention mechanisms, and they are exposed to the new means of trying to preserve. First, prevent accidents, and second, if an accident does occur, be able to prevent in the long run the loss of life.

In that chart I was staggering to see the impact. How many 100,000 are there in the shellfish industry in Alaska?

LT Richard D. Kennedy: There are about 3,500 full-time workers. There are more than that, but that is averaged or annualized out over one year. There are probably 15,000 people doing crabbing in Alaska.

Senator Ted Stevens: I found it hard to understand that the red side went to 100,000 — it was per 100,000, yet I do not think there are 100,000 in that fishery, are there?

LT Richard D. Kennedy: No, there are not. It was adjusted for 100,000. In other words, if there were 100,000 workers then you would expect to see 480 deaths.

Senator Ted Stevens: I just want to emphasize that. I have never seen

any figures that showed me we had 480 deaths in any year, but I can understand that is the making of the chart. It is still very, very high. I am hopeful that those of you that are participating in this and those of you who organize these programs will put on your thinking caps and send us a word.

What can we do? Are these laws manageable as far as Alaska is concerned? Are they enforceable? Are they affordable? Are there things we can do with the federal law and regulations that would make your lives easier in terms of bringing about compliance with these laws? Is there any way that we can encourage greater education as far as the people in these industries?

I have to make the same statement to the timber industry next Saturday in Ketchikan. Can we find ways to avoid these instances and to prevent this terrible loss of life in the two industries that are of vital significance to our economy?

So, I am here to encourage you on one hand and the other hand to enlist your help. We are a long way away.

We have to have input not only from those who complain about the laws that we pass, and I get a lot of complaints about that law we passed, but also to get input from those of you who deal with the people who must live with these laws that we passed to find out if there are ways we can make them easier to comply with, more workable and, above all, better to bring about the mechanisms that will prevent the loss of life of our people who are involved in these industries in the state.

So, accept my apology, and again I apologize for interrupting you. As you can tell, I am late and I would like to ask you to indulge my leaving.

If you have any questions about what we have just done — does anyone have any pressing questions? For those in the Coast Guard, we did get your money transferred from the Department of Defense account, over $300 million, into the Coast Guard account, and we got a new aircraft for the Coast Guard Commandant to make sure that he can cover the vast — vastness here.

It is a vast operation. Costs are going up so rapidly because of the new systems they are utilizing that the budget requires an infusion of defense money in order to keep up with the changes. □

QUESTIONS

Spike Walker: How exactly are you closing that 45 square miles (The Donut Hole) ?

Senator Ted Stevens: The agreement is that there will be no fishing in that area, and we will enforce that agreement.

Eric Fry: Why would it be a burden on the fishing industry to ask them to report injuries and deaths?

Senator Ted Stevens: I did not say that. Do not misunderstand — I am talking about the gear and equipment and making sure that they have the safety devices on board and making sure that they put the people through training sessions like this. I did not make any comment about reporting.

Eric Fry: One of the things that has come through is the difficulty in finding accurate information, and it seems to be that that is a pretty basic thing in the modern world.

Senator Ted Stevens: Well, I agree with you. I thought he made quite a point about that. I do not have any problem about that. If you take me to dinner, I have to report it now. I think people ought to be able to report it if my son has problems.

G.V. "Corky" McCorkle: Senator Stevens, On behalf of the people of Kodiak and the Kodiak fishing fleet, and particularly the harbormaster, I want to thank you so much for your securing that $26 million for our new breakwater, which will provide a home port for this fleet. So, thank you again, Sir.

Senator Ted Stevens: Listen, I went out and looked at the St. George. The Pribilof Island ports now are really safe havens out there, I think, at least for some storms. We have done as much as we can in the current budget to bring money here for that purpose, and I hope that we can continue to expand those facilities.

KEYNOTE: THE LONG HAUL

By Mrs. Peggy Barry

Dr. Peter M. Nakamura: Next is our Keynote Speaker, Peggy Barry, whose presentation is entitled *The Long Haul*. In August of this year, Peggy moved to Jakarta, Indonesia, where her husband Robert is the United States Ambassador. The five years prior to that move, Peggy spent working (in Washington, D.C.) at a private, non-profit school for emotionally disturbed adolescents and young adults. She taught, tutored, and administered an art program. In August of 1985, the Barrys lost their son ,Peter, when the *Western Sea*, a purse-seiner working off Kodiak, sank, with the loss of six onboard. During the following year, the Barrys became involved in the development of commercial fishing vessel safety legislation, which became law in 1988. Peggy was named to the Coast Guard Advisory Committee that was mandated by the law, and has since been reappointed. As a Foreign Service family, the Barrys have spent a number of years living abroad, primarily in Eastern Europe and the former Soviet Union. Their son John lives and works in Boston; their daughter, Ellen, is in her senior year in college. Mrs. Peggy Barry:

Good morning, everybody. I want to start with a heartfelt thank you to Mike Klatt, Jennifer Lincoln, and Lurah Bruner for bringing us all together. I think they have done a super job.

I think I can claim credit for having come farther than anyone else to attend this conference in a couple of ways. I have come from Jakarta, Indonesia where Bob, my husband, and I are now living on a government assignment.

We are now in the hot–wet season as opposed to the hot–dry season, and I am sorry I was not able to bring some of our 85-degree breezes or our frangi-pani blossoms, both of which you are a little short of here in Anchorage. That trip was long, but relatively easy.

The more important journey is the long, hard, circuitous one, with its frustrations and setbacks, which started on the awful day in August 1985, when we learned that our son Peter had died in the Gulf of Alaska; that the *Western Sea*, the purse-seiner on which he was working, had disappeared with virtually no trace.

Our shock and pain gave way to our perception of a cold, unyielding world up here, and an industry peopled by strong and energetic men and women. These are good qualities to have, but in this industry, the value of human life had taken a backseat to the value of the next net-load of fish. The gold rush days of the late 1970's and the early 1980's in the crabbing and fishing industry were levelling off, and the specters of over-investment and under-maintenance were appearing.

On the aging boats, which could least afford it, and by skippers who thought they had to, the wrong corners were being cut. Safety did not show.

Now, seven years later, after thousands of hours spent talking and meeting with people from every aspect of the industry, I am here in Alaska for the second time. Bob and I came to Alaska last summer. Thanks to good friends here and a lot of homework done in the intervening

years, we know that our early vision of the state and the industry was only a small part of the whole picture. That part is still there and I hate it, but it is only a part. There is still money to be made, at least for some, and that is important. But there is so much more.

Now we understand the attraction that Alaska has for the strong and adventurous young person. We understand the lure of the tales of John Muir and John McPhee; even the pull of the fishing industry, of "working on the edge," as Spike Walker puts it so well. We understand a lot better what led Peter to Alaska.

Among those working toward any kind of change, there is the endless argument of whether the glass is half full or half empty. First, I insist on the full half of the glass. There has been progress.

The only fishing vessel safety legislation since before World War II was enacted in September 1988. It is not perfect, but it is good. Like all legislation in a democratic society, it is full of the push and pull of competing interests. If anyone considers it one-sided, I would be happy to fill them in on some of the points won and lost by each side.

The regulations pursuant to the legislation have been out for a year. There cannot be too many deep water fishermen today who can claim to be surprised that they have to carry life rafts and survival suits for all aboard. Again, the regulations are not perfect, but I do not think they should be viewed as static. We have to find out what works and how it can work better. I will get back to this point in a minute.

The Coast Guard has accepted the challenge of ACTING to prevent disasters rather than REACTING to take care of them. The creation of a specific office at headquarters to deal with fishing vessel safety is an important step. And there have been a handful of special individuals within the Coast Guard — Norm Lemley, Mike Rosecrans, and Alaska's own Glenn Sicks — who have gone far more than the extra mile.

My preferred "signs of progress" go deeper than the law or the regulations; they are the beginnings of a change in attitude that safety is not an extra but safety must be part and parcel of a healthy, economically secure workplace. The fact that NIOSH has called this conference is part of this change. It is hard to imagine this having happened even five years ago. Thank you, NIOSH.

I loved hearing a lobster man from Maine say that, on the three boats he owns, there are three licensed skippers. Two years ago, there were no licensed skippers. Like it or not, they have accepted the direction things are going, and being smart and competent business men, they would rather be ahead of the curve than behind it.

> The National Transportation Safety Board recommended, in its report on the sinking of the *Aleutian Enterprise*, that legislation be sought to require stability tests and stability training.

But having said all of this, we are left, unavoidably, with the empty half of the glass. I guess this is where the gloves come off. There is still a lot to do. So, where do we go from here?

In preparing to come here, I have done quite a lot of reading, not only of books and manuals that I had not gotten to before, but I have been going over my own extensive, if

disorganized, files. It is hard to read about the messages that have been ignored. The sinking of the *Americus* and the *Altair* within two weeks of one another in 1983 is when it first became clear that the conversion of a vessel for another fishery could have a disastrous and potentially fatal effect.

Lack of stability was a factor in the sinking of the *Western Sea*, the *Lasseigne*, the *Aleutian Enterprise*, and how many others? The National Transportation Safety Board recommended, in its report on the sinking of the *Aleutian Enterprise*, that legislation be sought to require stability tests and stability training. And I agree. I realize what a complex problem this is. In some of the large vessels, it MIGHT be taken care of by rigorous adherence to loadline requirements, but we have to keep hammering on it. It will not go away.

Another major problem is training. Here again, there has been progress. A very modest training component was included in the bill: a monthly or a once-a-trip safety drill for the crew of every fishing vessel with two or more people aboard. By the fall of 1994, the individual conducting that drill must be certified and will have to have had some formal training. A number of us have been working for almost two years now to help ease this regulation into being.

Many of the training programs already in existence have done an outstanding job of expanding their curricula, finding creative ways of taking their training to the often reluctant fisherman, and of convincing the community in general of the very real life-and-death value of such training. We all know the stories, but there are not statistics for those who are alive today because they knew how and when to get into their survival suits, how to inflate and get into their life rafts, and, most important, how to keep their heads in the face of disaster.

What about the thousands of miles of U.S. coastline where there are no training facilities. How are those people going to comply with the regulations?

Then there are the issues of vessel inspection and licensing, both touched on in the 1988 legislation, but put off for further study. While recognizing that "further study" is often legislativese for "deep sixing," there has been progress here, too.

The Marine Board's study of fishing vessel safety was very comprehensive and has given us a solid base of data all in one place which had not been true before. I cannot fully concur with their conclusion that inspections should start with a self-administered checklist, but maybe I am being unduly pessimistic.

A lot of time and energy has been spent during the past four years on possible licensing plans. The Coast Guard has developed a fairly conventional plan. The Commercial Fishing Industry Vessel Advisory Committee mandated by the 1988 Act has developed another plan, which makes every effort to be industry friendly and therefore, in the view of the committee, workable.

Now, I have heard stirring of a new cooperative plan with the Coast Guard and the industry, through the committee, working together from the beginning to create a plan everyone can work with, rather than at the end, when involved groups have a vested interest in their own version.

One of the inevitable results of the bonanza years was over-capitalization, putting more boats out there for the industry to sustain — perhaps

more than it could sustain. As the resources levelled off and the competition became keener, there was the increased threat of over-fishing; there were shortened openings which led to chaotic races out of harbors to the fishing grounds; and there was more corner-cutting.

The responsible owner/operator skippering his own boat was probably — not necessarily, but probably — going to be just as conscientious as ever about keeping it in good shape. But, there is a diffusion of responsibility when you get into the larger — and largest — vessels owned by corporations. Some of the vessels with the worst safety records in the industry are owned, in part, by highly regarded members of the fishing community.

Some of these delinquent vessels have more than a dozen lawsuits pending against them. While there are "safety experts" representing them to the public, I am going to have to be shown that the changes are more than cosmetic.

In 1990, OSHA issued 269 citations to fishing companies for safety violations. As recently as July of this year, I received a telephone call from a young woman, the widow of a man who had become ill on one of the more infamous of these vessels, and who died for lack of proper medical attention.

Agencies are placing advertisements promising thousands of dollars to the eager young person from the Lower 48 who is willing to work hard.

Another tangential result of this period is the outrageous advertising for summer help, which still appears in both college and commercial publications. Agencies are placing advertisements promising thousands of dollars to the eager young person from the Lower 48 who is willing to work hard. There are a lot of those kids who are willing to work hard, but there are not the jobs. And, there they are, cold, hungry and broke, lured by a will o' the wisp. Another welfare problem for Kodiak, Dutch Harbor, or Sitka.

So, what are the approaches we should take, here and now? What are the best next steps?

Because of the interest NIOSH has shown in hosting this workshop, one of the things I look forward to is an increasingly sophisticated approach to the collection and analysis of data. Lack of data has always been a problem in the industry. Thanks to a lot of good work being done in that area, there is more available today, and that will increase as the reporting requirements of the regulations go into effect.

Within the next two years, by which time all of the regulations pursuant to the 1988 Act will be in place, there should be a format designed to test the effectiveness of specific regulations. We need to know what is working and what is not working.

A few of the questions that I think should be addressed:
The usage rates of survival equipment? In each accident, how many of the people involved were able to make use of survival suits and life rafts? Was the EPIRB properly used, effective, and what was the response time?

What about survival equipment on the vessel participating in a rescue? Had all the equipment been properly maintained? And, if exemptions were granted in the case of certain equipment, were they justified?

Casualty rates on inspected versus uninspected vessels? We can get

some help here from the experiences of other countries.

The effects of licensing? A "before" and "after" analysis of the towboat industry after licensing would be a good place to start.

Safety training for officers and crews? What is the correlation between amounts of training and casualty rates, accidents on deck, and equipment lost?

Many of you here are better acquainted with these issues than I. What I do know is that in today's economic and political climate, it is essential to *test* laws and regulations continually in order to prove that they are effective. If we want the help of the Congress in any further legislation, it is our responsibility to prove to them that what they HAVE given us has done what it said it would do—save lives and prevent accidents.

As I said, I am living temporarily in Indonesia, an exciting and energetic country, and with its 17,000 plus islands, a country in which fishing is an important part of the economy. Understandably, my eye goes right to the accounts of fishing vessel accidents. August 24th, a Greek cruise ship, the *Royal Pacific*, collides with the Taiwanese fishing trawler, *Terfu 51*: four dead, 70 injured, 26 missing. September 8th, nine were lost on the *Sukses Jaya* off Central Java.

It was a very small article, hidden away inside the paper. There were no names printed. It made me think how lucky we are to live in a country where, if something is wrong, people could get together and fix it. It may not be easy. It probably will not be easy, but it can be done. So, let us keep at it.□

CHARGE TO THE WORKSHOP
DELIVERING ON THE PROMISE IN THE LAST FRONTIER

By CAPT Richard A. Lemen, USPHS

Dr. Peter M. Nakamura: The last speaker of this first session is Captain Lemen of the United States Public Health Service who will give the *Charge*. Richard A. Lemen, Ph.D., is the Deputy Director for the National Institute for Occupational Safety and Health (NIOSH) in Atlanta, Georgia, and has been since August 1991. He is a Captain on active duty with the United States Public Health Service where he has served for 22 years. Prior to that Captain Lemen was on active duty with the U.S. Army for 2 years. Prior to his current assignment, Dr. Lemen served as Assistant Director, NIOSH, Washington, D.C., from October 1988 to August 1991. He was Director of the Division of Standards Development and Technology Transfer from June 1980 to September 1988 and has served NIOSH in a variety of management positions including Assistant Chief, Industrywide Studies Branch in the Division of Surveillance, Hazard Evaluations and Field Studies, and Chief of the Biometry Section and Branch in the Field Studies Division. He is a recipient of two USPHS Commissioned Officer Commendation Medals, the USPHS Distinguished Service Medal, and the U.S. Army's Commendation Medal for Meritorious Service in addition to various service ribbons. He is the author of many scientific publications including joint editorship of the book, *Dust and Disease*. He received his B.A. from Central Methodist College where he was named a Distinguished Alumnus in 1987. He has an M.S. in epidemiology from the University of Missouri and a Ph.D. in Epidemiology from the University of Cincinnati. CAPT Richard Lemen:

Ladies and Gentlemen, let me add my welcome to that of Dr. Bender's and Senator Stevens'. It is with great pleasure that I am here in the Nation's Last Frontier, and I wish to pass along from Rear Admiral J. Donald Millar, the Director of NIOSH and my boss, his regrets for being unable to attend this workshop. He was in Anchorage last year for the opening of the NIOSH Alaska Activity and enjoyed every minute of his stay.

It struck me upon my arrival in Anchorage that Captain James Cook was here 214 years ago exploring the coast line of Alaska and the Bering Sea in his search for the Northwest Passage. With his sailing vessels, *Resolution* and *Discovery*, he entered the inlet that was named after him, Cooks Inlet, in 1778.

Captain Cook's legacy offers a solid foundation for me in giving the charge at this workshop. Not only was he a pioneer in Alaska, he also maintained a concern for the health of his men at sea. Foremost among these were his successes in preventing the dread of seafarers of that day, the disease scurvy.[1] In the spirit of the concern for the health of these workers at sea, we are convened to consider the disease and injury problems faced by Alaska's seafarers of today, the commercial fisher.

In giving you the charge to this workshop, our interest in the long run is in the problems of both diseases and injuries as they relate to work in the fishing industry; and our concern extends well beyond Alaskan waters to the protection of all Americans who make their living from fishing. Moreover, what we do in the United States is of vital interest to preventive

efforts internationally. We are here to discuss these problems and learn more about how we can work together to prevent them.

Our purpose at this workshop is to increase the awareness about fishing safety, build coalitions, share information and experiences, and encourage action to prevent injury and disease that result from working in commercial fishing.

DISEASES AND INJURIES

The recognition that fishing can have health consequences is not new. Bernardino Ramazzini, a physician of Italy and the "Father of Occupational Medicine," wrote in 1700:

"The clothes of fishers are always wet through, hence they are exposed to diseases that arise from obstruction of transpiration; such as acute fevers, chest troubles, pleurisy, pneumonia, coughs, dyspnoea, and similar diseases. It is a known fact that fishers are sometimes attacked with torpor and numbness of the arms and feet..."

He also wrote that...

"when a doctor happens to have some fisher entrusted to his care, let him carefully consider that theirs is a very toilsome and exacting calling; that the man (or woman) has to endure the cruel buffets of the winds, freezing cold in winter...for fishers the night is usually spent in toil and sleepless."

The history of diseases and injuries faced by seafarers is replete with examples of a variety of health problems. Among these are problems not only with drowning and hyperthermia, as are so evident in Alaskan waters, but with diet — such as with scurvy, dehydration for lack of drinking water, lead colic from water drawn from leaded pipes, asphyxiation in bilge rooms where poisonous gases collected, burns, infectious diseases such as the plague, and seasickness.[2] The study of diseases among workers in the commercial fishing industry is increasing, as is demonstrated by investigations into the causes of lung diseases among crab workers.

Crab Workers' Bronchitis

Just last year, 1,000 crab processing workers in Alaska reported to the emergency room at Dutch Harbor with respiratory symptoms. This 1,000 are out of a total work force of 2,500 on processing ships, two out every five workers.[3]

At a seminar on September 2, 1992, at our facility in West Virginia, Dr. Dorsett Smith of the University of Washington presented the results of his investigation on behalf of an insurance carrier. He examined 41 crab processing workers, 33 male and 8 female, who gave up their 3 months of contract earnings because they were sick with bronchitis and a wrenching cough.

> ...we are serving at the vanguard for developing programs to demonstrate to the rest of the nation and the world how prevention can work to save life and limb.

His work indicates an association of an unusual lung disease with the butchering of crab and with the steam from crab boiling operations aboard crab processing vessels. A possible association was found with the crab's mouth foam, which it exudes during the "butching" operation. This foam contains a toxin that will burn the skin when used in a skin patch test. Much remains to be learned beyond

Dr. Smith's findings about this new organic lung disease.

Many crab harvest workers also work as crab processors. This problem may be shared on vessels other than just the large processing ships.

Other Diseases and Injuries

Many other problems of occupational safety and health among fish harvesters and processors bear attention. These include musculoskeletal injuries, noise-induced hearing loss, neurotoxic disorders, and stress. I will discuss some general studies of the health problems among fishers.

In 1988, Stanislaw Tomaszunas, et. al., published a paper[4] that examined morbidity among fishers. The population of fishers and seafarers included 1,131 from the North Pacific; 1,253 from the South West Atlantic; and 84 from the South East Atlantic. The five leading diseases per 1,000 fishers per year diagnosed in this study follow:

Disease	Incidence
Injuries	545
Respiratory diseases, acute infections	537
Skin, other than infections	209
Oral cavity diseases	201
Musculoskeletal diseases	181

The same study found the following leading causes of incapacity and sick absence by number of work days lost per 1,000 fishers per year:

Disease	Number
Injuries	619
Diseases of nerves and ganglia	116
Musculoskeletal diseases	102
Diseases of stomach, duodenum	98
Appendicitis	94

A 7-country study concluded for the years 1954 to 1979 that 70 percent of all diseases and injuries were attributable to the following four causes:[5]

Disease	Percent
Injuries	33.5
Digestive diseases	15.7
Respiratory diseases	11.2
Musculoskeletal disorders	8.9

What one sees in all of these results is that injuries are at the top of the list. For our consideration at this workshop the injury problem among the fisher population is the most compelling.

THE INJURY PROBLEM

Our data support not only that injuries are a compelling problem, but that we must look in Alaska first for some solutions. Our data for the years 1980 to 1988 show Alaska's occupational fatality rate of 33.1 per 100,000 is the highest among states and more than 4½ times the U.S. rate of 7.2. The major industrial division with the highest fatality rates in Alaska is agriculture, forestry, and fishing at a rate of 132.2 per 100,000, by far the highest in the nation. This high rate is attributable to the activity of commercial fishing.

We will hear more detail about this high rate in Alaska later in this workshop. We will also hear about ways to set priorities for research and control through surveillance, and of research needs in associating cause with affect and in developing and demonstrating better controls, and of ways to control the problem.

We are dealing with a specific population at risk, the American fisher. Our interventions to control injuries that they experience must include a balance of promoting health and safety through training and education, of protecting health and safety through engineering controls

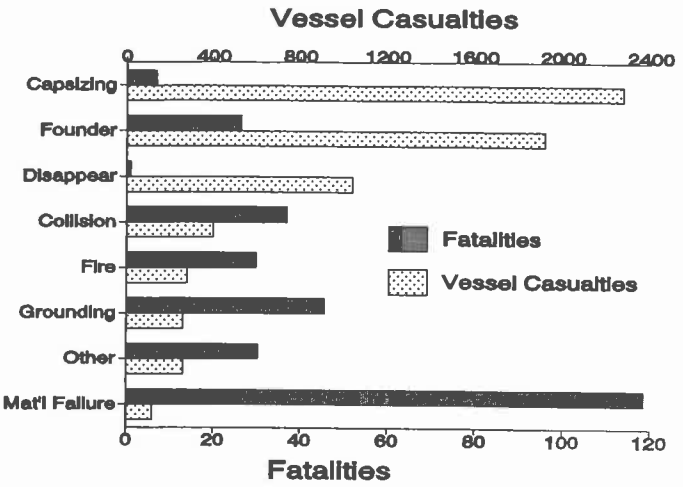


Figure 1. Number of Vessel Casualties Ranked Against Vessel-Related Fatalities by Nature of Casualty.

—Source: National Research Council

and different technology, and of preventive health services that range from forecasting weather to prompt rescue and resuscitation.

In understanding the problem, we must use care in associating the injury problem with the appropriate causes. Figure 1, when contrasted with Figure 2, illustrates the difference in ranking of problems by the measure selected. Grounding, Material Failure, and Fire and Explosion rank the highest in frequency as associated with vessel casualty. Conversely, capsizing, foundering, and disappearance rank the highest as associated with the frequency of fatalities related to casualties of commercial fishing vessels.[6]

THE ARCTIC DIMENSION

The extreme climate in Alaskan waters points to some likely international partners in our efforts. The countries that are located in or fish in circumpolar waters experience many common hazards of extreme cold, wind, rough waves, and darkness; and the common problems of sickness and injury. What we can do to prevent these problems may be learned

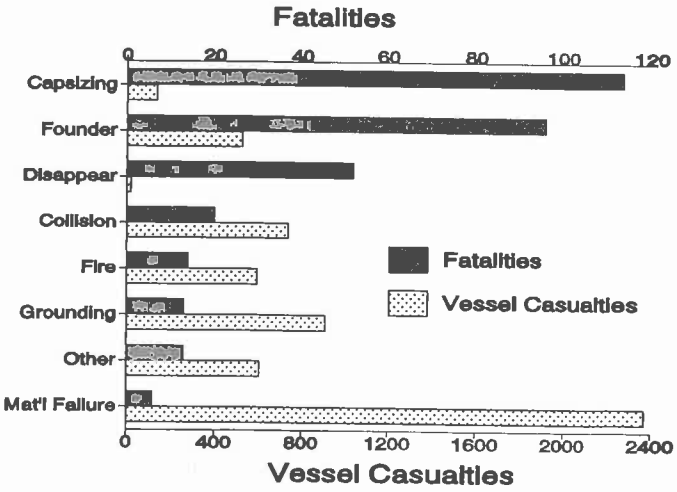


Figure 2. Number of Vessel-Related Fatalities Ranked Against Vessel Casualties by Nature of Casualty.

—Source: National Research Council

from other circumpolar countries or through joint efforts.

THE CHARGE

Our interest is in both diseases and injuries, and we are here to explore programs that will not only serve Alaskans but other Americans who fish in Alaskan waters. We are serving at the vanguard for developing programs to demonstrate to the rest of the nation and the world how prevention can work to save life and limb.

I want to offer a depiction of a tool that can help us find causes of the problems that we try to prevent. Figure 3 shows a cause-effect diagram that can help to bring together the many risk factors that may be associated with the problems, and thus, its solution. It demonstrates well the many factors that must be considered in prevention.

I charge you to share your knowledge and experience toward preventing the unnecessary toll of death and injury, and of illness among workers in the fishing industry. We must "Deliver on the Promise" from the Occupational Safety and Health Act "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and preserve our human resources." And since 1982, the Nation includes our 200 nautical mile Extended Economic Zone, which is truly our Last Frontier.

To share what we discuss here, we will print the proceedings (of this historic event) as a reference document for us and for others.

With the spirit of Captain James Cook searching for the Northwest Passage, I challenge you to go forth with the vision of "Delivering on the Promise" in this, our Last Frontier. But unlike Captain Cook, let us deliver on that promise and preserve our human resources in the fishing industry!□

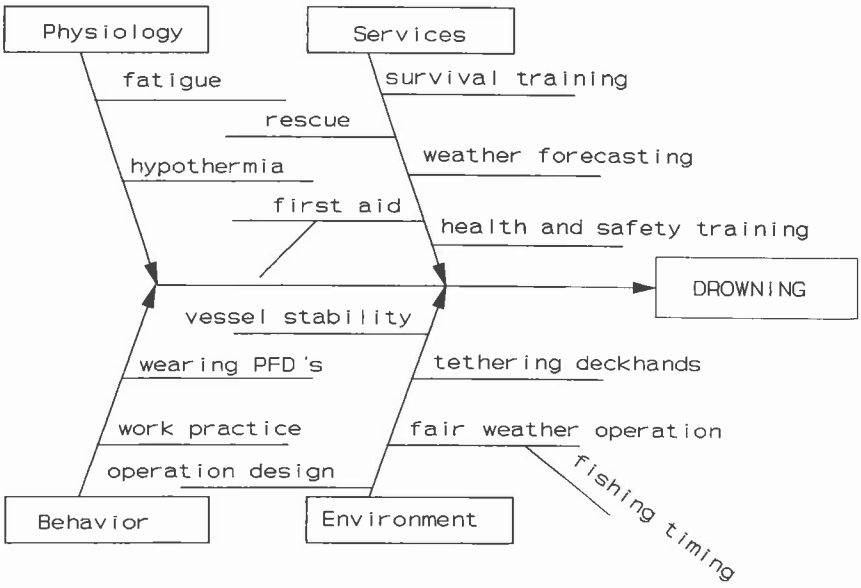


Figure 3. A Cause-Effect Diagram Related to the Problem of Fishers Drowning in Alaskan Waters.

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SESSION 2: DEFINITION OF THE PROBLEM

October 9, 1992

Moderator: Kathleen W. Johnson R.N., M.P.H.
Division of Public Health
Department of Health and Social Services, State of Alaska

Mrs. Kathleen Johnson is the Injury Control Program Manager for the Section of Epidemiology, Alaska Division of Public Health. She has been employed by the State of Alaska since October 1990. Prior to moving to Alaska in 1989, she was employed and engaged in graduate work at the University of Texas, Houston, School of Public Health. She completed her Masters of Public Health degree in 1990. Her interest in Public Health was generated, in part, by several years in clinical and administrative pediatric intensive care nursing. Her career in nursing began in 1976 when she graduated with an Associate degree in Nursing from Weber State University, Utah. She went on to finish a Bachelor of Science degree at the University of Utah in 1978. She worked at Primary Children's Hospital in Utah until 1981. From there, Kathleen went on to The Children's Hospital in Denver, Colorado, where she worked as senior staff nurse and Assistant Head Nurse/Administration. In 1987 she moved to Houston, Texas, where, after a short time in research, she entered into graduate studies at the University of Texas.

QUOTES FROM THIS SESSION

"As I have said before, the Coast Guard data do not necessarily pick up all the casualties that occur. In addition, we do not have very good data on how many vessels there are in each size class." — Gunnar P. Knapp, Ph. D.

"It is important to calculate fatality rates, as we have done here, in addition to examining the numbers of workers killed, because the rates give a direct measure of risk." — Thomas R. Bender, M.D.

"The development of interventions that account for the dynamic environment on board a fishing vessel are needed." — Paula S. Trapp, R.N.

"The largest number of injuries are extremity injuries. Sixty-three percent are limb injuries, 20 percent are head and neck injuries, and 14 percent are injuries to trunks." — Barbara L. Simonsen, R.N.

THE COMMERCIAL FISHING SAFETY RECORD A NATIONAL PERSPECTIVE

By Dr. Gunnar P. Knapp

Ms. Kathleen W. Johnson: This is Session Two of the National Fishing Industry Safety and Health (FISH) Workshop entitled *Definition of the Problem*. Our first speaker is Dr. Gunnar P. Knapp whose presentation is entitled *Commercial Fishing Safety Record: A National Perspective*. Gunnar P. Knapp is a Professor of Economics at the University of Alaska Institute of Social and Economic Research. A specialist in fisheries economics and fisheries management, he has studied the potential impacts of fisheries management on fishing safety, and has estimated commercial fishing fatality and injury rates. As a member of the National Research Council's Committee on Fishing Vessel Safety, he analyzed fishing safety data for Alaska and other regions of the United States. Dr. Gunnar Knapp:

INTRODUCTION

Commercial fishing safety is an important problem in Alaska. As different speakers will no doubt point out, the kinds of problems that exist differ for different fisheries in Alaska. The safety problems in the Bering Sea crab fishery are different than those in the southeast troll fishery. This makes it more difficult to define the nature of the Alaska commercial fishing safety problem or to figure out how to deal with it.

The same things are true at the national level. Commercial fishing safety is an important problem throughout the United States. The safety problems in the Gulf of Mexico shrimp fisheries are different from those in Alaska fisheries. These kinds of differences contribute to the difficulty of defining or addressing the commercial fishing safety problem at the national level.

This conference will focus primarily on Alaska commercial fishing. But I would like to first review the commercial fishing safety record with a national perspective.

Two years ago, I served on the National Research Council's Committee on Fishing Vessel Safety, which prepared a report entitled *Fishing Vessel Safety: Blueprint for a National Program.*[1] In preparing this report, the committee looked at the kinds of safety problems that exist in fisheries throughout the United States and approaches for dealing with them.

Today I will briefly review with you the picture that emerged of safety problems at the national level. All of the data are from the committee's report, except that I have added some additional data for Alaska. Any opinions expressed are my own rather than the committee's.

SOME TERMINOLOGY

Let me begin by defining some basic terminology, which is used by the Coast Guard and which our committee also used.

Casualties are any kind of incident that involves damage to a vessel or injury or death to a fisherman. **Vessel casualties** are incidents in which fishing vessels are damaged or lost.

There are many **natures** of vessel casualties, such as capsizings, floodings, collisions, fires, groundings, and equipment failures. Many

vessel casualties involve several natures, such as a grounding, which leads to flooding, or an equipment failure, which leads to a fire. Vessel casualties can have widely varying consequences. Some lead to serious vessel damage, and in the most extreme cases to **total vessel losses**. Some, but not all, vessel casualties result in injuries or deaths.

Although relatively few capsizings occur compared with other kinds of incidents, they are particularly serious causes of fatalities.

Personnel casualties are incidents in which fisher men and women die or are injured. Many, but not all, personnel casualties are **vessel-related**, such as when a boat capsizes and the crew drowns. But many personnel casualties are **non-vessel-related**, such as when fisher men or women fall overboard or are injured by equipment on board.

DATA SOURCE

The major data source for fishing vessel casualties in the United States is the Coast Guard's "main casualty data base," (CASMAIN), which is based on Marine Accident Reports. These are required to be filed with the Coast Guard for incidents that result in significant vessel damage, injury, or death.

The CASMAIN data base is far from perfect as a record of commercial fishing safety problems. Many incidents, including most non-serious incidents, are never reported to the Coast Guard. Only a fraction of non-fatal injuries are reported. Moreover, there is nothing in the CASMAIN data base that corresponds to the "near miss" data that the FAA collects for aircraft incidents.

Our committee reviewed major casualty incidents from the Coast Guard's CASMAIN data base for the six-year period from 1982-1987. We limited our analysis to those casualties that resulted in at least $25,000 in damages, a fatality, or both. In other words, we studied only the most serious incidents reported to the Coast Guard, which are not necessarily the only serious incidents that occur.

NUMBER OF VESSEL CASUALTIES

On average, nationwide there were almost 1,100 major vessel casualties (resulting in more than $25,000 damage) per year during the six-year period 1982–1987. Of these, there were an average of 216 total vessel losses per year nationally. Vessel casualties resulted in an average of 58 fatalities per year (but recall that there are numerous additional fatalities that do not result from vessel casualties).

NATURE OF VESSEL-RELATED CASUALTIES

The most frequent casualty natures resulting in total vessel losses are foundering and fires. However, the most frequent casualty natures resulting in fatalities are capsizing, foundering, and "disappearances"—many of which probably also resulted from capsizing or foundering. Although relatively few capsizings occur compared to other kinds of incidents, they are particularly serious causes of fatalities.

VESSEL CASUALTY AND TOTAL LOSS RATES

The rate of vessel casualties and total losses increases as vessel sizes increase. Perhaps this is because larger vessels are fished more intensively, and in more dangerous conditions.

I want to emphasize that the data on which these rates are based are not

particularly reliable. As I have said before, the Coast Guard data do not necessarily pick up all the casualties that occur. In addition, we do not have very good data on how many vessels there are in each size class. So these are crude estimates. But I think it is noteworthy that each year perhaps 2.9 percent of large vessels—those above 79 feet in length—are total losses.

REGIONAL DISTRIBUTION OF VESSEL-RELATED CASUALTIES

Vessel-related casualties, including total losses and fatalities, occur in all regions of the United States. However, the more serious casualties—total vessel losses and fatalities—occur disproportionately on the West Coast and in Alaska.

DISTRIBUTION OF VESSEL-RELATED CASUALTIES BY VESSEL LENGTH

Vessel-related casualties occur in all size classes. Most occur on smaller vessels, presumably because there are far more smaller vessels than larger vessels in the American fishing fleet.

FATALITIES AND FATALITY RATES

An average of 108 fatalities per year were reported to the Coast Guard nationwide during the six-year period 1982-1987. Of these, about half were vessel-related and about half were non-vessel-related. Based on crude estimates of the number of fishermen and fishing vessels, it appears that the average annual fatality rate is about 47 fatalities per 100,000 workers, which compares with rates in mining and construction.

However, this estimate does not take into account that a great number of these fisher men and women work in fishing only part of the time. Moreover, the estimated fatality rates are strikingly higher for larger vessels—possibly more than 200 per 100,000 workers for vessels longer than 79 feet.

These fatality rates may well be understated. Researchers with NIOSH have demonstrated that the Coast Guard data significantly understate the total number of fatalities that occur in commercial fishing. Many incidents are never reported, for example, those that occur on inland rivers such as the Kuskokwim and the Yukon.[2]

FATALITIES BY REGION

Fishing fatalities occur in all regions with roughly equal numbers of total fatalities in the North Atlantic, the Gulf Coast, the West Coast, and Alaska.

NATURE OF VESSEL-RELATED FATALITIES

As I mentioned earlier, capsizings account for more vessel-related fatalities than any other nature of incident, followed by sinkings and "disappearances."

NATURE OF NON-VESSEL-RELATED FATALITIES

By far the largest number of non-vessel-related fatalities occurred as a result of crew falling into the water. However, a variety of other types of incidents also occur.

CONCLUSION

I would like to offer three simple conclusions to this brief overview of the national fishing safety record.

- First, the record shows that there has been a serious, nationwide problem in commercial fishing.
- Second, a review of the record demonstrates that fishing safety is not a single problem with a single cause and a single cure. Many different kinds of casualties occur in vastly different circumstances for very different reasons. This suggests that

there is no single solution to the problem.

- Third, we will not be able to describe or fully understand the problem until we have better data.

Many of you probably have personal experience with fishing safety problems. You may have been on vessels that were damaged or on which people were hurt, or friends and relatives may have had these experiences. But each of our personal experiences and knowledge can only add up to a small part of the overall picture. To understand the problem, we need reliable data.

But the data we have at present are not really reliable, and they are certainly not sufficient. Each figure that I have given you raises questions about why the numbers are what they are, but the data usually are not complete enough to say why. Let me give you two simple examples.

I have not talked about what fisheries in which these incidents occurred. That is because the Coast Guard's CASMAIN data base does not include any information about what fisheries they occurred in. The Coast Guard does not routinely collect this information. Before we can identify the kinds of safety problems that have been occurring in specific fisheries, we will need to review each casualty incident and attempt to determine the fishery in which it occurred.

I also have not said anything about non-fatal injuries in commercial fishing, although we know that many people are hurt on fishing vessels. That is because there are no reliable national data on fishing injuries. In the past no one collected this information. A new reporting requirement has been established, but there are as yet no procedures for obtaining the data. □

REFERENCES

1. National Research Council. *Fishing Vessel Safety: Blueprint for a National Program*, National Academy Press, Washington, D.C. 1991. 282 pages.

2. Schnitzer, Patricia G., Deborah Landen, and Julie C. Russell, *Occupational Injury Deaths in Alaska's Fishing Industry, 1980-1988*. National Institute for Occupational Safety and Health, Division of Safety Research. Presented in part at the 40th Annual Epidemic Intelligence Service Conference, Atlanta, Georgia, April 8-12, 1991, and the 24th Annual meeting of the Society for Epidemiologic Research, Buffalo, New York, June 12-14, 1991.

COMMERCIAL FISHING FATALITIES: U.S. REGIONAL COMPARISONS

By CAPT Thomas R. Bender, USPHS

Mrs. Kathleen W. Johnson: The next speaker is CAPT Thomas R. Bender of the U.S. Public Health Service whose presentation is entitled *Commercial Fishing Fatalities: U.S. Regional Comparisons*. Thomas R. Bender, M.D., M.P.H., Director, Division of Safety Research since May 1988, joined CDC as a Medical Epidemiologist in 1969. He directed the Anchorage Field Station of the CDC from its establishment in 1970 through 1981. Dr. Bender was a CDC/ASPH adjunct professor at the School of Public Health and the School of Medicine, University of Hawaii (1981-1986), where he also was the Director of the Preventive Medicine Residency Program. During his last two years in the Pacific (1984-1986) he was Special Advisor to the Assistant Director for International Health, CDC. From 1986-1988, he was the Senior Epidemiological Research Advisor to the Office of Health, Bureau for Science and Technology, Agency for International Development. Dr. Bender received his M.D. from Hahnemann Medical School and Hospital, and his M.P.H. from The Johns Hopkins University School of Hygiene and Public Health. He is certified by the National Board of Medical Examiners, the Board of Medical Examiners of Alaska, and the American Board of Preventive Medicine. Dr. Bender has authored numerous publications and has held a wide variety of advisory appointments. Dr. Thomas Bender:

Dr. Lemen has already mentioned in the *Charge to the Workshop* what most of you are very familiar with, namely that Alaska appears to have the highest occupational fatality rate of any state in the nation. The primary reason for this is a disproportionately high number of fatalities in the commercial fishing industry.

Earlier today, many of you heard my introductory remarks where I reiterated some of these statistics. I remarked how NIOSH is engaged, through close collaboration with many of your agencies, in a program to significantly reduce the impact of these traumatic injuries in fishers and other workers here in Alaska.

I would like to compare and contrast fatalities in the Alaska commercial fishing industry with those of other states and regions within the United States. Some of you may have fished or sailed the waters off other states and therefore know much about the similarities and differences between areas.

Several of our speakers have mentioned the national surveillance system that we at NIOSH have employed to capture data on worker fatalities for the past 10 years, the National Traumatic Occupational Fatality program (NTOF). Data for NTOF are obtained by close review of death certificates provided by all 50 states, New York City, and the District of Columbia.

It is true that death certificates are not always coded correctly. NTOF, nevertheless, provides valuable data on the demographics of occupational fatalities in the U.S., and provides important clues to the nature of risk in the workplace. My remarks are based on nine years of NTOF data (1980-1988).

The National Marine Fisheries Service (NMFS) divides the fishing waters of the US into eight regions (Table I). For convenience I have combined the South Atlantic with the Chesapeake and the Mid-Atlantic with the New England regions.

Just under ten thousand million pounds of fish were landed by US fishermen in 1990. Alaska was responsible for more than half (56 percent) of the total commercial fishing pounds landed. This tonnage was three times that of the second ranked Gulf of Mexico region.

All of the Pacific Coast and Hawaiian fisheries combined amount to only about 12 percent of the Alaska landings. As many of you know, a substantial portion of Alaska's largest fishery, the Bering Sea groundfish industry, is harvested then transferred and processed aboard huge factory trawlers. These fish are eventually off loaded at non-domestic ports far outside Alaska, and do not show in these figures.

In the U.S., from 1980 through 1988, a total of 517 commercial fisher men and women lost their lives. This translates to an average yearly rate of approximately 90 fatalities for every 100,000 fishers (Figure 1). Despite the peaks and valleys, the overall trend remains fairly constant over the nine years.

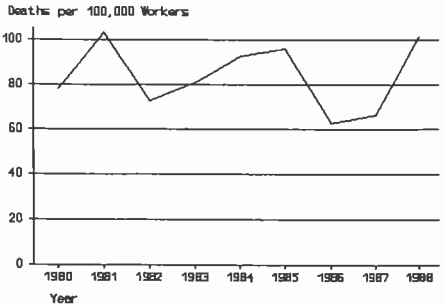


Figure 1. Occupational Fatality Rates in the U.S. Commercial Fishing Industry, 1980-1988. — Source: NTOF

These fatality rates are inclusive of all fisheries, but we know that some fisheries are substantially more risky than others. Later this afternoon, Richard Kennedy will present his findings on which Alaskan fisheries

Table I. U.S. Commercial Landings in Tons by Region and State, 1990.

Region	States	Landed harvest (percent)
Alaska	Alaska	5,400,000,000 (56%)
Pacific Coast and Hawaii	Washington, Oregon, California, Hawaii	650,200,000 (7%)
Gulf	Texas, Louisiana, Mississippi, Alabama, Florida (West Coast)	1,600,000,000 (17%)
South Atlantic (South Atlantic with Chesapeake)	Florida (East Coast), Georgia, N & S Carolina, Virginia, Maryland	1,128,200,000 (12%)
North Atlantic (Mid-Atlantic with New England)	New Jersey, New York, Rhode Island, Connecticut, Delaware, Maine, New Hampshire, Massachusetts	854,800,000 (10%)
Great Lakes	Michigan, Wisconsin, Minnesota, Pennsylvania, Ohio, Indiana, W New York	44,700,000 (<1%)

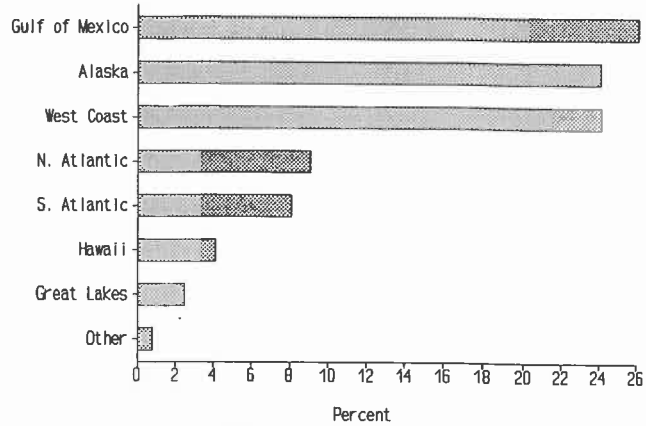


Figure 2. Percent of Workers Killed in U.S. Commercial Fishing Industry per NMFS Region, 1980-1988.

— Source: NTOF

are the most risky. It is important to calculate fatality rates, as we have done here, in addition to examining the numbers of workers killed, because the rates give a direct measure of risk.

Unfortunately, some of the specific rates we would like cannot be calculated, since we do not have adequate estimates of the specific worker subgroups at risk. But, while it is not possible at this time to determine fishing fatality rates for most individual states or even regions, we can at least begin to compare regional fatality experience by contrasting the number of fishers who died within each region.

Figure 2 shows for the NMFS regions, with Hawaii shown separately, the percent of workers killed in that region out of the total number of U.S. commercial fishing fatalities. Of the 517 fishers who died in the nine-year period, over one-quarter died in the Gulf of Mexico region. Alaska and the Pacific West Coast follow closely behind, each accounting for slightly under one-quarter of the total. The North Atlantic and South Atlantic regions as well as Hawaii and the Great Lakes areas accounted for a substantially smaller proportion of the total commercial fishing fatalities.

As can be seen in Figure 3, Alaska, as a state, has the greatest number of occupational fatalities in the commercial fishing industry, and far outranks every other state. Nearly a quarter of all U.S. commercial fishing

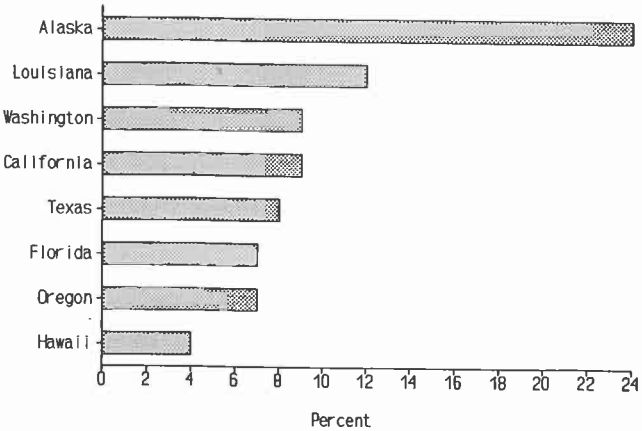


Figure 3. Percent of Workers Killed in the U.S. Commercial Fishing Industry by State of Occurrence, 1980-1988.

— Source: NTOF

fatalities occur in Alaska, twice the number of the second highest state: Louisiana. Fishing fatalities in Washington and California accounted for 9 percent each.

Given the difficult working conditions, abbreviated fishing seasons, and high tonnage harvested, it is not surprising that from 1980 through 1988, there were 126 deaths that occurred in Alaskan waters: a staggering statistic when one considers the relatively small size of the Alaskan commercial fishing workforce.

The Alaska region had the highest number of nonresident fisher fatalities, of any of the regions—54, or 43 percent. This may reflect the seasonal migration for fishing employment. Hawaii also had a high percentage of nonresident fisher fatalities (76 percent) but a relatively lower number, 16. The other regions each reported less than 10 percent nonresident fatalities; the national average, excluding Alaska and Hawaii, was 5 percent.

Table II. Mean Age of Fishers Killed in Alaskan Waters by Place of Residence, 1980–1988, N=526.

Place of Residence	Mean Age (Years)
Alaska	36.2
All Other States	32.3
– Oregon	27.8
– Washington	35.9
– Virginia	26.2
Other Country	34.4

Fishers who were killed in Alaskan waters, and whose state of residence was other than Alaska, were generally younger than the Alaskan fishers killed (Table II). While the average age of death for Alaskan fishers was 36.2 years, the mean age of death for residents of Oregon was 27.8 years, for Washington State, 35.9 years, and for Virginia, 26.2 years. Foreign nationals who were killed in Alaskan commercial fishing waters had a mean age of 34.4 years. Death certificate data from other states reported low numbers of nonresident fatalities, and were not counted for this reason.

Multiple fatalities are of special concern (Table III). The average number of deaths per multiple fatal incident is considerably higher in Alaska than in other regions. Alaska reports an average of 4.3 deaths in each multiple-fatality incident; Hawaii had an average of 3, but that was a result of a single 3-person incident. The other regions reported less than 3 fatalities per incident on the average. As detected by death certificates, the West Coast had the highest number of multiple-case incidents, 13. Alaska certificates were useful in identifying at least 12 multiple-fatality incidents.

Table III. Drowning Deaths Among Commercial Fishers by U.S. Region, 1980-1988, N=369.

U.S. Region	Total Fatalities	Total Drownings	Drowning as a Percent of Total
Alaska	126	97	77%
West Coast	127	100	79%
Hawaii	21	3	14%
Gulf of Mexico	137	89	65%
South Atlantic	42	33	79%
North Atlantic	47	34	72%
Great Lakes	13	13	100%
TOTAL	513	369	71%

Nationally, drowning was the most common cause of death within the

commercial fishing industry. For the 9-year period, 369 fishers or 72 percent of the total dead, drowned. Of these 369, 56 or 15 percent, included hypothermia as a contributing factor.

To gain additional insight into the nature of drowning events, a comparison was made of the percent of those who drowned within regions (Table IV). A second motivation was to acquire a fuller understanding of the nature of drowning incidents to better comprehend how intervention strategies, such as the use of personal flotation devices (PFDs), may influence fatality outcome. (See also Surveillance for Work-Related Fatalities in the Alaskan Commercial Fishing Industry.
By Dr. George A. Conway.)

Table IV. Fishing Vessel-Related Drownings of Commercial Fishers by Region, 1980-1988, N-227.

U.S. Region	Total Fatalities	Total Drownings	Drowning as a Percent of Total
Alaska	97	76	78%
West Coast	100	76	76%
Hawaii	3	1	33%
Gulf of Mexico	89	32	36%
South Atlantic	33	12	36%
North Atlantic	34	21	61%
Great Lakes	13	9	69%
TOTAL	369	227	61%

Of the 126 fishing deaths in Alaska, 97 were reported as drowning, representing 77 percent of all Alaskan fishing fatalities. Virtually the same number of drowning fatalities, 100, were reported for the Pacific West Coast region; this represented 79 percent of that region's commercial fishing fatalities. In the Gulf of Mexico region, 89 deaths were due to drowning, or 65 percent of the region's total; and in the South Atlantic region, 33 deaths were by drowning, or 79 percent of their total. The North Atlantic region had very nearly identical count as the South Atlantic region—34 deaths by drowning, representing 72 percent of their total. The Great Lakes region was unique in that all 13 commercial fishing deaths that occurred were caused by drowning. Hawaii only had 3 deaths from drowning, and these 3 represent a minor percentage of overall commercial fishing deaths, 14 percent.

Since drownings are by far the most common cause of death for fishermen and women in Alaska and nationally, it may be appropriate to examine the circumstances of drowning fatalities in more detail. Fishing vessel-related incidents, which include sinkings, capsizings, and collisions, accounted for 227 deaths nationally and were the leading event that led to drownings in each state. Alaska reported the highest number (76) of these fatalities; 78 percent of the 97 drownings in Alaska were vessel-related.

In Alaska, sinkings of the vessel accounted for 19 percent of drowning fatalities, collisions accounted for 16 percent, and capsizing accounted for 10 percent. Vessel-related drownings were also important in the West Coast region where they accounted for 76 percent of that region's drownings. A full 43 percent of drownings were caused by fishing vessels capsizing; 15 percent involved falls overboard, and sinkings were responsible for 11 percent. Within a single state of this region, Oregon, 88 percent of drownings were fishing vessel-related.

Of drownings in the Great Lakes and the North Atlantic, 69 percent and 62 percent respectively, were vessel-related. The Great Lakes region reported 23 percent of drownings were caused by fishing vessel collisions and 15 percent were caused by sinkings, and by capsizings.

North Atlantic falls overboard were the leading cause of drownings (29 percent); the second leading cause was fishing vessel sinkings (27 percent) followed by fishing vessel capsizings (18 percent). Fishing vessel-related drownings in each of the three remaining regions, South Atlantic, Gulf of Mexico, and Hawaii, represent about one-third of the total number of drowning fatalities. In the South Atlantic region, falls overboard represented the most common cause of drowning, 24 percent; capsizings were responsible for 12 percent, and sinkings or lost fishing vessels each accounted for 9 percent.

In the Gulf of Mexico, 35 percent of drownings were caused by falls overboard, 15 percent from vessels capsizing, and 8 percent from sinkings. Hawaii had three drowning deaths—one of which was vessel-related (a fall overboard). Hawaii had an additional net-related fatality, and another drowning for which no information was available.

Nationwide, the second leading cause of death for commercial fishers (just 5 percent of all deaths in this industry) was acute traumatic injuries as a result of being stuck by objects. The third and fourth leading causes were traumatic injuries as a result of being caught or entangled, generally in winches or nets, and asphyxia. With the exception of Hawaii, each region of the country reported drowning as the leading cause of death for commercial fishers.

In summary, Alaska commercial fishers remain at elevated risk of fatal injury. Drowning, and drowning with hypothermia, are the most common causes of death. Fishing vessel-related fatal incidents are much higher in Alaska than in the nation as a whole. Sinkings and collisions are the most common causes of vessel-related deaths.

The mean age of death for Alaska fishers is about the same as that for those in other regions of the country — a mean age of around 36 years. Alaska had the highest number of nonresident commercial fishing fatalities; the mean age of death of nonresidents was generally lower than that of residents.

All of this information indicates that certain kinds of interventions may be appropriate in Alaska that would not be appropriate in the Gulf of Mexico or other regions. This information certainly does not minimize the risk faced by other commercial fishers throughout the country, but clearly points out that Alaskan waters continue to be among the most harsh and unforgiving work environments known to man.

Our ability to extract meaningful information of this kind, both from NTOF and from various other data sources, has steadily increased over the last several years. Much of this improvement in data, in Alaska in particular, is because of the dedicated work of the many workshop participants present.

All of you deserve commendation for increasing our knowledge of the risks faced by fishers, especially in Alaska. Your continuing dedication and support are especially important now — we must now emphasize more vigorously the intervention and prevention efforts that will help save lives in this risky industry. □

NON-FATAL INJURIES IN THE ALASKA COMMERCIAL FISHING INDUSTRY

By Miss Paula S. Trapp

Mrs. Kathleen W. Johnson: The next speaker is Paula S. Trapp whose presentation is entitled *Non-fatal Injuries in the Alaska Commercial Fishing Industry*. Ms. Trapp is a registered nurse and is currently employed by the Alaska Health Project as an Industrial Hygienist. She is also a masters' candidate in the College of Nursing and Health Science at the University of Alaska Anchorage. Paula has 12 years of occupational health nursing experience in the Bristol Bay region. She is well-versed in occupational health issues and injury prevention, specifically in seafood harvesting and processing. Miss Paula Trapp:

The seafood harvesting industry in Alaska is dangerous. One half of the occupational deaths reported in this state occur in that industry.

But, what about non-fatal injuries? Are they important? How do we find out about them? And, last, but not least: What is known about non-fatal injuries to commercial fishers?

Experience has shown that injury events that result in death represent the tip of the iceberg in occupational injuries. Each fatality represents a large number of less serious injuries, which result from the same type of event. Intervention strategies, which impact fatality rates, also reduce the number of non-fatal injuries that occur.

The seafood harvesting industry is unique in this respect. The events that result in death to commercial fishers are, for the most part, those that cause vessel fatalities.

The deaths of the crew are secondary to the loss of a seaworthy vessel. Therefore, the study of fatalities will not provide information about non-fatal injuries occurring to commercial fishers. This lack of information will prevent the identification of causes and formulation of prevention strategies that would be effective against non-fatal injuries.

The first priority in the seafood harvesting industry is the prevention of fatalities. However, as this challenge is met, the need to identify, enumerate, and prevent non-fatal injuries will become more imperative. The unique nature of the seafood harvesting industry will demand research projects specifically designed to discover the character of the events that result in non-fatal injuries.

The development of effective interventions is based upon the collection and analysis of data. Complete, accurate, and accessible data on non-fatal injuries in the seafood harvesting industry is hard to find and difficult to obtain.

This lack of information will prevent the identification of causes and formulation of prevention strategies that would be effective against non-fatal injuries.

Commercial fishers in Alaska are, for the most part, considered self-employed because they work for a share of the catch. This classification excludes them from national injury statistics and workers' compensation data bases. Rare pockets of infor-

mation do exist in local clinic records and insurance claims.

The Alaska Trauma Registry may provide a rich source of information in the future. Currently, the Alaska Fishermen's Fund provides the largest, most complete amount of information on non-fatal injuries to commercial fishers. Analysis of this data base provides the best descriptive information on non-fatal injuries which occur to commercial fishers in Alaska.

The Alaska Fishermen's Fund was established in 1952 to provide a financial resource for commercial fishers injured while working. The Fund pays up to $2,500 per injury. Any person possessing a commercial fishing license in the state qualifies for benefits.

Alaskan residency is not a requirement for benefits. The system is passive, meaning that the recipient must file a claim before receiving benefits. Fatalities are excluded from benefits.

The Alaska Fishermen's Fund provided data from 1982, 1983, and 1984. It was analyzed by fishery as defined by species and gear. As can be seen in Table I, spinal sprains and strains occurred the most frequently in most fisheries.

In two longline fisheries, lacerations to the upper extremity were the most frequent. In the longline fisheries, which showed upper extremity laceration to be the most frequent, infections to the upper extremity were second. It is possible that these two categories represent the same injury, the difference being when they were seen and diagnosed.

Incidence rates by fishery can be estimated from the number of successful claims recorded by the Fund, as shown in Table II. The rates range from 1 out of 100 in purse seining for herring and setnetting for salmon to 7

Table I. Leading Injuries by Fishery.

Species and Gear	Spine Sprains Strains	Upper Extremity Lacerations	Upper Extremity Infections	Lower Extremity Sprains Strains	Upper Extremity Strains Sprains
King Crab Pots	18.7	9.5			8.2
Dungeness Crab Pots	25.3	12.6	9.1		
Salmon Purse Seine	17.0	11.0			8.9
Roe Herring Purse Seine	25.0	12.5		7.5	
Halibut Longline	18.5	19.5	11.8		
Sablefish Longline	14.0	22.1		11.4	
Salmon Drift Gillnet	23.4	10.6		7.3	
Salmon Set Gillnet	23.6	10.4			8.6
Unknown	15.1	12.4	7.2		

Table II. Incidence Rates by Fishery for 1983 per 100 Fishers.

Fishery	Actual Rate	Under Reported by 50 percent	Under Reported by 90 percent
Salmon, Power Troll	7	13	69
Dungeness Crab, Pots	5	10	50
Salmon, Purse Seine	5	10	50
Salmon, Hand Troll	4	8	36
Tanner Crab, Pots	3	7	33
Salmon, Drift Gillnet	3	6	31
King Crab, Pots	3	5	28
Halibut, Longline	2	4	23
Sablefish, Longline	2	4	18
Roe Herring, Purse Seine	1	3	14
Salmon, Set Gillnet	1	2	10

Denominator data from *Employment and Gross Earnings in Alaska's Commercial Fisheries: Estimates for All Participants and Residents of Washington, Oregon, and California, 1983–1984*. Prepared by Rick Focht, CFEC Report.

out of 100 for salmon power trolling.

These rates are based upon the actual number of recorded cases in the data base. If these numbers underrepresent the actual number of nonfatal injuries the rates would change significantly.

Decreasing the number of nonfatal injuries to commercial fishers represents a unique challenge to injury prevention specialists. The development of collecting reliable and accurate data is a priority.

Sprains and strains of the spine are generally regarded as ergonomic problems. The development of interventions that account for the dynamic environment on board a fishing vessel are needed. If these challenges are to be met, all involved or interested in preventing these injuries must work together. □

ALASKA TRAUMA REGISTRY

By Ms. Barbara L. Simonsen

Mrs. Kathleen W. Johnson: Our last speaker for this session is Ms. Barbara L. Simonsen. Since 1985, Barbara Simonsen has been the Quality Assurance Coordinator for the Providence Hospital Emergency Department and since 1988 the Alaska Trauma Registrar for the Alaska Trauma Registry. She is a member of the Advisory Council on Emergency Medical Services, the Anchorage EMS Advisory Board, and the Alaska Trauma Register Steering Committee.
Ms. Simonsen received her Bachelor's degree in Nursing in 1975 from Montana State University. Ms. Barbara Simonsen:

The information that I am going to present is the information that we have abstracted from the Alaska Trauma Registry. I want to briefly explain the Trauma Registry so you understand what it includes and does not include.

The Alaska Trauma Registry is a registry of all people that are seriously traumatized and either require hospitalization, transfer to a higher level of care, or die in the emergency room. We include all intentional and unintentional injuries. In the State of Alaska, we have decided to include two categories that are not routinely included in other state registries.

- First, we include people who are injured due to decrease in temperature: hypothermia. We have a lot of injuries in this state due to cold exposure and this included a number of people involved in the fishing industry.
- Second, we also include near-drownings and drownings.

The Trauma Registry includes many aspects surrounding the injury. It includes patient data, demographics, age, sex, residence, where the injury occurred, and mechanism of injury.

You will find that we have a little trouble translating the mechanism of injury information, specifically the fishing injuries, because we use ICD-9 codes, and these codes are limited. Additionally we include pre-hospital care, the care provided in the hospital, length of stay, disability, if any, and payment source.

> We would like to make this information available in the hopes that it will serve as a tool for making the fishing industry a safer occupation.

The information that I am going to present to you today is from March of 1988 through February of 1992. This information is only from the three hospitals here in Anchorage, so only the patients injured in the Anchorage area or were injured so severely that they had to be transported into Anchorage facilities will be included.

Unfortunately my presentation will not include the Southeast Region (of Alaska), and I recognize that the Southeast is a big fishing area. In the near future we will have the 1991 data for all the hospitals in the State.

When we looked at this information, we came up with 272 injuries that we can prove are fishing-related injuries out of the 367 injuries that occurred on a ship. When we first started collecting data for the Trauma

Registry, we did not include occupation. We have since identified that the patient's occupation is important information to collect.

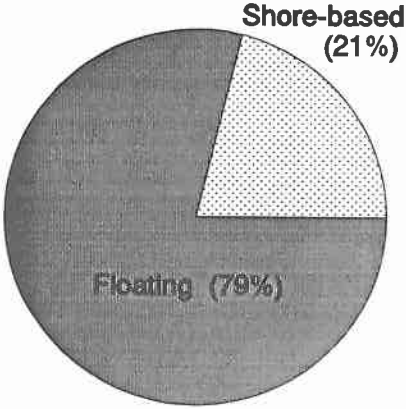


Figure 1. Fishing-Related Injuries.

Of the 367 vessel injuries, they could have been on a cruise ship or water transport, but not specifically fishing injuries. We are looking back, but it means manually pulling all those records, between 272 to 367, to see if they are fishing-related.

Of the 272 injuries, 79 percent were in floating vessels on the ocean and 21 percent were in the shore-based processing plants, as shown in Figure 1. Figure 2 shows that 62 percent of the injuries were in the Aleutian Pribilofs; Bristol Bay had 10 percent; Kenai had 6 percent; Kodiak, 10 percent; and Prince William Sound, 4 percent.

The region of occurrence is listed according to the place that the first medical intervention occurred. Unfortunately the medical record does not always include the exact location of the injury, but usually lists the location of the patient's first medical care.

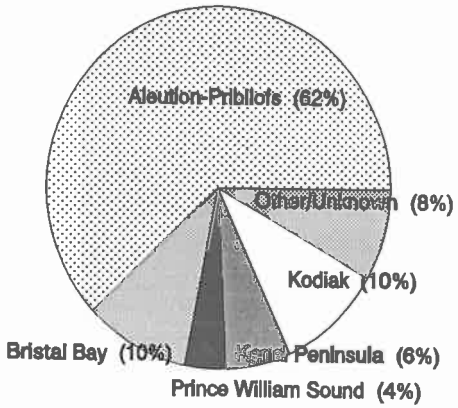


Figure 2. Region of Occurrence.

Figure 3 shows that 62 percent of the people injured live outside of Alaska. Some are foreign nationals, but most are from the Northwestern United States; 38 percent are from Alaska. Figure 3 also shows the breakdown according to their city of residence in Alaska.

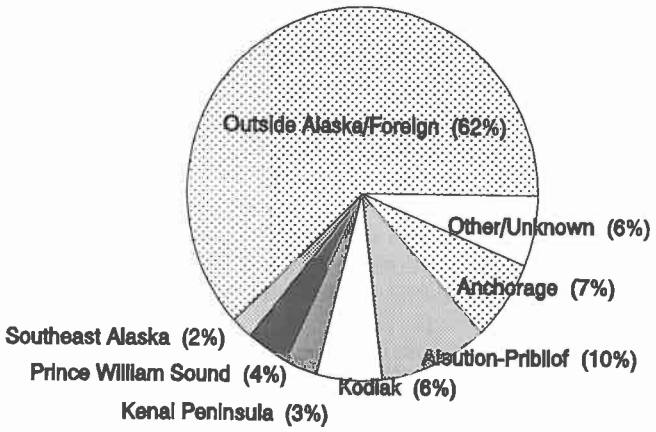


Figure 3. Patient Residence.

As I said before, we utilize ICD-9 codes for mechanism of injuries and these codes are not very specific for fishing injuries. The codes for water-related injuries include falls, fall on stairs, fall from one level to another, struck by machinery, and another category that is a catchall for injuries.

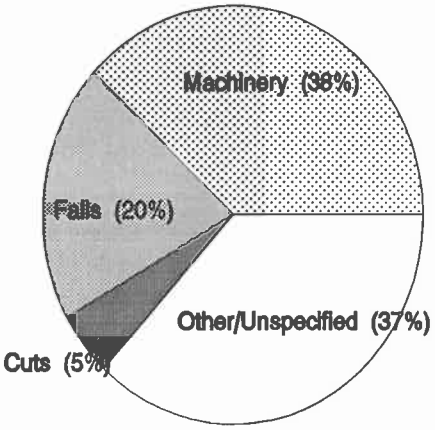


Figure 4. Mechanism of Injury.

As shown in Figure 4, we are able to identify that 38 percent are machinery injuries, 20 percent falls, 5 percent cuts and the other 37 percent were injuries such as hit by a wave, struck by a crab pot, entanglements, altercations, and all other types of injuries.

As shown in Figure 5, the largest number of injuries are extremity injuries. Sixty-three percent are limb injuries, 20 percent are head and neck injures, and 14 percent are injuries to trunks.

As shown in Figure 6, 86 percent of the patients were dismissed home. Of that, 10 percent had permanent disabilities. Three percent were transferred to an acute care rehabilitation center. That 3 percent can be considered disabled, so a total of 13 percent were permanently

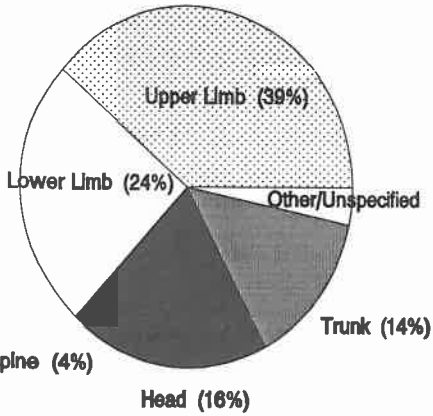


Figure 5. Body Region of Injury.

disabled, 1 percent died, and 86 percent where dismissed home without a permanent disability. That 86 percent may have had short-term disability but should have returned to their pre-injury status.

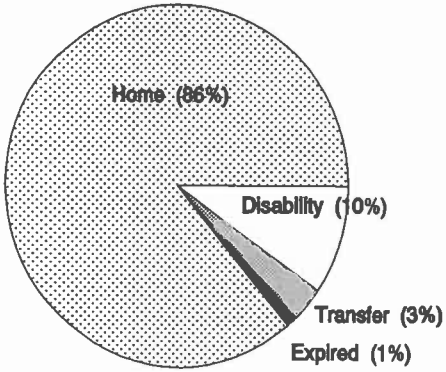


Figure 6. Patient Discharge.

Sample injury descriptions that are recorded in addition to E-codes are —

- *Struck in head by a block and tackle on the boom of a...*
- *2000 pound steel door fell across pelvis on fishing boat...*
- *Cleaning battery on fishing barge and battery exploded...*
- *Crab pot weighing 600 lbs fell on leg.*

- *On fishing vessel, hand amputated in surimi machine.*
- *Halibut hook caught in wrist and nearly carried him up...*
- *Crabbing boat, pulling up crab pots and ground line snapped.*
- *Caught arm in gilling machine conveyor belt when trying...*
- *Slipped on deck of fishing vessel.*

We collect as much information as we can to provide a more complete description of the injuries. It is unfortunate that we do not have statewide information for 1991 and 1992 because in the last few months of data collection, I can tell you that there have been a large number of fishing- related injuries that are not captured in the information I am presenting today.

Figure 7 refers to payment source. Seventy-five percent are identified as workers' compensation injuries. Thirty-seven percent have private insurance, 7 percent self-pay, 30 percent are Fishermen's Fund, 10 percent are Indian Health Service, and 15 percent are other.

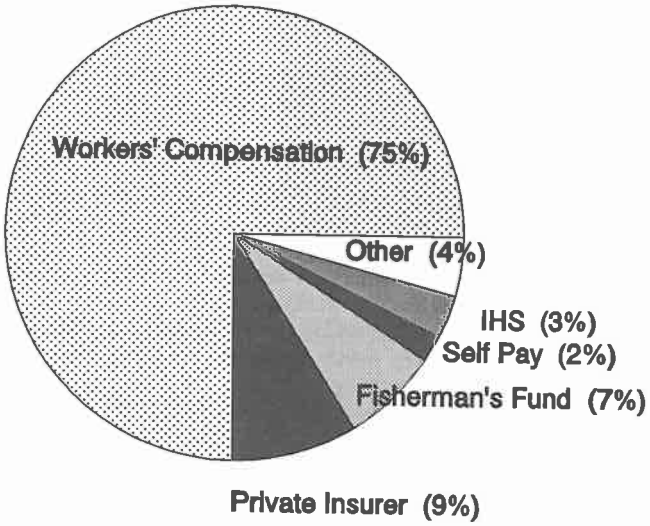


Figure 7. Source of Hospital Payment.

In the future, we will be able to provide more information related to fishing injuries and we would like to make this information available in the hopes that it will serve as a tool for making the fishing industry a safer occupation. Information is available upon request from the Alaska Department of Health and Social Services, Emergency Medical Services Section, in Juneau. □

SESSION 3: IDENTIFYING THE POPULATION AT RISK

October 9, 1992

Moderator: Bernice W. Carmon, R.N., M.P.H.
School of Nursing and Health Services, University of Alaska Anchorage

Ms. Bernice W. Carmon is an Associate Professor in the School of Nursing and Health Sciences at the University of Alaska Anchorage. Ms. Carmon, who received her Master's degree in Nursing from UAA and her Master's degree in Public Health from the University of North Carolina at Chapel Hill, is currently working on her doctorate degree in nursing at Wayne State University. Her research interests lie in the area of occupational safety and health with a specific focus on the impact of work stress on family environments. Her interest in workplace safety in the fishing industry developed from her research on using worker's compensation data as a preliminary means of identifying injury and illness patterns.

QUOTES FROM THIS SESSION

"This data strongly support the assumption that PFD's have saved lives and also support recommendations made by a number of agencies to make concerted attempts to increase PFD use." — George A. Conway, M.D.

"Three fishers were lost in 1972, and the most devastating year of all was 1988 when 44 were lost." — G.V. "Corky" McCorkle

"Alaska shellfish harvesting is the most hazardous fishery in the commercial fishing industry and probably the riskiest industry in the country." — Richard D. Kennedy, M.S.

SURVEILLANCE FOR WORK-RELATED FATALITIES IN THE ALASKAN COMMERCIAL FISHING INDUSTRY

By LCDR George A. Conway, USPHS

Ms. Bernice W. Carmon: This is Session Three of the National Fishing Industry Safety and Health (FISH) Workshop entitled *Identifying the Population at Risk*. Our first presenter is Dr. George Conway, whose presentation is entitled *Surveillance for Work-Related Fatalities in the Alaskan Commercial Fishing Industry*. George A. Conway, M.D., M.P.H., is the Chief of the NIOSH Alaska Activity here in Anchorage. For the four years prior to his Alaska assignment, he was a medical epidemiologist with the HIV Seroepidemiology Branch of the Division of HIV and AIDS at the National Center for Infectious Diseases, Centers for Disease Control, in Atlanta, Georgia. He is a graduate of the University of New Mexico School of Medicine, was trained in Family Medicine at the University of Wyoming and Preventive Medicine at the University of South Carolina, and is a former EIS Officer with the Centers for Disease Control. Dr. Conway is board-certified in Public Health and General Preventive Medicine. LCDR George Conway:

Good afternoon. Before I get to the substance of my talk, I think there are a few acknowledgements that are in order. I want to reiterate the fine job that Mike Klatt has done in pulling everything together for the conference: I really appreciate his doing that, and his help in preparing this presentation. The other acknowledgement I would like to make here is of Lt. Richard Kennedy.
Mr. Kennedy collaborated with me in preparing this talk and really helped a lot with the substance of it. So, I want to be sure that he is mentioned up front and I will also mention him during the talk in hopes that you will address most of your technical questions toward him.

As the title indicates, I will be talking about *Surveillance for Work-Related Fatalities in the Alaskan Commercial Fishing Industry*. Our approach to making estimates of the population at risk includes determining the size of the work force, estimating the number of annual employees, conducting occupational injury surveillance, calculating injury rates, and then drawing conclusions from rate comparisons.

The historical contributions to the estimation of the number of annual employees in the Alaska commercial fishing industry have come from a collaborative effort among the Alaska Department of Labor (AKDOL), Bureau of Labor Statistics (BLS), and the Alaska Commercial Fishing Entry Commission (CFEC). Starting in the late 1970's, and terminating with the 1984 report, AKDOL used CFEC data to produce yearly estimates of fisher employment. The computational algorithm, based on the work developed by George Rogers, made use of four constituent components:

1. Fish ticket landing receipts.
2. Vessel permits.
3. Crew size estimates (from survey).
4. Vessel trip length estimates (from survey).

A follow-up to the AKDOL and CFEC work was done by the McDowell Corporation, a group of Alaskan economic and market consultants. In May 1989, they published Alaska Seafood Industry Study: A Technical Report. That report contained, based on 1986 data, information such as statements of earnings, seafood harvest and production, and detailed employment estimates for the five major Alaskan fisheries: salmon, halibut, groundfish, herring, and shellfish.

Estimating the risk of different factors such as weather, vessel size, condition and equipment, fishing practices, short seasons, and use of protective and survival equipment involves a multifaceted approach starting with surveillance.

In 1991, Drs. Knapp and Smith of the University of Alaska, Institute for Social and Economic Research, published the Seafood Industry Sector Report, which used similar methodology to McDowell's, but with refinements to crew size and trip length.

First, I would like to discuss the methodologic approach that we have used for these problems. A substantial collaborative effort toward estimating the size of the work force has been made by the AKDOL and the CFEC. From the late 1970's to 1984, this effort employed the eclectic methodology that had been developed by George Rogers. This method made use of fish tickets, vessel permits, cruise size estimates, and trip- length estimates.

The McDowell Corporation's technical report, published in 1989 and based on 1986 data, and Drs. Knapp and Smith seafood-industry-sector report in 1991 made use of similar methodology with considerable refinements. Mr. Kennedy will refer in more detail to those. Current collaborative efforts are being made by CFEC, AKDOL, the National Marine Fisheries Service, the U.S. Coast Guard, and our office here as well as NIOSH personnel in Morgantown, West Virginia.

Estimating the risk of different factors such as weather, vessel size, condition and equipment, fishing practices, short seasons, and use of protective and survival equipment involves a multifaceted approach starting with surveillance. Fatal injuries are recorded and described by two evolving national systems. The first, NTOF or National Traumatic Occupational Fatality program is a single national system with limitations including the under-reporting of fatalities and the lack of precise work force estimates.

The FACE or Fatality Assessment and Control Evaluation program contains a number of components: one within the NIOSH DSR Alaska Activity, and state-based programs in nine states, now including the coastal states of Alaska, Massachusetts and New Jersey. I want to mention Gary Bledsoe who is the Occupational Injury Prevention Program Manager in the Epidemiology Section for the Department of Health and Social Services, Alaska.

We believe that commercial fishing fatality surveillance is now relatively complete in Alaska. Fatal and non-fatal injuries are recorded in Alaska by the Alaska Trauma Registry. The U.S. Coast Guard marine casualty system (CASMAIN) and search and rescue (SAR) dataset both provide vessel casualty and limited fatal injury data.

The FACE program conducts detailed surveillance for occupational

fatalities through close collaboration with federal, state and local agencies. Data are acquired through record reviews and a very active investigative process. In Alaska, this occurs through a very interesting hybrid of Gary Bledsoe and his associates — located within the state government — collaborating with our office.

Table I. Estimated Fisher Employment, Alaska, 1986 versus 1991 (counts are annualized full-time employee equivalents).

Fishery	McDowell [1986]*	NIOSH [1991]**
Salmon	6,800	7,500
Shellfish	1,850	3,600
Herring	600	500
Groundfish	2,200	4,600
Halibut	1,000	1,500
Miscellaneous	150	300
Total	**12,600**	**18,000**

* Seafood Industry Technical Report, McDowell Corporation, 1989

** Alaska Activity Denominator Project, Unpublished Data, 1992

The data gathered include demographics and detailed information on circumstances surrounding an event. This is compiled using state-of-the-art computers and data base software, then analyzed for descriptive and analytical reports. These analyses in turn enable the development of intervention strategies and the testing and evaluation of the effectiveness of such interventions.

I would like to give some very limited results. Shellfish and the groundfish fisheries annualized employment has roughly doubled (Table I) during 1986-1991, with all other fisheries showing a modest increase and a possible decrease in the herring fishery.

So far, the NIOSH Alaska Activity has compiled reports for 1991 of 79 fatalities in all industries; 35 of which were fatalities among commercial fishers. This works out to be a commercial fishing fatality rate of 200 per 100,000, which is very high even compared to other occupations in Alaska.

The 1992 fatalities as of September 30 in the commercial fishing industry have so far counted 29. It is quite possible that we will exceed the number that we had last year.

One of the basic questions we ask in epidemiology is, how good is the data that we are receiving? There has been a concerted effort to ascertain the completeness for occupational fatalities in Alaska. For 1991, by death certificate review, we believe that our surveillance is at least 95 percent sensitive, or that we have collected 95 percent of the available documented deaths in Alaska.

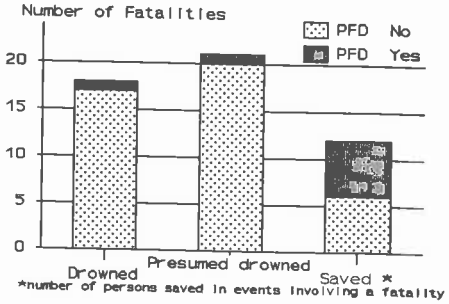


Figure 1. Personal Flotation Device (PFD) Usage for Persons Drowned, Presumed Drowned, or Saved, Alaska, January 1991 – September 1992, N=51.

Figure 1 displays personal flotation device (PFD) usage when that information was available. Shown are the 51 out of 71 persons drowned, presumed drowned, or saved in events involving at least one fatality in the Alaska commercial fishing industry during the period January 1991 through September 10,

1992. (Source: Alaska Activity, DSR, NIOSH)

Among the 17 individuals who drowned, only one was wearing a PFD. Of the 20 or so that were presumed drowned, only one had on a PFD. For survivors in severe settings where at least one other person died, one-half of these individuals were wearing PFDs. This data strongly support the assumption that PFDs have saved lives and also support recommendations made by a number of agencies to make concerted attempts to increase PFD use. I think that this is a good application of some of the risk and circumstance information that we are obtaining as part of our surveillance efforts.

Conclusions from the very limited information that I have had time to show here include that the knowledge of Alaska fisheries has improved throughout the last decade. It also shows that surveillance for fatal events is now adequate to provide meaningful counts of fatalities and begin to define causality and measure the effectiveness of interventions.

In the future, the NIOSH Alaska Activity will be focusing not only on fatal events, but also on doing our best to provide technical assistance and other efforts to improve surveillance for non-fatal occupational injuries in Alaska. Collaboration will be very important in the surveillance phase of the activities we are talking about.

As we develop interventions, logically based on the surveillance data that we are obtaining, collaboration will be very important among government agencies, research organizations, safety and prevention groups, and very importantly, industry. We look forward to a more productive collaboration, especially with industry, in the near future. Thank you very much. □

HARBORMASTER RECORD KEEPING

By Mr. G.V. "Corky" McCorkle

Ms. Bernice W. Carmon: Our next speaker is Corky McCorkle, whose presentation is entitled *Harbormaster Record Keeping*. Corky is currently the harbormaster for the port of Kodiak. He is a charter member past president, secretary, and member of the board of directors of the Alaska Association of Harbormaster and Port Administrators; he was also instrumental in forming this organization. Corky is also Alaska's representative to the Pacific Coast Congress of Harbormasters and Port Manager's Board of Directors. Furthermore, he is a consultant to the Ports of Whittier, Sand Point, Dutch Harbor, and St. George. Corky received recognition from the Corps of Engineers as harbormaster of the best-managed port in Alaska. He was a commercial fisherman from 1957 to 1979; his only son is a commercial fisherman. Corky is a 35—year resident of Kodiak. Mr. Corky McCorkle:

It is my pleasure to be here today to speak on the Kodiak Harbormaster's records of fisher men and women lost at sea. People in the multi-million dollar fishing industry pay the ultimate price with a casualty count at the end of each 12-month period. This is demonstrated each year at the Kodiak Crab Festival.

A Fishermen's Memorial Service is held in conjunction with the Kodiak Crab Festival during the month of May. Each year, the names of the fishing vessels and the crews that were lost during the year are remembered with a call to worship.

The Kodiak Ministerial Alliance conducts the service. Scripture is read, hymns are sung, and the names of those lost are read. A ribbon is placed on a wreath as the bell tolls. An echo bell is heard just seconds after the first ring. The wreath remains at the memorial site until the fleet parade and the blessing of the fleet the following day. The wreath is then taken to a harbor vessel and is on display during the fleet parade.

At the beginning of the fleet parade, each fishing vessel passes the ferry dock and is blessed by the Russian Orthodox Priest. The harbormaster returns to the ferry dock, picks up the priest, and joins the fishing vessels at sea. A prayer is said as the wreath is placed in the harbor of Kodiak.

Commercial fishing led all Alaskan industries in the number of working deaths in 1991. The harbormaster's office began maintaining records of vessels and the lives lost at sea in 1972. Since that time, all the names of the vessels and the men and women lost have been entered into the computer and are maintained in a data base. The names are received through press releases and notification from the U.S. Coast Guard, and on many occasions, the family or friends of the lost fisher will notify the harbormaster's office.

Over the years, historians, reporters, family, and friends of those lost have come to the harbormaster's office to seek additional information and details of each accident. This information has proved very valuable in many cases for the satisfaction and the interest of the parties and to help answer some of the questions by families and others. Many people just want to know what really hap-

pened; and in many incidences, we do not know.

> I would pray to God that just one year the bell would not toll.

Three fishers were lost in 1972, and the most devastating year of all was 1988 when 44 were lost. The fisher men and women who risk their lives daily in the Kodiak fleet are a community family.

The harbor staff works with these people each day. Many are our friends; many become our friends.

When a tragedy occurs, we feel the loss with a sense of losing a close family member. We share the grief and the sorrow with everyone. I have heard fishermen say, time and time again, "I hate this fishing and yet, I love it. It's in my blood, I can't wait to get home. I get home, and I can't wait to go back to sea."

If I could ask for one wish in my life, I would pray to God that just one year the bell would not toll. □

THE MEMORIAL SERVICE

> Mr. G.V. "Corky" McCorkle: I would also like to thank Channel 2 News, John Tracy for providing me with a clip (videotape) of the 1991 memorial service that was held in Kodiak, which you are going to see now.

Reporter John Tracy: "Where they deliver their catch. All fishermen do have one thing in common, they put their lives on the line every time they go to sea. Every year many of them do not come back. And, every year at this time, the town of Kodiak remembers. It is the most dangerous job in America. Since 1972, more than 350 fishermen have died in Alaskan waters. So far this year, 11 lives have been lost at sea.

(Singing)

Those who do not come home are remembered here.

Today, the names of 19 men will be added to the Kodiak's Fishermen Memorial. The bell tolls their passage.

(The bell sounds)

John Morgan, one of four men lost on the *Harvey-G* in November.

(The bell sounds)

Sean McCleffy one of the six men from the *St. George* who was lost and never found. And, then my skipper, Larry Tousinoff, who saved his crew when his boat, *Tahonkin* went down in heavy seas off Kodiak.

Interviewee: I wanted to make sure that all of them were in their survival suits and then they went over the edge, over the water, they abandoned ship and the crewmen looked back and Larry had on his survival suit and — and in the excitement of the moment, they are not sure what happened but the vessel went down and that is the last time they ever saw Larry."

Reporter John Tracy: "The story of Larry Tousinoff is tragic, but it is not unique. There is hardly a person in Kodiak who has not lost a friend or a loved one to the sea. Survival suits and emergency locators have saved many lives. Still

many skippers depend on an even higher power to keep their names off the Fishermen's Memorial."

Father John DeMengal: (Prayer given)

Reporter John Tracy: "This too, is a tradition in Kodiak. Father John DeMengal of the Holy Resurrection Church blesses the boats and the crews that work them.

(Prayer given)

The *Deliverance* will head out tomorrow. Skipper Joe Harland figures the blessing will not hurt. His name almost made the Fishermen's Memorial in January of 1989. His boat, the *Tidings*, was two hours out of Kodiak; it was 30 below zero and the seas were running to four feet. Then the nightmare of all skippers happened, his ship unexpectedly rolled over."

Joe Harland: "I made a quick turn May Day and then the boat rolled. I did not know if anybody had heard it or not. Anyway, the boat went down, I went with it. The crew got out. Two of them had life rafts — rather survival suits and lost them when the boat rolled. I could not climb out of there because of the dark. I did not know where I was and the stairs were upside down as I was going up the water, trying to open windows and doors, that which were underwater already, and it would not open — I could not get them to open.

I pretty much had written myself off at that point. I did not figure that I was ever going to get out. You want to panic, your heart sinks — you feel it in your heart. But, you say, well, I got to give it one more try anyway, and then I slammed back down and the bottom window popped out. And, how I could see how to get out of there, I will never know. I just kept going up and up and up. Finally, I popped up and it was pitch black out."

Reporter John Tracy: "Harland was lucky. He surfaced next to his survival raft. He gathered his crew and five minutes later they were picked up by another boat. Their May Day had been heard. It was the kind of experience that changes a man."

Joe Harland: "I know that I am not nearly as aggressive as I was. I used to try and — I always wanted to beat the best — you know, the other guys. Be the best. Never was, but I nearly came close — so, now, I do my best to keep my name off that list up there."

(Singing)

Reporter John Tracy: "For every fishermen that does not come back, there is someone else ready and waiting to take their place. And, as long as there are fishermen willing to challenge the waters of Alaska, there will be an endless supply of names for the Fishermen's Memorial."

"There is some good news to report on about a crew that lost their boat last year. 25 people have escaped with their lives, so far this year.

So, thanks to everyone in Kodiak who helped them out."

Interviewee: "There are a lot of nice people out there."

Reporter John Tracy: "Yes."

ALASKA COMMERCIAL FISHING FATALITIES BY FISHERY JANUARY 1991 THROUGH SEPTEMBER 1992

By LT Richard D. Kennedy, USPHS

Ms. Bernice W. Carmon: The last speaker for Session Three is LT Richard Kennedy, whose presentation is entitled *Alaska Commercial Fishing Fatality by Fishery, January 1991 through 1992*. Richard is a statistician with the U.S. Public Health Service serving with the Centers for Disease Control, National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research, Alaska Activity, in Anchorage, Alaska. Richard obtained his Master's degree in biostatistics from the University of Oklahoma in 1990. From June 1990 to August 1991, Richard served with the Division of Respiratory Disease Studies, NIOSH, in Morgantown, WV. Richard's research interests include statistical modelling, epidemiology of injuries, and graphical computing.
LT Richard Kennedy:

The fatality data for this presentation was collected by the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), Alaska Activity from January 1991 through September 1992. Fatality rates were calculated by enumerating known worker fatalities divided by employment estimates by industry for the same period. Fatality rates are expressed per 100,000 full-time equivalents (FTEs).

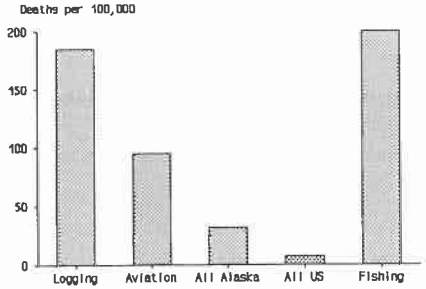


Figure 1. Occupational Fatalities by Industry Sector, Alaska, 1991.

For the year 1991, the occupational fatality rate for all industry divisions in Alaska was 32 per 100,000. This figure represents 84 workers killed and ranks the state as having the nation's highest risk of worker fatality — nearly five times the national average of 7 per 100,000 for the period 1980 to 1989. The Alaska industry sector having the highest worker fatality rate is commercial fishing with 200 fatalities per 100,000 workers. Logging was a close second at 185 per 100,000, followed by aviation at 95 per 100,000 (Figure 1).

Fatality information was obtained by the Fatality Assessment and Control Evaluation (FACE) program. FACE utilizes a surveillance component that attempts to capture all known occupational fatalities through a notification system by those responsible jurisdictional agencies such as the U.S. Coast Guard, the National Transportation Safety Board, or local public safety officials. Detailed information about the nature and circumstances surrounding the fatality is then collected and filed electronically for further analysis.

The number of workers at risk or the workforce in a given industry is usually obtained from the Alaska Department of Labor (AKDOL).

However, the last published employment statistics by AKDOL were for the year 1984. Later and more detailed commercial fishing employment statistics became available in May of 1989, as the result of the Alaska Seafood Study Commission (ASSC).

In 1988, the ASSC selected the McDowell Corporation to quantify the impact of the seafood industry (commercial fishing and seafood processing) on the state's economy. The McDowell Corporation, Alaskan economic and market consultants, produced the *Alaska Seafood Industry Study: A Technical Report*, and published it the following summer. The Technical Report contains, among other information such as statements of earnings, detailed employment estimates for the five major Alaskan fisheries: salmon, halibut, groundfish, herring, and shellfish.

The employment statistics by fishery from the McDowell Report served as a baseline for the 1991 and 1992 commercial fishing employment estimates produced by the Alaska Activity. In updating these figures a number of sources were contacted and requested to supply information, such as the amount of total catch or the number of vessels participating during a specific season, to approximate the employment figures. Table I depicts the state and federal agencies that contributed to these efforts.

For the 21-month period (January 1991 through September 1992) a total of 60 fishers died on the job. Using fatality information from the FACE program, the number of fatalities that, occurred in each of the five fisheries was then tabulated. Annualized full-time employment data were used to calculate occupational fatality rates for each fishery on a yearly basis. Table II summarizes these results.

Harvesting activities in the shellfish fishery are predominately crabbing. Major shellfish sub-fisheries are red and blue king crab in the

Table I. Agencies That Contributed Information in the Updating of Employment Statistics in the Alaska Commercial Fishing Industry by Fishery Type.

Agency	Fishery
North Pacific Fishery Management Council	Groundfish, catcher/ processors
Commercial Fisheries Entry Commission	All, especially salmon and herring
Shellfish Observer Program	Shellfish
Alaska Department of Fish and Game	All, fishery openings/closings
National Marine Fisheries Service	Groundfish, shellfish
University of Alaska Anchorage, Institute for Social and Economic Research	All
International Pacific Halibut Commission	Halibut

Table II. Occupational Fatality Rates by Fishery for Alaska Commercial Fishing Industry, January 1991–September 1992, (Annualized).

Fishery	Fatalities	Employment	Fatality Rate (per 100,000/yr.)
Salmon	14	7,500	110
Herring	0	500	0
Shellfish	30	3,600	480
Groundfish	8	4,600	100
Halibut	8	1,500	305
Miscellaneous or unknown	2	300	—
Total	**62**	**18,000**	**200**

Bristol Bay/Bering Sea areas; tanner and dungeness in most Alaskan waters except the colder waters north of the Pribilofs; and a much smaller portion of shrimp and scallops. The groundfish industry is primarily made up of sablefish and Pacific cod.

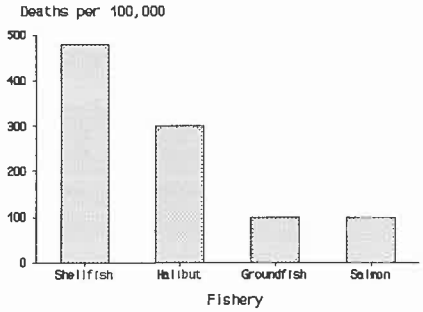


Figure 2. Fisher Fatality Rates by Fishery, Alaska, 1/1/91–9/30/92.

The halibut fishery has the largest number of fisher participation at any one time due to very short season (hours) management. This fishery also attracts a rather large percentage of part-time or recreational fishers who often have another main source of employment, but who hold commercial fishing licenses.

The average yearly fatality rate for all Alaskan fishers is 200 per 100,000. The primary cause of death among all fishers is drowned or presumed drowned. Of the five major Alaskan fisheries, the shellfish fishery has the highest fatality rate, 480 per 100,000 or nearly 5 per 1,000. The halibut fishery also has a markedly high fatality rate at 300 per 100,000. The salmon and groundfish fisheries are approximately 100 per 100,000 each or about one-fifth as hazardous as shellfish. Figure 2 shows the relationship of fatality rates by fishery for Alaska.

The substantially elevated fatality rate in the shellfish industry is due to a disproportionately high number of multiple fatalities occurring primarily in the Bering Sea during the months from November through February. Over the 11-month period from February 1991 through January 1992, the crabbing vessels *Barbarossa* and *St. George* vanished with six crewmembers each.

In November of 1991, the *Harvey-G* also vanished in approximately the same area with a

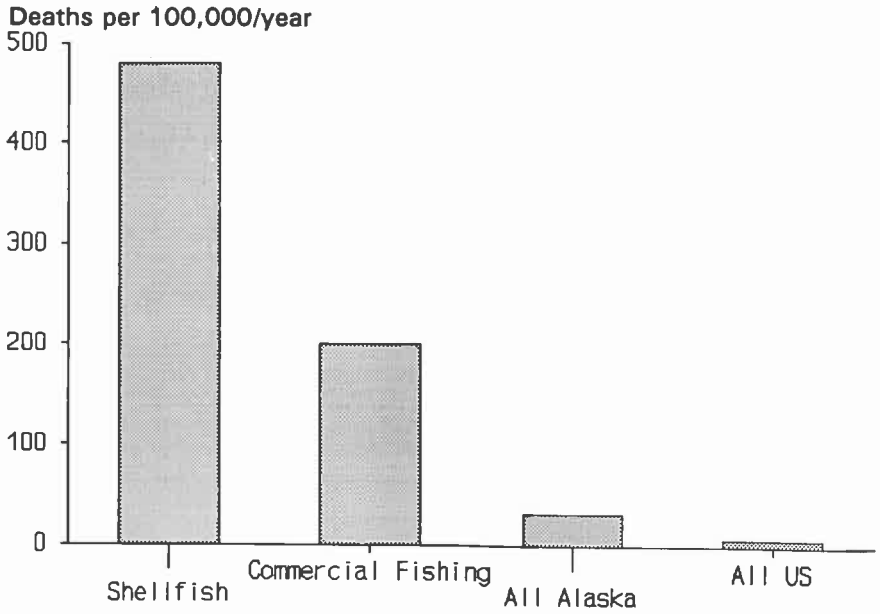


Figure 3. Occupational Fatality Rate Comparison Between Specific Cohorts.

crew of four. Crabbers also died on deck during harvesting operations. Two persons died due to crushing involving crab pot launchers and falling crab pots. There have been four (Five in southeast Alaska) halibut opening over the last two years. Two halibut fishers died in 1991 and six died in 1992, including five on September 9, 1992, during a 24-hour season.

The risk of fatality to Alaskan fishers and specifically those working in the crabbing fishery, can be put into perspective to other Alaskan industries and to the average U.S. industry with the use of Figure 3. Overall, Alaskan workers experience nearly five times the risk of dying on the job than the average U.S. worker.

The commercial fishing industry sector has over six times the fatality rate of the average Alaskan worker and 30 times that of the average U.S. worker. Alaska shellfish harvesting is the most hazardous fishery in the commercial fishing industry and probably the riskiest industry in the country. □

SESSION 4: TRENDS IN THE COMMERCIAL FISHING INDUSTRY

October 9, 1992

Moderator: Jan C. Manwaring, R.S.
Environmental Health and Safety Officer
Alaska Activity, Division of Safety Research, NIOSH

Lieutenant Commander Jan C. Manwaring is an Environmental Health and Safety Officer with the U.S. Public Health Service (USPHS). LCDR Manwaring conducts field research evaluations of work-related fatalities and makes recommendations for intervention strategies as part of the Fatality Assessment and Control Evaluation (FACE) project in Alaska. He received his commission with the USPHS in August, 1983, when he was assigned to the Indian Health Service on the Navajo Reservation in Chinle, Arizona, as the Service Unit Sanitarian. In August, 1984, he was assigned to the Centers for Disease Control (CDC), Center for Prevention Services in Miami, Florida, as a sanitarian for the cruise ship inspection program. In August, 1986, he was assigned to the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) in Morgantown, West Virginia, as a research industrial hygienist. In this position he investigated numerous confined space fatalities, gaining national recognition in the area of confined space fatality prevention. In August, 1991, he was assigned to his current position with NIOSH, DSR, Alaska Activity in Anchorage. LCDR Manwaring is a Registered Environmental Health Specialist. He began his career as an environmental health specialist for health departments in Utah and Idaho after earning his B.S. degree in environmental health science from Brigham Young University in 1976.

QUOTES FROM THIS SESSION

"This focus on the number of people at risk, and on the amount of time they are at risk, is more directly related to safety." — Ben Muse, Ph.D.

"The Council believes that individual fishing quotas will allow fishermen to choose when, where, and how to fish. With this flexibility, fishermen will not feel compelled to fish in poor weather and would not be rushed to get their share of the fish." — Clarence G. Pautzke, Ph.D.

"Although it has yet to be demonstrated statistically, it is reasonable to assume that derby management does, in fact, result in more vessel losses, injuries, and fatalities than would occur under other management systems." — Gunnar P. Knapp, Ph.D.

CHANGES IN THE DISTRIBUTION OF THE ALASKA FISHERIES

By Dr. Ben Muse

LCDR Jan C. Manwaring: Our first presenter is Dr. Ben Muse, whose presentation is entitled *Changes in the Distribution of the Alaska Fisheries.* Dr. Muse has a doctorate in agricultural economics from Cornell University and has worked at the Alaska Commercial Fisheries Entry Commission as an economist for 12 years. He is also an adjunct professor at the University of Alaska Southeast. Dr. Ben Muse:

My topic is *Changes in the Distribution of Alaska Fisheries.* I am interested in changes in the size of the different fishing industry segments, such as the shellfish fishery and the salmon fishery, off Alaska.

As an indicator of the size of the segments, I am going to focus on estimates of employment in each segment, rather than on estimates of the physical volume or value of fish products. This focus on the number of people at risk, and on the amount of time they are at risk, is more directly related to safety.[1]

This paper is organized on the basis of statistics supplied to me in August by Richard D. Kennedy of the National Institute for Occupational Safety and Health. Figure 1 shows Alaskan commercial fishing fatalities from January 1, 1991, to August 11, 1992. During this period there were 28 fatalities in crab, ten in salmon, eight in black cod and pollock, and four in halibut. Since August there have been more fatalities in the halibut fishery.

In line with these statistics, my paper has three parts. I am going to discuss the shellfish fishery because that accounts for about 50 percent of those fatalities, I am going to discuss salmon; and finally, I am going to discuss black cod, pollock, and halibut together as one groundfish category. This approach ignores some important fisheries, such as herring, but it focuses on fisheries that fatality statistics suggest may be important.

METHODOLOGY

I will use estimates of two measures of employment in Alaska's fisheries: numbers of persons employed and the number of person-years of employment. The numbers of persons employed will be used to study the salmon fisheries, while the

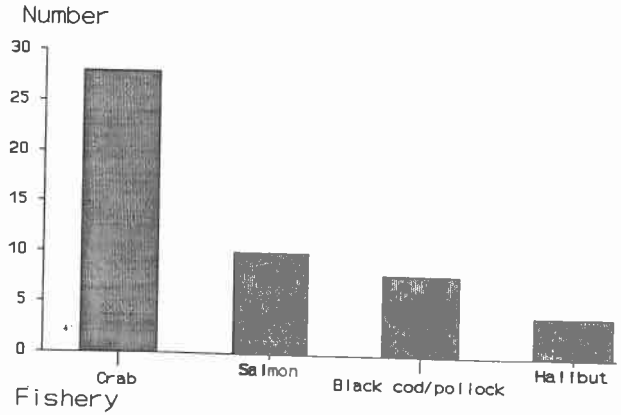


Figure 1. Commercial Fishing Fatalities.
—Alaska, January 1, 1991–August 11, 1992

number of person-years will be used to study the shellfish and groundfish fisheries.

The estimates of numbers of persons employed were made for this paper with information on numbers of fishing permits used in different fisheries and average crew size estimates. The estimates of person-years of employment come from two sources; some were made by me for this paper and others come from a 1987 Alaska Department of Labor report by Thomas.[2]

The approaches used here to estimate person-years of employment essentially add up the number of separate months in which each fishing permit was used to make a landing in a fishery, multiply this sum by an average crew size for the fishery, and then divide the result by twelve. Note that if a permit was only used in part of a month, this method still assigns a full month of fishing.

These results were adjusted to deal with double counting. If a permit holder fishes for halibut and sablefish in the same month, the approach that I just described will produce two separate months of activity by that permit holder when actually there was only one month of activity.

Thomas and I used different approaches to double counting. Thomas appears to have only kept the activity in the fishery with the highest gross revenues. I tried to incorporate an average crew size for the multiple fisheries.

We also may have differed in our definitions of the fisheries. Tests of the two methods for the same years suggested that for most fisheries, Thomas' approach was slightly more conservative, but the methods were not generally far apart. The biggest difference appeared to occur in the sablefish longline fishery.

The "person-years" measure of employment used here differs somewhat from measures used by other analysts. For example, the measure discussed here does not take explicit account of work other than the fishing itself. This work can take place before or after the season and can include finding markets, maintaining vessels and gear, and taking care of accounting.[3]

In addition, person-years are not exactly comparable to the "full-time equivalents" or FTEs estimated by some other analysts. For example, a study estimating full-time equivalents will try to account more explicitly for the length of a working day.[4]

Despite these limitations, person-years of employment, as estimated here, are useful:

- First, to some extent it implicitly includes work done before and after fishing activity. This occurs because any landing by a permit holder during a month will generate a month of fishing activity, whether or not fishing effort takes a full month.
- Second, to the extent that it does not include work before and after the season, it may provide a more accurate measure of employment on the water, presumably the time of maximal risk in fishing operations.
- Third, the estimates made here provide useful information on trends in employment in different fisheries.

SHELLFISH FISHERIES

The shellfish fisheries include the various fisheries for king, tanner, and dungeness crab and shrimp. Table I shows shellfish employment in person-years for the shellfish fisheries statewide, and for the shellfish fisheries in Western Alaska. The statewide data and Western Alaska data for the period from 1977 to 1984 are from Thomas. The statewide data and Western Alaska data in

1986, 1988, and 1990 were estimated for this paper.

> This focus on the number of people at risk, and on the amount of time they are at risk, is more directly related to safety.

Table I also suggests that statewide shellfish employment tended to rise from 1977 to 1982, tended to fall from 1982 to the mid-eighties, and then began to recover, although not fully to the earlier levels. Western Alaska shellfish employment appears to have followed a similar pattern, although the recovery has been relatively stronger.

Table I. Shellfish Fishery Employment.

Year	All Alaska	Western Alaska
1977	1,139	426
1978	1,335	649
1979	1,454	568
1980	1,383	698
1981	1,486	688
1982	1,530	690
1983	1,418	627
1984	1,177	581
1986	969	454
1988	1,188	637
1990	1,207	754

An important part of the Western Alaska fishery, especially in the late seventies and early eighties, was the Bristol Bay king crab fishery. This fishery peaked in the 1980-81 season when the fishermen landed 130 million pounds.

The fishery collapsed after that, and by 1983-84, there was no fishery. Since then, the shellfish fishery in Western Alaska has come back, fueled by an expansion in the opilio tanner crab fishery in the Bering Sea. In 1990, opilio landings alone came to 162 million pounds. If these employment estimates are correct, the current shellfish fisheries are producing more employment in Western Alaska than the boom of 1980.

There has also been a change in the regional distribution of shellfish-fishing jobs. In 1980, there were about 1,400 person-years of employment throughout the state and about 700 in Western Alaska. Thus, there were about 700 person-years of employment outside of Western Alaska.

In 1990, there were 1,200 person-years throughout the state and about 750 in Western Alaska. This implies that in 1990 there were only about 450 person-years outside of Western Alaska.

Alaska Department of Fish and Game reports on landings and production show large declines in shellfish fisheries outside Western Alaska. These declines take place in most of the king, tanner, dungeness, and shrimp fisheries in Kodiak, Cook Inlet, and Prince William Sound. One exception has been a small boom in the Southeast Alaska dungeness crab and pot shrimp fisheries.

SALMON FISHERIES

I will discuss the salmon fisheries next. Table II shows estimates of the numbers of separate persons operating each of the separate gears used in the salmon fisheries: drift gillnets, purse seines, set gillnets, and hand-and power-troll gear.

Each year's estimates were made by multiplying the numbers of permits fished in each fishery by an average crew size for each fishery.[5] Table II shows several interesting things:

- First, there were large employment increases in each of these fisheries at some point in the

late seventies. This is associated with relatively rapid increases in the percentages of limited entry permits being fished in the early years of the limited entry program. The drift and set gillnet fisheries are particularly affected by increases in the numbers of permits being fished in the large Bristol Bay fisheries. The employment increase in the troll fishery in the seventies is probably associated with strategic behavior by persons anticipating hand-troll entry limitation.

- Second, there have been continuing upward trends in the numbers of persons employed in the set gillnet and drift gillnet fisheries during the eighties, while employment in the seine fishery has been relatively stable since 1978, and the numbers of persons employed in the troll fisheries have been declining since 1978.[6]
- Third, several of these fisheries had a large decline in employment in 1989. That is the year the *Exxon Valdez* oil spill disrupted salmon fisheries from Prince William Sound west to Chignik.

The declining employment in the hand-and power-troll fisheries of Southeast Alaska contrasts with the trends observed in the other salmon fisheries. There are probably two factors contributing to this:

- First, many of the hand-troll permits are non-transferable and expire when the person holding them leaves the fishery.
- Second, the amount of time available for harvesting king salmon with troll gear dropped during the period. For example, in 1980 the king salmon summer fishery was open for 149 days. In 1990 it was open for 24 days.

Because fixed crew sizes were used to make these employment estimates, the increases in estimated employment do not reflect changes in average crew sizes. I chose crew

Table II. Salmon Fishery Employment.

Year	Total Number of Persons Employed				Total Number of Person Years			
	Drift Gillnet	Purse Seine	Set Gillnet	Troll	Drift Gillnet	Purse Seine	Set Gillnet	Troll
1977	6,077	5,057	6,506	3,149	1,150	1,090	1,555	852
1978	6,832	5,542	7,192	4,052	1,409	1,201	1,844	1,074
1979	7,179	5,483	7,469	3,640	1,441	1,256	1,934	982
1980	7,096	5,581	7,480	3,140	1,413	1,101	1,519	887
1981	7,316	5,711	7,697	2,541	1,602	1,263	1,647	780
1982	7,355	5,676	7,692	2,484	1,632	1,259	1,658	802
1983	7,387	5,573	7,761	2,364	1,588	1,176	1,588	822
1984	7,399	5,550	7,753	2,251	1,689	1,262	1,689	764
1985	7,468	5,383	7,829	2,355				
1986	7,515	5,406	7,900	2,251				853
1987	7,519	5,553	7,939	2,212				
1988	7,563	5,726	8,168	2,226	1,749	1,423	1,844	
1989	6,405	4,231	7,894	2,146				
1990	7,626	5,742	8,184	2,167	1,674	1,335	1,721	720

sizes that were prepared by the Alaska Department of Labor in the early 1980's. However, crew sizes can change through time.

Economics suggests that if the fishery is profitable, fishermen invest more capital and hire more labor. If a fishery was not profitable, crew sizes might shrink along with other measures of fishing effort.

GROUNDFISH FISHERIES

Finally I want to discuss the various fleets fishing groundfish species such as halibut, sablefish, flounder, cod, and pollock. I have divided the groundfish industry into five parts: vessels delivering in Alaska, vessels delivering to mother ships at sea, factory trawlers, freezer longliners, and joint ventures.

Table III shows estimates of the numbers of person-years used in three parts of the industry delivering fish in Alaska: the halibut fishery, the sablefish fishery, and the fishery for other groundfish. The sablefish and halibut fisheries are mainly longline operations, the fishery for other groundfish mainly uses longlines, trawls, and pots.

Table III suggests that employment was stable or trending upward in the late seventies and early eighties, and that employment began to increase rapidly in the mid to late eighties. The estimates for the years 1977 to 1984 are from Thomas. The estimates for 1986, 1988, and 1990 were made for this paper.

The estimates for the "other groundfish" fishery cover employment with several gears. An important element in the increase in employment in this fishery has been an expansion in its statewide otter trawl component. State records show no more than 49 permits were used in this fishery prior to 1982, and no more than 98 permits prior to 1987.

After 1987 there are large increases in the numbers of permits fished in this fishery. From 92 permits in 1986, the number fished jumps to 186 in 1987 and rises to 353 in 1990. Production also increases; the total pounds landed in 1990 was almost 20 times total pounds landed in 1986.

Table III. Groundfish Employment Summary.

Year	General Groundfish	Halibut	Sablefish
1977	25	507	46
1978	37	525	47
1979	52	702	108
1980	57	721	51
1981	75	620	34
1982	111	849	43
1983	138	931	98
1984	176	930	155
1986		1,270	203
1988	759	2,270	525
1990	860	2,095	409

The expansion in employment in the halibut fishery appears to have come, to a great extent, in the large vessel component of the fleet. The numbers of halibut permits for vessels under 30 feet that were fished were fairly stable during the late eighties, but the number of permits for vessels greater than 30 feet that were fished rose dramatically during this period. The expansion in numbers of person-years in halibut is especially striking since it has occurred despite a shortening of the halibut fishing season over the time period.

The numbers in Table III may tend to overstate actual employment due to double counting and short halibut seasons. The employment estimates in this figure are subject to

a certain amount of double counting. These are situations where it might be very common for someone to have used sablefish and other groundfish permits in the same month. As noted earlier, Thomas's approach to double counting appears to be somewhat more conservative than mine, particularly for sablefish.

Short halibut fishing seasons may also lead to an overestimate of fishing employment. Halibut seasons have been very short during this period; often they last only a few days. Assigning a full month of fishing activity if one landing is made in a month may lead to overestimates of person-years of employment.

Groundfish caught off Alaska are often delivered to motherships for processing or are caught and processed by factory trawlers and freezer longliners. In these cases the fish are not delivered to an Alaskan port.

Data readily available to me on these fisheries are not as good as the records from the fisheries discussed earlier. I will provide "back of the envelope" estimates of employment in 1990. These estimates are very tentative. However, when compared to 1980, when these fisheries were not significant, they will provide a rough idea of the scale of growth in these fishery sectors during the eighties.

Table IV summarizes estimates of the numbers of separate motherships, factory trawlers, and freezer longliners that reported harvests during 1990. The column labeled "Vessel Months" shows the number of separate months in which vessels in each category reported harvests. Ten vessels, each reporting harvests in two months, would produce 20 vessel months of activity.

The factory trawler fleet consists of larger boats that can process their catch on board. My information on crew sizes is not good. Some information suggests an average of 50 persons is plausible. If average crew sizes were equal to 50 persons, the 607 vessel months of fishing activity by factory trawlers in 1990 imply 2,529 person-years of employment.

The freezer longliner fleet has also expanded in the past few years. If crew sizes were about 20 persons, the 260 separate months of activity in 1990 imply 433 person-years of employment.

Table IV. Offshore Groundfish Activity Estimates.

Type of Operation	Vessels Active	Vessel Months
Hook and line motherships	8	211
Trawler motherships	11	62
Hook and line catcher-processors	28	260
Trawler catcher-processors	65	607

Source: Personal communication from David Colpo, National Marine Fisheries Service, Seattle.

Motherships accept fish for processing from an associated fleet of trawlers or longliners. My information on crew sizes in this fleet is even poorer than for the factory trawlers and freezer longliners. I have assumed that the trawler motherships typically employed 150 persons on board the mothership and the associated trawlers.

I have been unable to get any information on longline mothership crew sizes. If the information on trawler mothership crew sizes is correct, they may provide 775 person-years of employment. Employment on longline mothership operations would add to this.

The joint venture fleet that operated in the eighties used U.S. harvesters who delivered at sea to foreign

processing vessels. The joint venture fleet is gone now; it has not operated since 1990. It peaked in 1987. In 1986, a year close to the peak, McDowell et al. estimated that it provided about 550 years of full time equivalent employment to U.S. fishermen.[7]

SUMMARY

To summarize this paper:

1. Person-years of shellfish fishery employment in Western Alaska fell from the early to the mid-eighties and recovered in the late eighties.
2. Person-years of shellfish employment elsewhere in the state tended to fall between the early and late eighties.
3. The numbers of persons employed in the salmon drift gillnet and set gillnet fisheries tended to rise during the eighties.
4. The numbers of persons employed in the salmon seine fishery did not have a strong trend during the period.
5. The numbers of persons employed in the salmon troll fishery fell during the eighties.
6. Person-years of employment in groundfish fisheries delivering to shore rose during the eighties, particularly in the late eighties.
7. There was a general tendency for person-years of employment in groundfish factory trawlers, freezer longliners, and operations delivering to motherships to rise in the eighties.
8. Joint venture operations peaked and disappeared during the period. □

NOTES AND REFERENCES

1. I would like to thank Richard Kennedy of the National Institute for Occupational Safety and Health, Elaine Dinneford and Susan Shirley of the Alaska Commercial Fisheries Entry Commission, and Dave Colpo of NMFS, for help with this paper. That help includes valuable insights into the fisheries. They are not responsible for errors in this paper.

2. Thomas, Kathleen. *Alaska Seafood Industry Employment, 1977-1984.* Alaska Department of Labor. Juneau: June, 1987.

3. For an analysis that takes explicit account of work in addition to fishing see Eric McDowell, et al, *Alaska Seafood Industry Study*. The McDowell Group. Juneau: May, 1989.

4. For an example of this approach see the report, *Economic Impacts of the North Pacific Factory Trawler Fleet*, by Frank Feeman and Michael Hubbard. A report by the consulting firm Coopers & Lybrand for the Alaska Factory Trawler Assoc. Seattle: January, 1990.

5. Note that the figure shows estimates of numbers of persons employed, not person-years of employment.

6. Other data suggest that the number of person-years of employment have been rising since 1978 for drift and set gillnets and for seiners, and dropping for trollers.

7. McDowell et al., page A-14. As noted earlier, FTEs and the person-year concept used in this paper are not fully equivalent. McDowell et al. also try to include estimates of time spent doing work in support of fishing activity.

FISHERIES MANAGEMENT

By Dr. Clarence G. Pautzke

LCDR Jan C. Manwaring: Our next presenter is Dr. Clarence G. Pautzke whose presentation is entitled *Fisheries Management*. Dr. Pautzke has served as executive director of the North Pacific Fishery Management Council since 1988, after serving as deputy director for eight years. Previously employed by the Pacific Marine Fisheries Commission, he served as an alternate member of the Council for two years. Dr. Pautzke graduated from the University of Washington, earning his doctorate in Oceanography in 1979.
Dr. Clarence Pautzke:

ABSTRACT

The fisheries off Alaska are managed by the North Pacific Fishery Management Council (Council), the National Marine Fisheries Service (NMFS), the International Pacific Halibut Commission (IPHC), and the Alaska Department of Fish and Game (ADF&G). ADF&G manages the herring, salmon, and shellfish fisheries, while the Council and NMFS lead in managing the groundfish fisheries of the Gulf of Alaska and Bering Sea and Aleutians outside of 3 miles. IPHC manages the halibut fisheries from the shoreline out. All fisheries are controlled mainly through the setting of harvest quotas, seasons, gear restrictions, and time-area closures that strive to conserve the stocks and minimize the impacts of one fishery on another. The groundfish fisheries have developed very rapidly since the passage in 1976 of the Magnuson Fishery Conservation and Management Act that extended U.S. fisheries jurisdiction to 200 miles and established the regional council management system. These fisheries include cod, pollock, sablefish, flatfish, rockfish, and mackerel. Gear types include trawls, hook and line longlines, and pots. Foreign fishermen took over 99 percent of the catch from the 1960's into the early 1980's, but have since been displaced by U.S. harvesting and processing operations. The groundfish fisheries alone yield 2.3 million metric tons annually, valued in excess of $500 million on first landing. All fisheries have been heavily capitalized, and though the stocks in most fisheries are healthy, there are too many boats for the resource available. This has led to derby-style fisheries where openings, such as in the halibut fisheries, are short and intense and there is little room for mistakes. There also is little time to think about safety. Expansion of the fleet and shortening of the seasons have resulted in increasingly unsafe situations. This will continue to occur unless fishermen have the latitude to avoid bad weather and are not rushed in their work. Safety equipment standards, recently imposed by Congress, ensure minimal safety equipment on vessels, but do not deal with working conditions. Several management measures have been identified which could lead to safer operating conditions. These include enhanced safety standards, seasonal closures and flexibility, catch limits, trip duration limits, and vessel and gear restrictions. The Council has approved an individual fishing quota (IFQ) system for the fixed gear halibut and sablefish fisheries wherein each fisherman has so much fish to catch based on past participation. The Council believes that IFQs will allow fishermen to choose when, where, and how to fish. With this flexibility, fishermen will not feel compelled to fish in poor weather and would not be rushed to get their share of the fish. The IFQ system for sablefish and halibut, if approved by the Secretary, will not be implemented until 1994. The Council is examining individual

fishing quota systems for groundfish and crab fisheries also. Such a system will require considerable time to design and implement, and the soonest it could be in place would be 1996.

Ben Muse has talked about the salmon and other fisheries, but what I want to cover with you is the major growth in the groundfish fisheries. I am not going to talk about the crab fisheries much, but there is a lot of interaction with these other species such as halibut and crab. Everybody went through growing pains up here as we went through the 1980's during the development of our domestic groundfish fleet off Alaska.

I am with the North Pacific Fishery Management Council, which was established in 1976 as one of eight councils in the nation as kind of a new concept in fishery management. Instead of just having, for instance, the federal government manage the fisheries, the Congress decided in 1976 to set up a council of industry and government to manage the fisheries.

This occurred because we were having problems off our coast with foreign fleets. They showed up off the coast of Alaska in the late 1950's and the early 1960's. The Japanese and the Soviets were fishing the stocks heavily.

Pollock was one of the mainstays of their fisheries. After World War II and the Korean War, the fishing fleets were rebuilt, and they started coming up off of Alaska. We had a three-mile limit here, so the offshore fleets were regulated through various bilateral and multilateral agreements with these countries. As we moved into the early 1970's, yields from the stocks peaked and then crashed.

THE 200-MILE LIMIT

So, we have this marker year in 1976 when the Congress said it is time to do something about this, and we need to extend our jurisdiction out. Extending the jurisdiction out to 200 miles was a very contentious issue.

I remember being in a class down at the University of Washington, and my professor at the time was a man named McKernan. Don McKernan had been the head of fisheries for the United States, and he was also designated the Fisheries Ambassador for the U.S.

One of the biggest problems we had and the most resistance we had with extending our zone out to 200 miles was our own tuna fishermen. They fished off South America and Mexico and took tuna that was within the 200-mile zone of those countries.

Countries, like Ecuador, were extending their zones out, but we refused to extend ours, to a great extent because of the strong tuna lobby. The tuna fleets thought they would be disenfranchised if we recognized 200 miles in our own zone because it would lend validity to these other countries who were extending their zones out to 200 miles.

Also, the military thought that if we extended ourselves out to 200 miles, we were going to have problems with our rights of military passage through archipelagos and off of other countries. Despite this opposition, the Act was passed, and it was probably the best thing that could have happened to the United States for fisheries.

Once this went into place, the regional management councils were set up, and we had jurisdiction and control to set up various management

regimes for the fisheries off our coast.

Eight regional councils were established. These councils are listed in Table I.

Table I. Fishery Management Councils.

Council	Office Location
North Pacific	Anchorage, AK
Pacific	Portland, OR
Western Pacific	Honolulu, HI
Caribbean	Hato Rey, PR
Gulf of Mexico	Tampa, FL
South Pacific	Charleston, SC
Mid-Atlantic	Dover, MD
New England	Saugus, MA

THE NORTH PACIFIC COUNCIL

Off Alaska, we are unique because we have only one state under our jurisdiction. The Council has 11 voting members, including members from Washington State, Oregon, and Alaska and both the regional director of the National Marine Fisheries Service and the head of the Fish and Game Department for Alaska.

It also includes non-voting members, the U.S. Coast Guard, Department of State, Fish and Wildlife Service, and the Pacific States Marine Fisheries Commission. The Council's staff resides in Anchorage, and we meet five to six times a year.

The issues that we are looking at are very controversial right now. They involve things like inshore-offshore allocations of fish, limited entry, such as individual fishing quotas, moratorium, and so on: things that I will touch on as I go through my talk.

In any case, this was the crisis that we had here in 1976 when the councils were set up. Immediately, they brought forward many regulations that we already had for the foreign fleets, and various management areas were established.

For groundfish, we established two main areas. We have the whole Gulf of Alaska out to 170 degrees West and then the Bering Sea and Aleutian Islands. Within those main areas, you have two management areas for the Bering Sea and Aleutian Islands and the Eastern, Central, and Western areas for the Gulf of Alaska. There are some smaller areas for the management of sablefish and pollock.

That gives you the broad overview of our fishery management plans, which are the vehicles of all our regulations. Species managed include pollock, Pacific cod, sablefish, flatfish, rockfish, and so on.

As you get out in the Bering Sea and Aleutian Islands, you have sablefish, flatfish, rockfish, Pacific cod, mackerel, and so on. All those white-meated fish that you buy down at the market are generally in the groundfish category or in the species complex.

And the biggest — the most abundant — species is pollock right now. Pollock is the center of controversy on a lot of different fronts. Where you will probably run into pollock is fish sticks, but more likely you will run into it when you go to the salad bar. You want the seafood salad down at Carr's, and you will find the fake crab legs.

If you ever get a chance to visit one of the plants down in Seattle where they make crab legs, you will find it fascinating. They make them out of a minced, well-washed surimi that takes all the flavor out.

If you go out on a factory trawler or in a shore plant and taste the minced fish, it has no taste whatsoever. It is absolutely bland. Then they add back in all the flavors. I imagine that they could make a chicken or a turkey or anything out of it if

they really wanted. Maybe it will be T-Bone steaks one day — they will even put a bone in it.

As the Council started to engage in their work of managing the fisheries, probably the first mandate they had was to get rid of the foreign fisheries. The Magnuson Act gives priority to fully harvested and processed sectors of industry. It gives the lowest priority to the foreign fisheries where they take all of the fish and process it themselves.

Then there was the growth that Ben (Muse) mentioned about joint ventures in the middle 1980's when U.S. fisherman caught the fish and transferred it to a foreign processor on the water; this was given a middle priority. You see these priorities coming into play over the last 12, 15 years, or so.

Right after the Magnuson Act came into place, 99 to 100 percent of the fish was being taken by the foreign fleets off Alaska. The Japanese and Soviets were big players, as were the South Koreans. You also had Taiwan, Poland, and even Mexico put in for permits at one time. We have seen permit requests from Iceland, Portugal, and other countries that wanted to come up off Alaska and fish.

In November of 1978 the first transfer of fish from a U.S. vessel to a foreign processor took place. Immediately, these joint ventures started to grow as more tonnage came in over those first years, and there was a flurry of activity by the U.S. processors to protect themselves. They did this by giving U.S. processors priority, not just U.S. fishermen. This all happened in the late 1970's and early 1980's. It was very contentious back then.

Needless to say, the joint ventures took off and grew exponentially during the 1980's and pushed out the foreign fleets. More and more pressure was put on the Japanese. The Soviets were really big on the joint ventures. The Japanese were kind of stand-offish and did not want to get into it with us. Then all sorts of pressure was brought to bear on them to participate in joint ventures if they wanted a directed allocation.

At one time, we counted 130 to 140 U.S. trawler boats that were delivering in 25 different company arrangements with joint ventures from six of seven countries. Where did these boats come from? A lot of them came from the crab fishery when it went bust in the early 1980's. They all put on trawls and went for groundfish.

The next component to develop was the U.S. processing fleet and shore-based processing. The U.S. processing fleet started in 1980 or so, and now it is up to 50 or 60 vessels. Shore-based processors also developed, especially in Dutch Harbor and Kodiak. Much of it was due to pressure on the Japanese to transfer their technology to us: to put up shore plants, for instance, out in Dutch Harbor.

When other fisheries were down, you may have seen articles in the paper about how the lights are always on in Dutch Harbor, and things are going on out there. There are several shore plants processing groundfish there, plus you have major transportation and logistic supply points for the factory trawlers there.

THE FISHERIES

We manage the groundfish fisheries by season, starting normally around January 20th for most of the trawl fisheries. They start a little bit earlier for some longline fisheries. Some of the fish are allocated on a seasonal basis. The areas are cut up

into smaller areas for stock management.

There has been a tremendous growth in the trawl fleets since 1984, when the number of trawlers increased, not only in the joint venture fleet but also in the factory trawl fleet. You have got longliners also coming on-line as you go into 1989 and so on. There also are pot boats and various motherships. The motherships are large floating processors, and they have their own batch of smaller trawlers that deliver to them.

That is the kind of fleet that we are looking at. Some of the fisheries, for instance the derby fisheries, are going on out there. If you look at the sablefish: in the early 1980's, most of the fish were taken over to Japan. Then we had our own domestic longline fleet grow very rapidly here.

The catch kept going up too, because we kept taking it away from the foreign fleets. It then pretty much leveled off, but now we have a problem where the seasons have gotten shorter and shorter and that has led to a consideration of limited entry. That is one of the issues that I will go over for you real quickly. That is not only happening in the sablefish fleet. All components have generally gone up.

The smaller boats are up to 36 feet. You also have vessels that are in the 36- to 50-foot range, and even up in the 90-foot range. The whole fleet capacity has gone up. This has caused progressively shorter and shorter seasons and a bigger and bigger race for fish.

There are about 5,000 vessels out there in any one year. Even though the vessels over 191 feet are a relatively small proportion of the fleet, they are taking a great volume of the fish. So, when you see the addition of another factory trawler or another factory longliner, you are going to get a pretty large incremented fishing capacity compared to if you had say 100 or more boats in a smaller range under 36 feet.

Let me run through a couple of issues with you to give you a sense of some of the contemporary issues that you may read about in the paper and where we are going with safety issues. As we have seen the domestic fleet come on line and displace the foreign fleet, we have had conflicts. The conflicts have arisen as the result of the growth of a massive groundfish fleet that is taking a bycatch of other traditional species such as halibut, crab, salmon, herring, etc.

As with the foreign fleet, it is illegal for trawlers to keep halibut; they have to discard it over the side. The big issue is what are we going to do with this growing trawl fleet and all of the halibut they are catching.

The first thing we did was put a cap on the amount of halibut that could be taken incidentally to the groundfish fishery. As soon as that groundfish fishery hits that cap, even though there is considerable unharvested groundfish, they have to close down. This experience caused adjustments in the groundfish fleet on how they fished, whether they fished off bottom or right on the bottom, which areas they fished, and so forth.

To this day, we are still working at refining that program. We still have problems. We still have a cap out there on halibut, and one on crab too, so they are not taking so many king crab and so on. We still have the issue before us at almost every meeting, in every year.

A cap for a particular fishery creates a race to try to fish as hard as you can before the bycatch cap is reached. At some point I think the Council will end this race by giving each fisherman their own individual bycatch quota. I do not know when

that will come along, because it requires lots of data. It is hard to prosecute fishermen if there is a lot of variability in bycatch rates.

You have probably read about inshore and offshore allocations. This is where we had seven or eight factory trawlers fish off Kodiak in early 1989, catching about half of the yield of pollock there. This upset everybody in Kodiak, leaving the plants high and dry, and closed early. The pollock stocks were down in Shelikof Straits anyway, and this further aggravated the situation. At our April meeting, the shoreside industry came in saying we have got to do something about the factory trawlers.

We spent over a year trying to refine the problem and the alternatives. The Council finally decided to allocate pollock between the factory trawler offshore fleet and the inshore processors.

It has been a very contentious issue. In the Bering Sea, in our latest round, we have allocated the offshore fleet 65 percent of the pollock and the inshore fleet 35 percent in 1993-95. This separates those two competing sectors. In the Gulf of Alaska, we allocated 100 percent of the pollock to the inshore fleet and about 90 percent of the cod.

We also set up what is called a community development program out in the Bering Sea. It is a very interesting allocation of pollock that amounts to about 100,000 metric tons. It is the first that I know of in the United States where it has happened. The 100,000 metric tons are set aside for disadvantaged Western Alaska communities. About five or six groups of communities will benefit from that program.

Another thing that we are working on is full utilization of the fish. How many of you saw on Channel 2 the other day a videotape of pink salmon being dumped in Prince William Sound and waste of fish going on in the factory trawl fleet? Right now the dumping of fish is a big issue. The video they showed of the pink salmon was over in Prince William Sound. As you recall, last year they came in late, so they were dark, and no one wanted them.

There already had been a good salmon fishery out in Bristol Bay and there were not many buyers. When these fish came back to hatcheries, fish that were grown by the fisherman and paid for by fees, they were put on barges and taken out and dumped because no one wanted them. This discard was filmed on video, as was a salmon giveaway in Anchorage. A lot of them were given away in Fairview and other areas to the needy.

People began to ask us why we were throwing all of these fish away. Why do they not give them to the needy and the hungry? Full utilization is an important, emerging issue.

DERBY FISHERIES

Finally, let me talk about the derby fisheries. Limited entry is a big item for halibut fishermen and for sablefish fishermen as well. The Council has developed a very controversial program called IFQs. If you are a halibut fisherman, you should be following this one very closely.

It is going to be based on your participation and catch records from the past years, and it is going to assign individual packets of fish to each fisherman to catch when they want to. It has been very controversial, but it is a direct result of the collapse of the halibut season into one-day derbies and the collapse of the sablefish fishery, that went down in

season-length. It is only for the longline fleet right now.

The program is being forwarded to the Secretary of Commerce in a month or so. It will probably be implemented in 1994, possibly in 1995.

Coming right behind that, we have placed a moratorium on the number of vessels that can participate in the crab or groundfish fisheries. That moratorium will come along sometime in 1993, and right behind is going to be some kind of rationalization program, limited entry or IFQ. An IFQ system could be in place for the fisheries in 1996.

You see boats lost in the halibut fishery every year, boats that are completely overloaded, awash with fish.

The derby fisheries that have developed the greater fishing effort make people fish faster. They often neglect their safety in trying to do this. You see boats lost in the halibut fishery every year, boats that are completely overloaded, awash with fish.

The Council is cognizant of the safety problem. That was one of the reasons that IFQs passed. That is one of the reasons that we asked the International Pacific Halibut Commission to have more of their openings in the summer time, because part of the fishing fleet was being lost in the short openings during bad weather.

Just this last opening in September, five or six vessels were lost out of Sitka. You never know what the whims of the weather are going to be. Kodiak for instance had great weather as far as I understand and no losses.

The Council has tried to address safety concerns in the groundfish fleet also. For inshore/offshore, we are letting some of the smaller trawlers come into the catcher-vessel operational zone, which was originally going to be set aside only for the inshore processors.

Now, motherships will be able to come into that zone with their smaller trawler fleet. We are worried about safety, but until we get a more rationalized fishery, which is a little slower paced, there are going to be problems. I imagine you are going to hear more about the derby fisheries from Gunnar Knapp when he speaks.

Those are some of the issues that I wanted to bring to your attention. If there is time, I would be glad to answer questions. □

QUESTIONS

Dr. Clarence G. Pautzke: When the salmon limited entry system was set up, there was a reason for people to try to get their foot in the door by fishing one fish and getting in it. Either you were in or you were out. You had to have a certain number of points and so on. Either you had this valuable permit that you got for XYZ fishery, which now is worth $400,000, or you did not make it.

When people say, "Well, we had to go out in bad weather to fish in 1991." I tell them that they have missed the point, because what we are going to use for the IFQ system is different. You are not going to be either in or out. You are not just getting a permit to participate with a limited number of people in another derby fishery. You are going to get an IFQ that is based

on, say, five or six years or so of your fishing history. If you landed one pound of fish in one year, you are not going to get much when they give out the quota. Still, some people thought that they needed to get their foot in the door by making one landing.

It is unfortunate, but you cannot always get the word out to everybody. There was no reason for it. If they were following what we have been doing on halibut limited entry since 1983, they would have known. They would not have taken that risk. Also, it boils down to good judgment. It does not matter whether it is a derby fishery or not.

We have fishermen come in and tell us that they do not need limited entry, and that they are not going to subject their crew to bad conditions. But, that is not what necessarily happens out there when these guys know there is a 24-hour opening. They are looking at their watches, they have got all their gear set, their baits hung, and they are ready to go. There are going to be those responsible ones that are going to poke their head out around the cape and decide to go home. More often than not, I think there are the ones that will poke their heads around the cape and say, "We've got 24 hours. Let's go get them and hope we will make it back."

Dr. Clarence G. Pautzke: The reason why the Council vacillates — you say, well, it is not a good decision-making body, but part of the reason that they vacillate is they are listening to industry. On every one of our issues, the industry has a large input on what we are doing and often there is a lot of industry resistance to it. Then they back off a little bit. Then, they come forward and back off. Until you get a certain critical mass going, you do not make the decision.

Dr. Clarence G. Pautzke: I do not know about the data, but I can tell you about the process. The process is federal, and the process that we go through to put in any regulation requires a thorough study of the benefits and the costs of that regulation, environmental impacts, and so on. It is not easily done on something as complex as an IFQ system for the groundfish fisheries. The IFQ system, we are putting together for sablefish and halibut for the longline fleet where there are many small boats, will be implemented in 1994 or 1995, not 1996.

The IFQ system, by making a season longer, may cause one or two fishermen that otherwise would have gone out in bad weather to not go out in bad weather to tailor their fishing to good weather. It will save lives, starting in 1994.

As far as the other IFQ systems for crab and groundfish go, if we do indeed go that way, it will take at least a year to study the benefits and costs and meet the requirements of other federal law. Then, the Secretarial review takes four to five months. It will probably take another couple of months to get the regulations ready for proposed rulemaking. You are looking at a half of a year there, if not longer.

Then, you have to notify the fleet so that they can be apprised of what their potential catches would be, then fight it, and appeal it all the way up the line as far as they can. For the sablefish and the halibut, we are looking at a year to do that, to set up the administrative procedures. So, January 1, 1996, is actually optimistic.

Dr. Clarence G. Pautzke: The Canadian halibut fisheries have already switched over to IFQ's. The first effects that I saw of that was going into Carr's grocery down in South Anchorage last spring before our halibut fisheries had started off of Alaska. I went over to the iced section, and they had these beautiful fillets of halibut sitting out there — fresh roasts of halibut like you or I would get out sport fishing. It was Canadian halibut, $10.99 a pound — fresh halibut brought in from Canada. Right next to it was a piece of Alaskan halibut that was yellow and freezer burned from last year and it was $6.99 a pound. The availability of fish throughout the year is one of the things that you can see. Now, you go to any restaurant down in Seattle — Anthony's Home Port, Everett — anywhere you go, they have Canadian halibut on the menu, not Alaskan halibut, because we have these short seasons and everything's frozen. This is a beautiful opportunity to compare the derby and IFQ systems of management.

SAFETY IMPLICATIONS OF DERBY FISHERIES

By Dr. Gunnar P. Knapp

LCDR Jan C. Manwaring: Out last presenter for the day is Dr. Gunnar Knapp whose presentation is entitled *Safety Implications of Derby Fisheries*. Dr. Knapp is a Professor of Economics at the University of Alaska Institute of Social and Economic Research. A specialist in fisheries economics and fisheries management, he has studied the potential impacts of fisheries management on fishing safety, and has estimated commercial fishing fatality and injury rates. As a member of the National Research Council's Committee on Fishing Vessel Safety, he analyzed fishing safety data for Alaska and other regions of the United States. Dr. Gunnar Knapp:

INTRODUCTION

Commercial fishing has a well-deserved reputation as one of the most dangerous occupations in America. Contributing to the dangers of commercial fishing, it is frequently alleged, is the "derby" management of many fisheries — short openings in which large numbers of boats work all out to catch a limited quota. This kind of management is alleged to cause fishermen to take more risks, such as fishing in bad weather, leading to increased vessel losses, injuries and deaths.

Contributing to the dangers of commercial fishing, it is frequently alleged, is the "derby" management of many fisheries — short openings in which large numbers of boats work all out to catch a limited quota.

These safety concerns have entered the debate over proposals to change the management of some derby fisheries. One such proposal is to adopt an "individual fishing quota" or "IFQ" management system for the Alaska halibut fishery. Proponents of IFQs cite safety problems among other problems of the current management system, and improved safety as one of the benefits from changing to an IFQ management system.

In this paper I briefly review the available evidence about the safety implications of derby fisheries.

ALLEGED SAFETY PROBLEMS OF DERBY FISHERIES

Derby management is alleged to have both direct and indirect effects upon commercial fishing safety.

Direct Effects

Direct effects result from increased risk-taking during fisheries openings. Examples include —

- Faced with no other choice if they are to participate in a fishery, fishermen may take the risk of fishing in unsafe weather conditions.
- Given a limited opening, fishermen may work continuously for long periods without rest, leaving them extremely fatigued and at greater risk of being injured.
- Fishermen may overload boats rather than lose time returning to port to deliver fish.

Indirect Effects

Indirect effects result from effects of the management system on the

kinds of vessels and persons involved in the fishery:

- Fishing fleets may include more small boats than would be able to participate profitably under other management systems.
- Derby fisheries result in participation by large numbers of fishermen who are less experienced and work only part-time in fishing. These fishermen may be less aware of how to fish safely.
- Derby fisheries are often not profitable, which reduces fishermen's ability to invest in safety equipment and training.

WHAT WE *CAN'T* SAY

I am not aware of any evidence which conclusively supports these allegations or which demonstrates that derby fisheries lead to more vessel or personnel casualties than would occur under other management systems.

There have been several studies that examined implications of fisheries management for safety. A 1985 study[1] prepared at the request of the House Committee on Merchant Marine and Fisheries concluded:

"*Competition in any form may cause harvesters to ignore safety precautions if they feel it is necessary to maintain or increase profits. This competition among harvesters can be reduced by only a few regulatory regimes, such as those utilizing a form of limited access based upon harvest shares or individual harvester quotas.*"

A 1986 study compiled by the National Council of Fishing Vessel Safety and Insurance, which interviewed fishermen and fisheries managers about the impacts of management on safety, cited a wide variety of perceived safety problems associated with derby fisheries.[2]

Neither of these studies demonstrated any statistical relationship between derby management and fishing safety. Neither study used data to examine whether fisheries with derby management systems had higher casualty rates than other fisheries nor whether casualty rates in derby fisheries increased as seasons became shorter.

> Serious research should be undertaken so that we can better understand how management decisions affect safety.

There are two reasons for which it is difficult to measure statistically how significant derby management or other management factors may be for commercial fishing safety.

- First, there are many possible contributing factors to safety problems, which are not independent of each other. Risk-taking resulting from derby management might be only part of a long chain of causes that together may lead to a vessel casualty, injury, or fatality.

Other factors could include lack of training, a harsh environment, and improper equipment, for example. Not only may all these factors contribute to safety problems, but their effects are not independent of each other, making it difficult to statistically measure the importance of any given factor.

- Second, data are lacking which would permit investigation of the extent to which these factors were present in incidents that have occurred in the past. For example, data are generally not available, except by tedious reconstruction of the circumstances of individual incidents, to determine the fisheries in which

vessel casualties, injuries, and fatalities have occurred in the past.

In sum, I am not aware of any studies, which have ever been undertaken, that would show whether or not derby management leads to more vessel losses, injuries, or deaths than would occur under other management systems.

WHAT WE *CAN* SAY

The absence of data and statistical analysis makes it difficult to say specifically what the effects of derby management on safety may be. Nevertheless, there is a lot that we *can* say about derby fisheries and fishing safety. Clearly, many of the safety problems of the commercial fishing industry have nothing to do with derby management.

- First, many fisheries are not derby-type fisheries.
- Second, many incidents occur in calm seas on vessels that are not working at a particularly hectic pace. Many incidents occur when vessels are in transit between ports, or on their way to fishing grounds.

However, just as clearly, many vessel losses, injuries, and fatalities do occur in derby fisheries, in conditions in which fishermen were obviously taking risks in order to participate in these fisheries. Anybody who lives in Alaska knows that almost every halibut opening brings reports of rescues and losses of fishing vessels and fishermen. Usually, bad weather means more incidents. This may be seen in Table I, which summarizes halibut season incidents reported over a three-year period in the *Kodiak Daily Mirror.*

Fishermen know whether or not derby management leads to safety problems. Who would know better? The fact that many fishermen claim that derby fisheries are dangerous suggests that they probably are.

CONCLUSIONS

Although it has yet to be demonstrated statistically, it is reasonable to assume that derby management does, in fact, result in more vessel losses, injuries, and fatalities than would occur under other management systems. Why, then, does derby management continue? Perhaps because it is easier to recognize the safety problems associated with derby fisheries than to do something about them.

Many fishermen have strong objections, which have nothing to do with safety, to some of the alternative management systems that have been proposed. This is not irrational. Some of the alternatives to derby management, such as individual quotas, could have very significant economic consequences, under which some vessel owners and crew stand to gain and others stand to lose. Fishermen who stand to lose economically from other management systems may oppose management changes even if these might reduce safety problems.

Careful fishermen may feel that they can and do operate safely during derby openings, even though other fishermen cannot or do not. Fisheries managers need to think seriously about safety as an important consideration in all management decisions.

Safety should not be invoked only when it is convenient to bolster an argument. Serious research should be undertaken so that we can better understand how management decisions affect safety. The essential first step is to begin collecting the kind of data that would permit this research.

Consider the following statements from the draft Environmental Impact Statement[3] for the proposed IFQ management of Alaska halibut fisheries:

Table I. Summary of Halibut Fishery Safety Incidents Reported in the *Kodiak Daily Mirror*, 1987-1989.

Date	Weather Reported	Incidents Reported	Newspaper Comments
May 4, 1987	Calm seas, moderate winds, and good visibility at start of opening, changing to 30 knot winds and 20 foot seas by end of opening.	1 death, 3 crew missing, 3 vessel sinkings, 9 crew rescued from sinking vessels, 2 crew medivaced for illnesses, 2 vessels disabled.	"Fishing boats, their holds plugged with halibut and their crews exhausted, continued to limp into port this morning after the close at noon of the first of the frantic 24-hour fishing marathons known as "halibut openings." Coast Guardsmen were exhausted too today after working diligently to pull unlucky or unwise fishermen from trouble."
June 1, 1987	"The finest ever out there:" winds calm, seas as close to flat as ever.	(no incidents reported in newspaper)	"The local Coast Guard, usually hard-pressed to keep up with rescues during halibut openings, had no calls at all for help.
Sept. 2, 1987	Winds at 25 mph and gusting	2 groundings; 3 crew rescued.	"Two vessels fell victim to the rocks and shoals during the just-completed 12-hour halibut opening."
Sept. 30, 1987	16 foot seas & 35 knot winds predicted, with weather calming	(no incidents reported in newspaper)	"Gale force winds battered the fleet in the hours before the opening...The predicted gale convinced some skippers of the smaller boats that it just was not worth the risk to life and limb... Meanwhile, some fishermen said they fished in 12 to 14 foot seas and they have the bruises and boat damage to prove it."
May 23, 1988	"Usually good weather for a first halibut opening."	2 vessels lost, crew rescued; 3 vessels taking on water assisted.	
June 20, 1988	Small craft advisory, northeast winds to 25 knots, seas to 10 feet.	2 crew medivaced with injuries.	
Sept. 7, 1988	"Fairly mellow weather"	(no incidents reported in newspaper)	
Oct. 3, 1988	25-foot seas, winds gusting to 50 knots.	3 crew abandoned ship, rescued.	
May 15, 1989	High winds and seas; "howling westerly winds"	1 vessel loss, 5 crew rescued.	"One skipper said, 'I risked my life for pennies.' Some smaller vessels turned back when faced with high seas and larger vessels had their windows blown out."
June 12, 1989	Winds at 10 mph.	1 death, 2 vessel losses, 9 crew rescued	
Sept. 5, 1989		(no incidents reported in newspaper)	
Oct. 10, 1989	Winds to 20 mph	2 vessels received assistance from Coast Guard	

"*Effects of an IFQ Program on Vessel Safety: An IFQ program is expected to increase vessel safety by reducing substantially the incentive fishermen have to disregard factors that increase the risk of accidents. However, due to a lack of reliable data and methodological problems, it is hard to provide quantitative estimates on the linkages between vessel safety and other factors, such as management practices.*"

The entire treatment of safety in the IFQ analysis is less than one page long. I understand — I wholeheartedly agree with — the statement that lack of reliable data and methodological problems makes it hard to tell what effects an IFQ program might have on vessel safety. But managers need to begin to obtain this data and study these problems.

It might be argued that the absence of statistical proof of the problem should not be a barrier to doing something about it. I wholeheartedly agree. In the absence of statistical proof, it is often more convenient to continue to look the other way. Relatively small changes in management could reduce commercial fishing safety risks for some fisheries. The most obvious of these is postponing or delaying seasons when the weather is forecast to be bad.

Unfortunately, problems may arise when managers begin to actually assume some responsibility for thinking about safety. It may be that in actively considering the safety implications of whether or not to open a fishery, managers assume a liability if the weather turns out to be bad. If this is a deterrent to thinking about safety implications of fisheries openings, it reflects a particularly grievous defect in our legal system.

It is difficult to make management decisions for safety reasons, which will not have unequal economic consequences. If managers do not delay an opening when the weather is forecast to be bad, this benefits the larger vessels, which will be able to fish safely anyway.

If managers do delay an opening for safety reasons, it benefits the smaller vessels not only for that opening, but in general, because there is a greater chance that they can succeed economically without having to sit out some openings because of bad weather or else risk their lives and their vessels. □

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SESSION 5: SAFETY AND HEALTH: WHOSE RESPONSIBILITY IS IT?

October 10, 1992

Moderator: Richard R. Arab, B.A.
Deputy Director, Occupational Safety and Health Section
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Richard Arab is the Deputy Director of the Occupational Safety and Health Section for the Alaska Department of Labor. Richard graduated from the University of Alaska in 1968 with a BA in English/Journalism. From 1968 to 1970 he was a reporter for the Ketchikan Daily News, and from 1970 to 1975 he was a labor market economist for the Alaska Department of Labor's Research and Analysis Section. Richard has worked for the Occupational Safety and Health Section since 1976 and has been the Deputy Director since 1981.

QUOTES FROM THIS SESSION

"Those areas of worker safety and health not covered by a Coast Guard standard are covered by OSHA within Alaska's territorial waters."
— Barry C. Noll, P.E.

"We often tend to leave out the prevention factor. If you do have a stable boat that is fire safe and meets many of the other criteria for prevention, you can avoid needing the other safety equipment." — Glenn C. Sicks, M.S.

"I would like to make a suggestion to the Coast Guard and NIOSH if you get involved in encouraging compliance with regulations. Fishermen are not stupid, but they need to have a clear game plan."
— Jim W. Herbert, M.A.

"Rather than having a bunch of people who did not want to be changed, we really had a bunch of people who wanted to be taught how to do it the right way."
— A.B."Tony" Ford, M.B.A.

OSHA AND THE ALASKAN FISHING INDUSTRY

By Mr. Barry C. Noll

Mr. Richard R. Arab: Welcome to day two of the National Fishing Industry Safety and Health (FISH) Workshop. This is Session Five of the FISH Workshop entitled *Safety and Health: Whose Responsibility Is It*? Our first presenter is Barry C. Noll, whose presentation is entitled *OSHA and the Alaskan Fishing Industry*. Barry Noll has been the Area Director for OSHA in Alaska since July 1991. Prior to that, he worked as a regional safety engineer in the Seattle Regional Office of OSHA from 1989 to June 1991. From 1981 to 1989, he was a civil engineer and later a state engineer in the Anchorage State Office of the Bureau of Land Management. Prior to that, he held other civil engineering and surveying positions in Colorado and California. A native of San Francisco, Mr. Noll received a B.S. degree in civil engineering from California State University at Chico. He holds professional civil engineering certificates from the states of Alaska, California, and Colorado. Mr. Barry Noll:

OSHA AND THE ALASKAN FISHING INDUSTRY

On December 29, 1970, the 91st Congress passed the Occupational Safety and Health Act (OSH Act). This Act led to the creation of the Occupational Safety and Health Administration (OSHA) and charged it with the promulgation and enforcement of safety and health regulations.

These OSHA regulations apply to areas of industry that are not already regulated by another federal agency. The OSH Act further limits OSHA's offshore authority to the state's territorial waters.

JURISDICTION

Section 4(a) of the OSH Act states:

"*This act shall apply with respect to employment performed in a workplace in a state...*"

This is the section that limits OSHA's jurisdiction to a state's territorial waters. A state's territorial waters are considered to extend 3-nautical miles seaward from the coastline. The exception to this is the Gulf Coast, where the territorial waters extend 3-marine leagues, or approximately 9-nautical miles.

The coastline is the line of ordinary low water along the part of the coastline that is in direct contact with the open sea. Enforcement of OSHA regulations is confined to vessels that are operating within 3-nautical miles of Alaska's coast. All vessels involved in longshoring operations are subject to OSHA regulations. Longshoring operations occur whenever material is moved vessel to vessel or vessel to dock.

Section 4(b)(1) of the OSH Act states:

"*Nothing in the Act shall apply to working conditions of employees with respect to which other federal agencies... exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health.*"

Essentially, OSHA relinquishes its authority to any federal agency that chooses to assume the responsibility for worker safety and health in all or part of an industry. The Coast Guard

Table I. Standards Addressed under the Occupational Safety and Health Act.

1. On-board cranes and their maintenance and use.
2. Powered vehicles on board.
3. Cutting and welding permits, tests prior to work, and competent persons.
4. Part of the ammonia standard and refrigerants other than ammonia.
5. Chlorine storage and use.
6. Tools and portable equipment (this can include machine guarding on portable machinery).
7. Reporting of illnesses, injuries, and fatalities (48 hours maximum).
8. Recording of illnesses and injuries (OSHA 200 forms).
9. Ropes: wire, manila and synthetic.
10. Chains, hooks, and slings.
11. Sources of ignition including smoking.
12. Confined spaces, including testing of oxygen deficient or potentially oxygen deficient atmospheres.
13. Warning signs and labeling of control switches.
14. Maintenance: painting, lockout/tagout, unguarded holes in decks.
15. Gas cylinders, use and compatibility.
16. Relief valves on refrigerant piping.
17. Vessel access (gangways).
18. Elevators and dumbwaiters.
19. Illumination of work areas and accommodation spaces.
20. Temporary cords: use, maintenance and material construction.
21. Steam hose use and fittings.
22. Working around radars and other emission devices.
23. Gas masks and canisters.
24. Respiratory protection programs and respirator checks.
25. Washing, bathing, toilet and clothes washing facilities.
26. Ergonomics.
27. Noise.
28. Personal protective equipment.
29. Materials handling and storage.
30. Asbestos, chemical exposures, and health hazards.
31. Hazard communication.
32. Bloodborne pathogens.
33. Open-sided floors and platforms.

is the lead federal agency on the water.

Regulations issued by the Coast Guard preempt OSHA's. Those areas of worker safety and health not covered by a Coast Guard standard are covered by OSHA within Alaska's territorial waters. Beyond the territorial water line, these areas are essentially unregulated.

Uninspected vessels fall under OSHA and Coast Guard jurisdiction. Inspected vessels — with the exception of record keeping, discrimination and, longshoring — are the jurisdiction of the Coast Guard.

Of all the fish processing vessels operating in Alaskan waters, only one, the *P/V Ocean Phoenix* is an inspected vessel. The remaining fishing and fish processing vessels are uninspected and subject to shared jurisdiction of the two agencies.

On vessels under OSHA jurisdiction, OSHA enforces its General Industry Standards, 29 CFR 1910, and Maritime Standards, 29 CFR 1917-1919. These standards cover

the Byran amendment to the OSHA Appropriations Act and exempt commercial fishing boat and diving operations with 10 or fewer employees from OSHA safety inspections only.

Accidents and fatalities as well as employee complaints in both these industries must still be investigated by OSHA when they occur within OSHA jurisdiction. By regulation, accidents that hospitalize five or more people and fatalities must be reported by employers to the OSHA Area Office within 48 hours of their occurrence.

INSPECTION PRIORITY

OSHA workplace inspections occur for one of four reasons. In declining order of importance they are as follows:

- An imminent danger to employees.
- A fatality or catastrophe (five or more hospitalized).
- An employee complaint or referral from another government agency.
- A general scheduled inspection.

An imminent danger is:

"*. . . any condition or practice in any place of employment which is such that a danger exists which could reasonably be expected to cause death or serious physical harm.*"

When the OSHA Area Office receives a report of an imminent danger, a compliance officer is dispatched to investigate the complaint within 24 hours. In certain instances, the Area Office will contact the employer before the inspection to have affected employees removed from an area of imminent danger.

OSHA requires fatalities and catastrophes to be reported to the Area Office within 48 hours of their occurrence. Fatalities and catastrophes are investigated as quickly as resources, priorities, and travel permit. Over the last two years, the Anchorage Area Office has had inspectors at the scene of either a fatality or catastrophe within 36 hours of receiving notification.

A fatality or catastrophe occurring in an area where OSHA and Coast Guard overlap would be investigated by the Coast Guard, as lead agency. Their declining to investigate would allow OSHA to conduct the investigation.

For a complaint to trigger an inspection by OSHA, the complaint must be formal as opposed to nonformal. A formal complaint comes from a current company employee, union representative, or relative.

> An imminent danger is "any condition or practice in any place of employment which is such that a danger exists which could reasonably be expected to cause death or serious physical harm."

Nonformal complaints are from past employees or others who complain about a health or safety violation. Nonformal complaints are handled by mail. OSHA sends a letter to the employer and asks them to investigate the allegations, correct any deficiencies and respond when completed.

If the company fails to respond, then OSHA can inspect the workplace. Formal complaints must be investigated by the Area Office. A serious formal complaint received by the Area Office must be investigated within 30 days. All other formal

complaints must be investigated within 120 days.

Scheduled inspections are the lowest priority for inspection, yet account for most of the fishing industry inspections in Alaska. Currently in Alaska, OSHA has a special inspection program emphasizing floating processors. Under this special program, processors can be inspected as often as once a year, and all processing vessels are subject to inspection.

INSPECTION CONDUCT

Once an OSHA compliance officer arrives on board, they will present OSHA credentials and hold an opening conference. During the opening conference, the compliance officer will discuss the reason for the inspection, areas to be covered, and rights of the owner and employees to accompany the compliance officer on the inspection.

Before beginning the inspection, the compliance officer will review all the required written programs and the injury/illness logs. The written programs required on vessels under OSHA jurisdiction include:

- Hazard communication program.
- Respirator program.
- Hearing conservation program.
- Hazardous energy control program (lockout/tagout).
- An exposure control plan for bloodborne pathogens (if applicable).

The illness/injury logs for the current year and previous four years (five-year total) are required to be kept on the vessel and subject to review by an OSHA inspector.

During the walkaround, the compliance officer will discuss the apparent violations observed, interview employees, and listen to concerns about health and safety issues. When the walkaround portion of the inspection is completed, a closing conference will be held. During the closing conference, the apparent violations will be discussed again, along with the employees' rights and responsibilities following an OSHA inspection.

The Area Office issues citations. If possible, copies are sent to both the inspection site and corporate office. Once received, the employer has 15 working days to hold an informal conference with the Area Director or contest the citations, penalties, or both. The results of an informal conference could be a lowering of the penalty based on abating the cited hazards.

The Budget Reconciliation Act passed by the 101st Congress increased the penalties for violations of the Occupational Safety and Health Act. The Budget Reconciliation Act stipulated a seven-fold increase for the maximum penalty limit.

This effectively raised the maximum limits of a willful or repeat violation to $70,000, serious or other than serious to $7,000, and posting violations to $1,000. OSHA has developed a set of factors that include probability, severity, and company size to reduce the maximum penalty so that a typical penalty for a serious violation is now between $1,000 and $2,000.

OSHA AND COAST GUARD COORDINATION

A discussion of OSHA's presence in the Alaskan fishing industry would be incomplete without discussing the gray area that exists between certain OSHA and U.S. Coast Guard regulations. Whenever an issue is encountered that could fall to either agency, the OSHA Area Office is contacted by the Coast Guard's

Marine Safety Office (MSO) and an immediate decision is made on the proper course of action.

Investigators for both agencies are now using each other for a sounding board. The discussions often concern jurisdiction but have included policy issues, documentation criteria, and inspection conduct.

This coordination and cooperation between the OSHA Area Office and the Coast Guard are expanding. In the recent past, both agencies jointly inspected crab processors in Dutch Harbor.

The agencies coordinated on inspections where the Coast Guard has noticed flagrant safety and health problems. During OSHA's inspections, violations of the Commercial Fishing Industry Vessel Safety Act of 1988 are documented and referred to the 17th Coast Guard District.

SUMMARY

OSHA will continue to cover those areas of uninspected vessels not regulated by the Coast Guard within 3-nautical miles of the Alaskan coast. This regulation includes longshoring work on the vessel while docked.

Except for imminent danger complaints, OSHA inspections are unannounced, follow a prescribed procedure, and are administered by the OSHA Area Office. The Coast Guard and OSHA will continue to coordinate the inspection work and improve on the system presently used. In the future, more inspections will be conducted jointly and more referrals will be made between agencies. The outcome of this effect will be an improved, safer processing fleet operating in Alaskan waters. □

U.S. COAST GUARD REQUIREMENTS FOR FISHING VESSELS

By LCDR Glenn C. Sicks, USCG

Mr. Richard R. Arab: Our next presenter is LCDR Glenn C. Sicks, whose presentation is entitled *U.S. Coast Guard Requirements for Fishing Vessels*. LCDR Sicks is the Fishing Vessel Safety Coordinator for the 17th Coast Guard District that encompasses all of Alaska. During his five years in this position, he has helped develop and advertise regulations implementing the Commercial Fishing Industry Vessel Safety Act of 1988. He represents the Coast Guard as a board member of the Alaska Marine Safety Education Association. Prior to this assignment, he was Chief of the Investigations Department at the Marine Safety Office in Honolulu, Hawaii. During his 24-year Coast Guard career, he has also served as a Deck Officer on the *High Endurance* Cutter, as Deputy Group Commander in Memphis, Tennessee, and as a Marine Inspector and Investigating Officer in the 14th Coast Guard District. He holds a Bachelor of Science degree in geology from Northern Illinois University and a Master of Science degree in oceanography from the University of Hawaii.
LCDR Glenn Sicks:

I would like to introduce my boss's boss, RADM Rufe. I appreciate your coming, Admiral, and your concern for fishing vessel safety is demonstrated by your presence.

Also, I would like to introduce my assistant, Sue Jorgensen. I stole her from the Vessel Documentation Office in Juneau where she was the supervisor. Many of you who have a documented boat, will know her from that role. She demonstrated that she could do my job, and I am very happy to have her working with me.

The third member of our team is Ensign Rob Lee. He came on board last summer, and he has done a great job monitoring fishing industry casualties and working with NIOSH. I think we have come a long way from when this was a collateral duty that I picked up five years ago. We are now a three-person office doing fishing vessel safety, exclusively.

THE SAFETY TRIANGLE

I call the Safety Triangle, which is shown in Figure 1, the "Bottom Line." We can talk about regulations and safety all day, but if you do not have these major items in mind, whether they are regulated and apply to your vessel or not, you are missing the point. The idea is to save the boat and to save the people on it.

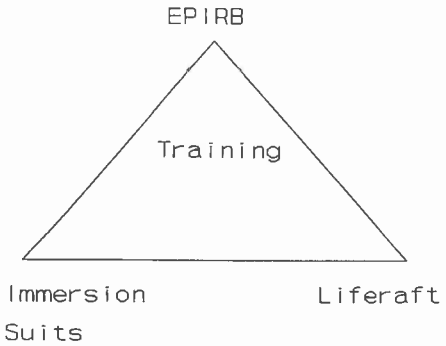


Figure 1. The Safety Triangle.

These are the items that have been primarily responsible for saving lives in Alaska. Under EPIRB (Electronic Position Indicating Radio Beacon) you can also include radio — any electronic means used to call for help.

The importance of immersion suits has been demonstrated over and over. The latest case was the fishing vessel *Majestic*. Five people were saved out of the water after three to five hours in the water in immersion suits. They were saved because they had an EPIRB and survival suits.

Life rafts are another big life-saver. Last month, five people were saved out of a life raft after the fishing vessel *Nord* went down in Chatham Strait. It is well-known that you can have all the safety gear in the world, and that it will not do you a bit of good if you do not know how to use it. Training is essential.

We often tend to leave out the prevention factor. If you do have a stable boat that is fire safe and meets many of the other criteria for prevention, you can avoid needing the other safety equipment. So, that is a good place to start.

Let me ask, how many of you have known a fisherman who has died at sea or who has been lost at sea? Okay. A good percentage of you.

You have got to be constantly aware of what is going on and go way beyond what is in the regulations as far as keeping your boat safe.

This loss really hit home to me, not from a fishing boat accident, but from the loss back in 1978 of the University of Hawaii's research vessel, the *Hula Hula*. Three of my classmates were on that vessel, and their families came to me as the Coast Guard's representative and asked, "How could this possibly happen." This is a 90-foot vessel; how could it be lost at sea?

I had to tell them that the reality, from my Coast Guard experience, is that it is amazing it does not happen every day. One little thing can go wrong, and you can lose the boat. You have got to be constantly aware of what is going on and go way beyond what is in the regulations as far as keeping your boat safe.

REGULATION DEVELOPMENT

I think that all of you are aware that there are new regulations. I want to discuss for a few minutes where we were before 1988. The initial fishing vessel safety law was proposed to the Congress back in the 1940's. That effort was stopped because of World War II when other priorities took precedence.

In the early 1980's we worked on a Voluntary Standards Program. There was no law under which the Coast Guard could increase the requirements for commercial fishing vessels. We published a Navigation Vessel Inspection Circular, NVIC No. 5-86, that was accepted by the industry as a "standard of care" for many vessels. After that, the EPIRB requirement came out. That preceded the Commercial Fishing Industry Vessel Safety Act by a couple of years.

They are often tied together because the EPIRB requirement is repeated in that Act, but it actually became effective in 1990 before these other regulations came out. We also have had many other existing requirements: i.e., manning requirements, personal flotation device (PFD) requirements, fire fighting, and casualty reporting requirements.

We have talked a lot about Coast Guard casualty numbers and the Main Casualty Data Base (CASMAIN) program that our headquarters uses to track marine casualties. Keep in mind, there has been a requirement on the books for many years that casualties be reported. There is a

$1,000 civil penalty for not reporting them. There are two requirements:

1. To immediately report to the Coast Guard that you have had a casualty.
2. Within five days to submit the casualty report on the form CG-2692.

I think someone asked yesterday what is the motivation to submit these casualty reports. That is it. There is a penalty if you do not make the report, and if we had sufficient enforcement personnel to get out there after everybody, we would have many more casualties reported.

As you know, the Commercial Fishing Industry Vessel Safety Act was enacted in September of 1988. That Act told the Coast Guard to write regulations. The Congress does not usually pass a law that immediately goes into effect. We started with an Advance Notice of Proposed Rulemaking in December of 1988.

We took public comment on that proposal and, for the areas where we had flexibility to specify what was needed to implement the Congress's law, we modified the original proposed regulations. Then in April of 1990, we published a Notice of Proposed Rulemaking (NPRM), which was essentially a draft of the regulations.

The Coast Guard took comments again on the NPRM, and held 13 public hearings, four of which were in Alaska. As many fishermen will tell you, the public hearings were held in the middle of August — right in the middle of salmon season and the attendance by fishermen was very poor. But, we did get substantial comments on the NPRM. Over 500 comments were submitted and considered, and many of those from Alaska helped modify the regulations.

TRAINING

In the development of the regulations, one area that I feel very strongly about is in the center of our safety triangle — training. The law that the Congress passed was unclear regarding the need for training.

There are three little words in the law that a number of us focused on that told us that training could be required in the regulations. Those words are "and use of" in the section applicable to the documented vessels that go outside the boundary lines or that carry more than 16 people. With those three words, we said that there is a standard that requires training in the use of safety equipment. It does not go as far as requiring a licensed operator, but at least the people on board the vessel should know how to use their safety gear.

The regulations require three levels of training, a basic safety orientation for new people, mandatory monthly instruction, and monthly drills for the documented vessels that go outside the boundary lines or that operate anywhere with more than 16 people.

Reading the new regulations can be difficult. I call the final rule, the Coast Guard's 1040 IRS form. Sit down at night and read this before going to bed and, after you have read about the five different classes of vessels, twice, in different ways, you will be sound asleep. There is a lot of information in here. It is probably better than going through the whole Code of Federal Regulations (CFR) and the law — pulling out things, but it is a challenge.

We also have a pretty red, white, and blue pamphlet, which is like the 1040 IRS form after your tax preparer has helped you through it. It is a little bit easier to understand, there are more pictures, and it is more concise then the regulations.

GEOGRAPHICAL ZONES

Several factors make the regulations confusing. As a fisherman goes farther away from shore, the requirements increase.

Openings to the Sea

Where the opening to the sea is less than two miles across, there are very few requirements beyond the ones existing before the 1988 Act. The Port of Valdez would be an example of such an area.

Then, when you go through the narrows out into Prince William Sound, where the opening to the sea is more than 2 miles across, your requirements suddenly increase. The major requirements that increase at that point are that you are required to have survival suits for everyone on board and also to have distress signals.

> The initial fishing vessel safety law was proposed to the Congress back in the 1940's. That effort was stopped because of World War II when other priorities took precedence.

Boundary Lines

The next zone is defined by lines called "boundary lines." The Congress made my job difficult by using these lines as they are not found on any charts. For many areas the boundary lines follow the coastline and point-to-point across the headlands. There are also a number of very specific lines that are published in the regulations where the headlands are not clear. Using Prince William Sound again as an example, the boundary lines join the off-shore islands and enclose the Sound.

The Territorial Sea

The 3-Nautical-Mile Line, at the outer edge of the Territorial Sea, defines the next zone. Many requirements, such as that for carrying an EPIRB, start at this line. The 12-nautical-mile line currently defines the outer limit of the survival craft exemption zone. If you sail with less than four people on board and you stay within the 12-Nautical-Mile Line, you are not required to have a survival craft at this time. At 20 miles offshore, the life raft and radio requirements change for documented vessels and similarly at 50 and the 100 miles — the requirements change again.

So, again, it is like your tax forms, there are exemptions and deductions that you can take if you know where you are operating and know that the lines are important. They are one of the major variables used to determine which exemptions are applicable to specific fishing operations. In determining which rules apply, you must know where you will be operating.

VESSEL REQUIREMENTS

The other main variable that is used to determine what applies to any particular operation is spelled out in the Table of Contents in this pamphlet, the *Federal Requirements for Commercial Fishing Industry Vessels*. It has colored tabs down the side of the book.

The first tab, the "All Vessel" classification with the blue tab, applies to the majority of the vessels. It does not matter whether you are a documented vessel or a state registered vessel, and it usually does not matter where you are operating; these requirements apply.

The second major category, the *additional requirements for documented vessels that operate*

beyond the boundary line or on any waters with more than 16 people, contains the majority of new requirements. If you are operating a small 36-foot-fishing vessel, for example, and you go beyond that boundary line, your requirements have gone up substantially. It was recognized in the rulemaking process that this group of fishermen would be hit the hardest in the pocketbook. These requirements have the red tabs in the Table of Contents. The requirements for the majority of existing vessels are contained under these first two tabs.

The next three categories are for the relatively new vessels and those that have undergone a major conversion. The additional requirements for vessels that are built or that undergo a major conversion after September 1991 are covered under the next tab.

The last phrase under this tab is "*and that operate with more than 16 persons on board.*" If you are building a new skiff tomorrow, you are not going to be regulated under this section. If your vessel carries more than 16 people, however, many requirements apply. This category contains requirements equivalent to those for an inspected vessel.

The next tab covers the stability requirements for certain vessels. It applies to new vessels and to those that are substantially altered or undergo a major conversion after September 1991.

The last tab covers the requirements for fish processor vessels. That includes a biennial examination requirement to determine compliance with these regulations and a requirement to carry a Certificate of Compliance. For new processors, there are also additional requirements for being classed by the American Bureau of Shipping (ABS) or similar organizations.

An additional set of requirements, that is often over-looked, is found on page 33 of this pamphlet under "Other federal laws...". These are existing regulations that are also applicable, and I fought personally to get them listed in this pamphlet. Initially, it was a book of only the new regulations.

I argued that we needed a document similar to the checklists handed out throughout the 17th District that goes not only into new requirements, but also into the existing requirements. With either the pamphlet or our Alaska checklists, you can self-check your boat and know what the boarding officer is going to ask before he gets aboard. I think it is very important that we all work from the same sheet of music so that you know what we want and are ready, willing, and able to give it to us.

I hope that makes the new requirements a little bit clearer. If you pick up this final rule and read it from cover to cover, you may think everything applies; it is not easy.

ALL VESSEL REQUIREMENTS

What applies? In the pamphlet, I used the term "All Vessels" loosely because there are exceptions where it does not apply to all vessels as shown in Table I.

Immersion Suits

"Immersion Suits" (commonly called survival suits) are one of the major requirements that affect the Alaskan fishery. The only vessels that are not required to have immersion suits for everyone on board are boats that operate in an area where the opening to the sea is less than two miles across. I cannot think of any boat, other than one up the rivers, that falls into that category.

You are no longer required to carry PFDs in addition to survival

suits — survival suits definitely substitute and are preferred over PFDs. They are probably the major new product in the last 20 or 30 years that has contributed most to the saving of fisher lives.

Table I. Requirements for All Commercial Fishing Vessels, Alaska.

Item	Effective Date
Immersion suits & PFDs	Nov 15,1991
Ring life buoys	Nov 15,1991
EPIRB (vessels beyond 3nm)	May 17, 1990
Survival craft	
documented	Sep 1, 1992
undocumented	Sep 1, 1992
Equipment marking	Sep 1, 1992
Maintenance and inspection of lifesaving equipment .	Sep 15, 1992
Distress signals	Nov 15, 1991
Portable fire extinguishers (≥65ft) .	Sep 15, 1992
Injury placard (≥65ft) . . .	Sep 15, 1992

— Refer to 46 CFR Part 28 and other checklists and pamphlets for specific requirements and exemptions.

Life Buoys

"Ring Life Buoys" are required on all boats of 26 feet and longer. If the vessel is over 16 feet and under 26 feet in length, at least one buoyant cushion, similar to that carried on a recreational boat, or a ring life buoy is required. The number of required ring life buoys goes up to three for vessels 65 feet and longer.

Electronic Positioning

"EPIRB" requirements, that were in effect prior to the Commercial Fishing Industry Vessel Safety Act of 1988 under a different law, affect boats that operate beyond the 3-nautical-mile line.

EPIRBs are another one of the proven products that may save your life. You can use it to call the Coast Guard for help more efficiently than by almost any other means. There is currently an exemption in the EPIRB rule for a vessel that has neither galley nor berthing spaces.

Galley and Berthing Spaces

The definitions of "galley" and "berthing spaces" have been very controversial, particularly for the smaller boats. If any of you would like to discuss that issue further, please see me later.

Survival Craft

"Survival Craft" requirements are next. They are very necessary as I illustrated with the triangle at the beginning of my talk. Inflatable life rafts, the primary survival craft on fishing vessels, are another one of the major life-saving devices. Currently there are also many exemptions that allow boats to operate without them. The primary exemption is for vessels that operate within 12 miles of shore and with less than four people on board.

> Ten that I know of were rescued just in September by the use of survival suits, EPIRBs, and life rafts. Twenty years ago, those ten would predictably be dead.

A Supplemental Notice of Proposed Rulemaking (SNPRM) will soon readdress this exemption. It is not an easy rule to explain. If you are trying to decide which life raft to buy today or during this show, you may want to talk to us so you can get it right the first time. The requirement for equipment packed in the life raft is particularly complicated.

The "Stowage of Survival Craft" requirement just means that if you operate beyond 20 miles offshore,

you must have a float-free inflatable life raft. The survival craft requirements also went into effect on September 1, 1992, for only documented vessels operating in this North Pacific area.

Markings

The "Markings" requirement just went into effect on September 1, 1992.

Equipment Maintenance

"Maintenance and Inspection of Lifesaving Equipment" is just common sense. It is the master's responsibility to keep his gear in order and ready for immediate use.

Distress Signals

"Distress Signals" are also very important. They are proven lifesavers. It is the same requirement as for a recreational boat until you cross that 3-Nautical-Mile Line that is marked on charts.

Outside that line more distress signals, including at least three parachute flares, six hand-held flares, and three smoke signals are required. Vessels operating more than 50 miles offshore must carry "SOLAS" grade distress signals.

Fire Extinguishers

The "Portable Fire Extinguisher" requirement has not changed a bit for boats under 65 feet. If you have a boat 65 feet or longer, however, you have a very complicated table to figure out how many you need and where you need them.

I suggest if you have a boat 65 feet or longer, that you contact a Coast Guard Marine Safety Office and get a written agreement concerning the required number and location of extinguishers for your vessel. I will talk a little later about a Dockside Examination Program that provides an excellent opportunity to resolve issues like these fire extinguisher requirements.

Injury Placard

An "Injury Placard," which tells the crew to report any injury or illness to the skipper of the boat within seven days after its occurrence, is also required. As you can imagine, it is good protection for the owner and operator of the boat. That summarizes the easy "All Vessel" requirements.

SPECIAL VESSEL REQUIREMENTS

I am not sure if I have time to go into detail on these requirements in the second category — the red tabs in the pamphlet.

Firefighter Outfits

For the big boats, two "Fireman's Outfits" are required if you are carrying more than 49 people on board. Two "Self-Contained Breathing Apparatus" (SCBA) with spare cylinders are required if you have any ammonia refrigeration system on board.

First Aid

"First Aid Equipment and Training" is the next requirement. The training requirements for CPR and first aid go into effect for boats that have more than two people on board on September 1, 1993. Again, it is for documented vessels only. For you folks who operate smaller boats, remember that this is a "standard of care" that has been established in regulations as proven to save lives. There may be a civil court out there that will hold you to this standard, even though the regulation does not apply.

Guards

"Guards" for exposed hazards are obviously needed. We now have a

specific regulation that requires guards on exposed hazards.

Navigation

The "Navigational Information" requirement is complicated. Reference books are required, like the *Coast Pilot, Tide Tables*, and *Light List*, but the main part of the requirement to have an adequate chart on board is so you can navigate safely.

Equipment

A "Magnetic Compass" is required so that you can find your way.

"Anchors and Radar Reflectors" are important; no fisherman would go to sea without at least an anchor. I think!

The "General Alarm System" requirement is, again, for the bigger boats — those where you cannot call to everyone on board from the operating station and let them know that an emergency is happening.

The "Communication Equipment" requirement is one that I feel should have been included in the "All Vessel" category, but it ended here. The basic requirement is for a VHF radio when you go beyond the Boundary Line (or anywhere with over 16 people).

Beyond 20 miles offshore, in addition to the VHF radio, a single side band radio is also required. But, again, that is a complicated rule. You need to read it carefully to see how it applies to your vessel.

"High Water Alarm" requirements apply to boats 36 feet and longer. Again, they are a proven life-saver.

"Bilge Pumping Systems" are also required. It always amazes me that a pump is the first thing that the Coast Guard has to fly out to a sinking boat. Why are not suitable portable pumps for dewatering carried on every fishing boat? It is one of the major reasons why we are losing boats and lives.

"Electronic Position-fixing Devices" are required on vessels 79 feet or more in length. It is like LORAN and GPS.

Emergency Training

Lastly are the requirements for "Emergency Instructions, Drills, and Safety Orientations." These are required right now. There is no question that you have to conduct drills and give instruction to your crew and give safety orientations to the new people on board. Depending on the number of people on board, some of these emergency instructions have to be posted. If you have less than four people, you can put the instructions in a binder and keep them readily available.

There are a number of organizations that produce standard formats for emergency instructions. They are good, but they should also be tailored to your particular operation. It is one thing just to put up something that you bought, and it is another thing to identify how it applies to your particular boat. It is not easy, but it does not take a college education either.

OTHER PROGRAMS

I have mentioned that we are here to help. We are trying to be more in the educational mode.

Dockside Examinations

The Dockside Exam Program that was initiated this year is a way that you can have your boat checked by the Coast Guard and receive a decal and confirmation that you are in compliance with the regulations.

Our enforcement boarding officers are instructed to consider a decal during their safety equipment check. A decal will not prevent a boarding

by the Coast Guard because we board for many other reasons. We are checking your fish, we are checking for drugs, and we are checking for safety equipment.

For the safety equipment part of it, the decal will help you minimize the time it takes to complete that portion of the boarding and get the Coast Guard on and off your boat as quickly as possible. The exam and decal will also help ensure that your voyage will not be terminated for an especially hazardous condition.

Statistics

Anyone who was here yesterday knows that you have to have statistics of some kind in these presentations. When I started this job in 1987, I was frustrated with our headquarters' CASMAIN data base for casualties. I started keeping my own numbers, mostly because the news media kept asking how many lives have been lost this year! Who were they?

Table II. 17th Coast Guard District, Alaska Commercial Fishing Industry Losses.

Year	Vessels	Lives
1987	41	33
1988	47	39
1989	48	38
1990	37	34
1991	39	37
1992	40*	29*

*As of 30 September 1992.
1992 POB saved : 84 (as of 30 Sep 1992)**
1991 POB saved : 44 (as of 30 Sep 1991)**
**From sunk vessels.

Initially, I had no current data base to answer them. The numbers that I have been keeping are shown in Table II. The average for lives and vessels lost over the last five years is 36 lives and 42 vessels per year. If you graphed it out, it would be a straight line graph, plus or minus two or three either side of the line.

Apparently, there has been no improvement over this period. If you look at the numbers for 1992, you see 40 vessels and 29 lives have already been lost. It looks, at first glance, like we are making no improvement at all with the new regulations. On the positive side, however, this year we have counted 84 lives saved after their vessels sank.

We started keeping track last year of how many people can survive the loss of their vessel when it sinks. At this time last year, there were only 44 saved from sunk vessels. This year we are at 84. Ten that I know of were rescued just in September by the use of survival suits, EPIRB's, and liferafts. Twenty years ago, those ten would predictably be dead. So, there is a significant improvement using these numbers.

CONCLUSION

I mentioned the safety triangle in the beginning of my talk. It contains the equipment items that were primarily used to save these 84 people this year and the 78 total that were saved last year from sunk vessels.

The radio was also one of the most valuable items on many of these boats. A good May Day is worth its weight in gold. Survival suits, liferafts, EPIRBs, pumps, and skiffs have all saved fishermen. They are basic safety equipment.

It may be coincidental that most of these items are now required. I will not be so bold as to say that these fishermen are alive only because of the new regulations, but I believe the new regulations have established a "standard of care" that everyone is accepting. They are similar to the seat belts in our cars.

We hope, we would not think of driving without wearing a seat belt.

I feel that we can make an improvement and reduce casualties if we start reaching into the next generation and educating kids about basic safety equipment. For you parents out there, how many times have your children reminded you to put your seat belt on while you are strapping them in? The same thing should be happening with PFDs.

In Alaska now, for recreational vessels with children under 13 years of age, there is a requirement to wear a PFD. I can see the time coming when children are going to say, "but, Daddy, why aren't you wearing yours?" It is time for that to happen.

"Total quality management" was brought up yesterday. These are new buzz words in the Coast Guard and in many other industries. What I heard the gentlemen say is that it is good business sense to be safe.

Fishermen have a choice. They can ignore the regulations, risk civil penalty action, and risk the loss of their vessel; or they can go the other way and be pro-active and prevent the loss of their vessel, prevent civil lawsuits, and get the Coast Guard on and off their boat as quickly as possible. I think that the latter choice is in their best interest, for both economical and moral reasons. There is no doubt about it in my mind.

What I would like to do now is show you half of a video we made this last year. I will stop it when we get into the Dockside Exam Program and show that portion tomorrow.

[Video playing]

On the video I would like to emphasize that, to keep it simple, we carefully chose the vessel for the animated example so that it would eliminate most exemptions that are available. We used a 37-foot boat with four people on-board going everywhere; requirements for other vessels may be very different. □

A FISHER'S PERSPECTIVE ON FEDERAL REQUIREMENTS FOR FISHING VESSELS

By Mr. Jim W. Herbert

Richard R. Arab: Our next presenter is Jim Herbert. His presentation is entitled a *Fisher's Perspective on Federal Requirements for Fishing Vessels*. Jim Herbert has fished commercially in Alaska for 20 years. During that time he has fished for nearly all species of Alaskan finfish and shellfish with a broad variety of gear and aboard many types of vessels. He holds a master's license from the Coast Guard and Merchant's Mariners Document. Over the years, he has served as a member and chairman of the Homer Fish and Game Advisory Committee. He currently serves on the Board of Directors of the North Pacific Fisherman's Association and the Alaska Marine Safety Education Association. Jim is an original member of the Coast Guard's Commercial Fishing Industry Vessel Advisory Committee. During the winter months, he teaches marine and fisheries classes at the Alaska Vocational and Technical Education Center in Seward, Alaska. Finally, Jim has told us to let you know that his appearance here is possible with the reluctant consent of his wife, Jill, and their year-old son. Mr. Jim Herbert:

Good morning everybody. Following the OSHA people and the Coast Guard reminds me of a small fisherman, a very young man, who became a ward of the State. A judge had to assign him to someone for custody. First the judge said, "I'm going to give you to the Coast Guard."

"No, don't do that, they'll beat me."

"Well, son, the other agency that kind of takes care of small fishermen like you is OSHA. I'm going to give you to them."

"No, please don't do that. They'll beat me."

"Young man, you have to go to somebody. Who do you want to go to?"

"Well, give me to the Seattle Seahawks, they never beat anybody."

I was supposed to give a speech on how fishermen are reacting to Coast Guard regulations. After listening to statistics yesterday, which I believe are important, I think people still have a misconception about what is actually going on out there. One of the questions I have down on my prepared remarks was, "Who really likes to be regulated? Do you like to be told what to do?" Most of us do not.

As a group, commercial fisherman are a rather crusty and independent lot. Be they males or females, they are particularly resentful of having people tell them what to do. An industry that has been essentially unregulated for so many years suddenly has fairly stringent regulations come down on it. This is bound to create a certain amount of resentment.

I think most of you realize that the Coast Guard has been fairly heavy handed with the marine industry in regards to the zero tolerance program, and that generated a lot of bad feelings. Usually, when I am speaking to folks, there are a lot of Coast Guard personnel in the audience. Today there are not. The other uniforms I see are not directly

involved with the regulation of commercial fishermen.

I think it is important in terms of feedback that the fishing industry has a mixed impression of what the Coast Guard does for them. You saw rescues being effected in that last video and that is very desirable — the angel part of the Coast Guard.

Yet, when a young Ensign comes aboard with that 45 on his hip and says, "I'm going to check your boat," there is a certain amount of intimidation associated with that boarding. Part of the education process that is going on is balancing out those two faces, the enforcer and the rescuer.

THE FISHING INDUSTRY

I think what I would like to do with much of the time that has been allotted to me is show you some pictures. Some of you folks are not too familiar with the fisheries here in Alaska. I hope some of my comments will put things in perspective.



Figure 1. Vessel on Trailer in Front of a Barn.

As you heard yesterday, the industry is extremely varied. We have multi-million dollar factory trawlers and we have little skiffs built out of plywood. They are all considered fishing vessels. They all come under the Fishing Industry Vessel Safety Act of 1988.

Figure 1 is not an Alaskan vessel. I took that photograph in Newfoundland. I thought that it captured the spirit of a lot of first-time fishermen. They have the notion that they have bought a boat, they are going to go out there and do battle with King Neptune, and they have got it together.

I think many of us here in the audience have spent time at sea, and we know that the ocean really does not care. The fisherman in this case, has an attitude that he is going to be able to take care of things, but "moxie" is not enough.



Figure 2. Wooden Seine Vessel.

In Kodiak, there is a broad range of vessels. Figure 2 shows one type of fishing vessel, an older wooden vessel. It has a salmon seine net on the stern and a skiff behind. She is located in a small community on the western side of Kodiak Island called Larson Bay.

This vessel was probably built in the early 1950's. It still fishes today. It does not spend too much time very far off shore. The dollar value, if you were to reach into your pocket and buy that boat without its gear and without its salmon permit, is probably on the order of $60,000. That is a relatively inexpensive fishing vessel in Alaska.

Figure 3 shows another salmon seining vessel from Kodiak. This one

is called the *Crimson Beauty*; it is relatively new, made out of fiberglass. It has a pair of powerful engines and probably makes about 25 knots. This vessel probably cost on the order of $700,000.

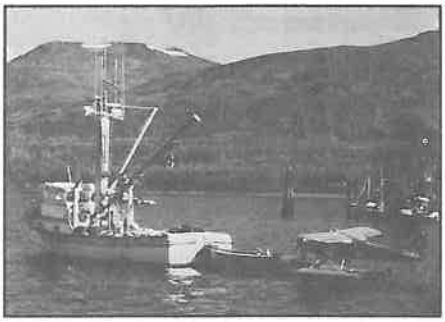


Figure 3. Fiberglass Vessel, Skiff, and Float Plane.

Now, these two vessels both fish for the same species. Perhaps this vessel, the *Crimson Beauty*, has a more integrated operation. Overall, you would expect this fellow to have a lot more safety equipment because there is more money available. Indeed, that seems to be the case.

Look how complicated fishing gets. Not only does he have the same net and the skiff as the boat in the other picture, but in this case, he has got a plane tied off to the stern because that plane is involved in spotting fish.

The vessels in the background probably run the gamut between that older wooden one and this modern, expensive vessel.

I was fishing down at Red River, a red salmon area on the lower end of Kodiak, and one boat was fishing close to the beach. In fact, he was in the breakers, and he is a very experienced guy. He has been seining there many years, and he is known for his daring-do activities. But, on this day, with his relatively new boat, he managed to lose it in the surf, as shown in Figure 4. My seine skiff is in there, and these other boats were all attempting to get him off.

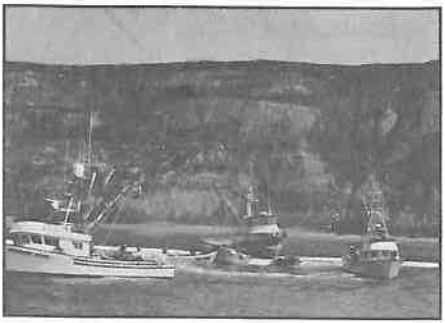


Figure 4. Three Boats, One on the Beach.

Peggy (Barry) mentioned in her opening remarks about a sense of greed. Well, fishermen are a greedy lot. By golly, if there is one fish out there and you and I are the only two that are left fishing, I want to be the one that gets that fish. That was indeed his attitude.



Figure 5. Vessel Steaming in Sloppy Weather.

He wanted to be the one to get the fish right there in the surf. Ironically, he did get pulled off with no appreciable damage. However, he did not even haul in his seine once he got off the beach.

He immediately assumed the same position he had before he was on the beach and continued fishing. He did not terminate his operation. He did not inspect because there were still fish running, and he wanted to get them. There was not much of a thank you to the people who helped him.



Figure 6. View Through Pilot House Window.

You have seen a lot of pictures of vessels, and Figure 5 shows one I took last summer in Bristol Bay. It is a typical sloppy day. This is a shallow body of water and often very choppy.



Figure 7. Water Obscuring the View Through Window.

On this day it was blowing a bit, and visibility was low. Here is a fish tender vessel, probably a 65-footer with a dollar value of $400,000 – $500,000 steaming to the grounds.

Figure 6 is a view through the wheel house window of my boat in early September, near the mouth of Cook Inlet. It is choppy. It was probably blowing about 25 or 30 (knots) just off shore. That is what we were looking at. Of course, I would have to grab everyone's chair and shake it, to give you the full effect.

Figure 7 shows what I was looking at almost half the time. It was very choppy, and we were bucking into it. Waves were coming over the bow, and I just was not seeing. These are things that do not necessarily show up in statistics.



Figure 8. Winter Scene of Frozen Bering Sea.

I will just remind some of the statisticians that you probably would not see a high incidence of vessel losses off Unalakleet in the winter. As shown in Figure 8, the Bering Sea freezes this far north, so keep that in mind when you do your statistics.

Figure 9 shows the *Northern Eagle*. We have moved to the other end of the scale of commercial fishing vessels in the North Pacific. The *Northern Eagle* is one of about 60 factory trawlers. It is a surimi vessel. We have talked about that; the fish paste, which is going to be

found in all kinds of food before too long.

The *Northern Eagle* is, I believe, about 275 feet long, has a crew of roughly 100, sometimes more, sometimes less. This is an expensive piece of metal; multi-million dollars. Until now we have been looking at sole proprietor enterprises. Now, we are looking at a corporate entity.



Figure 9. *Northern Eagle*, Bow Shot.

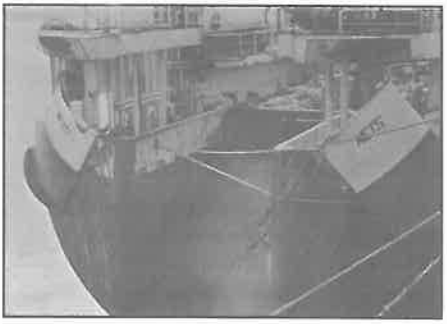


Figure 10. *Northern Eagle*, Stern Ramp.

Figure 10 shows the stern ramp of the same *Northern Eagle*, and I will remind you that the stern ramp concept was evolved by the Soviets when they were whaling. That is how they would drag whales aboard their factory whaling ships. Clever people realized it was a good way to bring nets aboard. It revolutionized fishing first in the North Atlantic and then everywhere.

The doors on the stern, those big steel plates, are part of the trawling operation. These are very sophisticated operations: a floating fish catching machine that then processes its catch.

The decks on the vessels, shown in Figure 11, are full of gear. They do not go back to port except to unload and reprovision some of their consumables. They usually pack a large number of spare nets, cable, and other fishing gear. In terms of stability, there is a lot to worry about.



Figure 11. Gear on Deck of Factory Trawler.

Just to give you an idea of the scale, Figure 12 shows that same *Northern Eagle*. Here is a welder doing some minor work. He happened to be cleaning the tip of his torch and sat down on the bottom on this trawl door.

By the way, the brand of this door is called a "Fish Buster." Its height is probably about 14 feet, which gives you an idea of the horsepower that is required to pull some of this gear through the water.

Nets can be huge. Their mouths are easily the size of a basketball court, with some of the biggest the size of a football field. This means

huge fishing capability. Figure 13 shows the trawl deck of the same large factory ship. The controls are located there to bring the net aboard. You can see some gear on deck.

There is a fair amount of protection from the elements here, but by the same token, when the openings are on, these vessels regularly are going to be fishing in very tough weather. All in all, they are very safe vessels and very efficient catching machines. They also have the most onerous regulations to comply with compared to smaller vessels.



Figure 12. Man Sitting on Trawl Door.

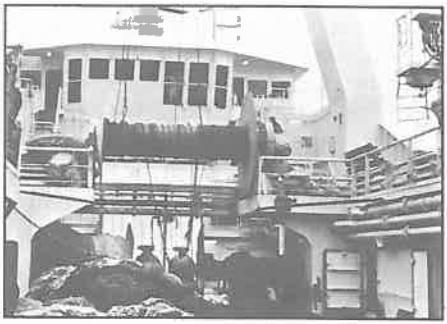


Figure 13. Trawl Deck of a Factory Trawler.

Inside these vessels, there are complicated processing lines, as shown in Figure 14. Shown in that photograph are horizontal plate freezers, conveyor belts, and the huge capability of reducing whole fish into filets, surimi, meal, and oil. The majority of the workers on these boats are fish processors.

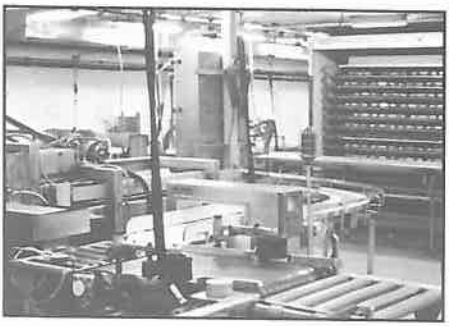


Figure 14. Processing Deck of Factory Trawler.

Large vessels have large and involved mechanical plants, as shown in Figure 15. There are refrigeration, hydraulic, and electrical systems. There are many different kinds of engines. To a certain extent these are regulated under the new Fishing Industry Vessel Safety Act. Some of the requirements just make good sense: safety railings, good guards, things like that.

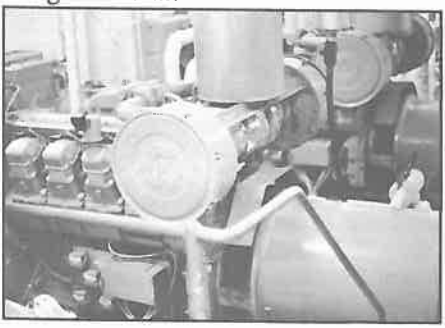


Figure 15. Generators and Engines.

Figure 16 is not the skipper of the boat who is looking at the color machine. It just happened to be a young man on board. The Coast

Guard regulations put relatively little emphasis in their regulations on electronic instruments, whether they be navigation, fishing finding, or whatnot.



Figure 16. Boy Standing in Front of Electronics.

Fishermen realize the importance of these things to catch fish and invest heavily in electronics. Right there, you are probably looking at $250,000 worth of electronics. Very expensive, but very important to catch fish be they mid-water or bottom fish.

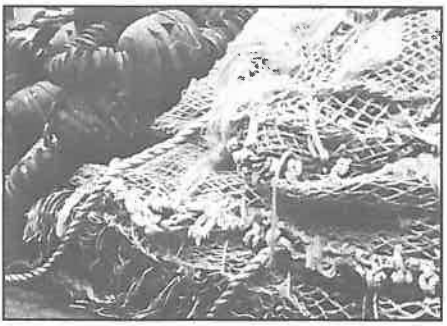


Figure 17. Nets in a Pile.

The gear on these nets is quite heavy. You can see in Figure 17 a chain along the side of the net about half way down. In the upper left, there is some of the gear that makes contact with the bottom: very massive. There are tremendous strains on all this equipment which result in some of the injuries that were alluded to yesterday.

Studies in eastern Canada show that as the fisheries got bigger and more aggressive, the nature of injuries became progressively more and more severe. This was because the forces involved, the weather and equipment, were on a much greater scale than when people were using their small boats near shore. That relates to some of those statistics that Ben showed us yesterday concerning increasing crew size in certain fisheries.



Figure 18. *Diamond Head* Tied to a Dock in King Cove.

The vessel in the foreground in Figure 18 is the one that I was working on this summer. The *Diamond Head* is a mud boat. Mud boats are vessels that had former service in the Gulf of Mexico delivering supplies to offshore oil rigs. The oil patch began to shrivel and wilt at the same time the Alaska fisheries were beginning to rebound from the king crab slump.

These became a prime piece of nautical material upon which to build a new enterprise. The *Diamond Head* is about 135 feet long and measures 198 gross tons. Being less than 200 gross tons is an important consideration in light of Coast Guard

regulations. The owner spent something like $500,000 doing work on this boat last spring. You can see there are two cranes on the deck there because this vessel spends most of its year fishing for opileo crab, which is the smaller species of tanner crab in the Bering Sea.

You see forward there is a bulbous bow. Extensive replating was done. Earlier in its history it had been re-engined with about 1,300 horsepower between two main engines. There are four generator sets aboard.



Figure 19. Stacks of Crab Pots.

When it first came up from the Gulf the stack houses were at a lower level. They were increased in height to enhance stability.

A lot of modifications were done to this boat, and it was issued a Coast Guard's compliance sticker to show that it had all the proper equipment.

That is not necessarily the case with most vessels in Alaska. I believe less than 600 of those stickers were issued, and there are over 6,000 documented fishing vessels in the state. That is not a great record.

The owner of the *Diamond Head* tells the joke that he owns a million dollar boat, but it cost him $2 million. This means that he bought it for less than a million dollars, but by the time he got done over a series of years making the improvements he wanted to get it to this state, it was more than $2 million invested. It has a market value of $800,000 - $1,000,000. On the bright side, this vessel in its best year grossed over a million dollars, but there is a huge overhead. For example, it burns 1,000 gallons of fuel a day.

Behind it, there is another type of vessel. It was built by Marco, a manufacturer from Seattle with a very good reputation. You can see life rafts on the roof and sodium lights for fishing at night. This class of vessel fishes crab out West. The picture in Figure 19 was taken out in King Cove, which is on the Alaskan Peninsula.

In King Cove, as in Dutch Harbor and as in the Pribilof Islands, there are places where crab pots seem to grow mysteriously out of the ground. They are everywhere, thousands and thousand of them.

There is no question in my mind about the statistics concerning the effort in the crab fisheries. You just have to fly into any of those communities, and you know that crab is still king. There is a lot of money being made.

> "I don't need this little pamphlet. What I need is a list for my boat."

From the injury point of view, you can see why these pots are dangerous. Each one of them probably weighs 700 or 800 pounds. They are usually handled on a wet deck in the winter. Often there are severe icing conditions. On a good day in the Bering Sea, it is blowing 35 to 40 (knots); on bad days, boats like the *Diamond Head* are regularly working gear when it is 50 or 60 knots. This is not fun, but because

people can make good money, they work on the edge.

CONTROLLING RISKS

One of the risks is in maintaining a stable vessel. Virtually all of the large boats that fish in the crab fleet have stability reports, data that are mandated by their insurance companies. It is a rather onerous document, very complicated and fairly costly to produce.

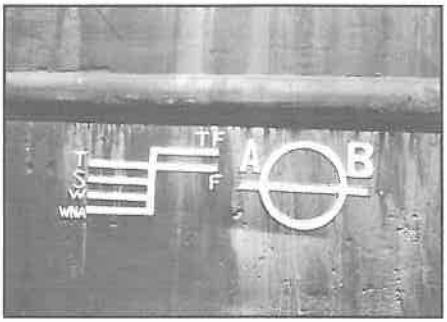


Figure 20. Load Line, Plimsol Mark.

Even on my little boat, a 42-foot steel seiner, it cost me about $1,500 to have a fairly abbreviated stability report done. In my case , it was not required. It was just for my own piece of mind.

On other vessels like the *Ocean Dawn*, it was required by the insurance company. Like a lot of things, unless you have good knowledge of how to use this tool, it is not worth a lot.

Some larger vessels are subject to load lining. In Figure 20, you see the markings on the sides of the vessels, which is the result of an even more costly process and something that was resisted by some of the fleet. There have been discussions with the Coast Guard and private industry concerning the appropriateness of load lines for various classes of vessels. We will probably hear more about this in the future. There is basic agreement that the integrity of the hull is probably the single most important factor in terms of load lining.

As the vessel shown in Figure 21 was leaving King Cove, I said, "Gee, you've got an awful lot of stuff on deck. Do you think you have too much?"

"Oh, she can pack it."

This vessel was a salmon tender and they were going go to Seattle with a deckload of trawl equipment. Just before they left the dock, I saw a crewman walk from one side to the other and, in doing that, the vessel took an appreciable list. A 180-pound person walking from one side to the other caused a list!

When they left town, they could not fill their crab tank with water without having negative freeboard. What they did instead was fill the hold bladder with buoys to create a void. By doing that, they were able to get at least a modicum of freeboard.

There were several people besides myself who said, "Hey, you guys think you're doing the right thing?"

"Yeah. She can really pack, can't she."

I do not even know if she made it to Seattle. This is indicative of what you see out there now and again. I am not saying it's the



Figure 21. Stern View of Heavily Laden Vessel.

norm, but it is something that makes people with a bit of knowledge real nervous. Figure 22 shows the sticker, which I proudly display on my boat. Even though I have been involved in this whole regulatory process for three years, it still took three visits by the inspection team until I got mine.

I appreciate very much, as do most fishermen, the positive attitude and the educational aspect of the Coast Guard. For example with me, my anchor was not working. It was all torn apart, and, between fighting with a machinist and this and that, the inspectors had to come back. I have heard it from several people, "Yeah, I got it, but those guys had to hold my hand to make sure I did everything right."

I would like to make a suggestion to the Coast Guard and NIOSH if you get involved in encouraging compliance with regulations. Fishermen are not stupid, but they need to have a clear game plan.



Figure 22. Coast Guard Inspection Sticker.

A woman, who with her husband, owns several very large boats, told me, "I do not need this little pamphlet (the one that Glenn Sicks showed us). What I need is a list for my boat."

Along those lines, a private firm has worked with the Coast Guard to produce a computer program in which you enter your vessel, your size, where you will fish, how many persons on board, etc. Hit the enter key, and it is supposed to give you a reasonably true printout of the exact equipment required of your boat.

That is the thing that we need at a show like this. You also need to have somebody run around with a gorilla suit waving people in so they see what is going on. You have got to be salesmen.

I wanted to throw out some costs and suggest why people balk at some of these fishing regulations. Most people reluctantly comply, but they do it. Figure 23 shows the flares that I have on my rig: three parachute rockets, three smokes, and six handheld flares.



Figure 23. Collection of Flares.

I will not give you a lecture on the relative merits of these things, but each of the flares has a date on it. After three years I will have to buy a complete new set. This collection of flares cost me on the order of $200. Heaven forbid, I am ever going to need to use them. I would be very happy to have them at that time.

Figure 24 shows an inflatable liferaft. This one, at least, has its link attached to the boat. Some people forget to do that. If you were

to buy a Coast Guard approved six-person raft, you would spend a minimum of $4,000, maybe up to $5,500.

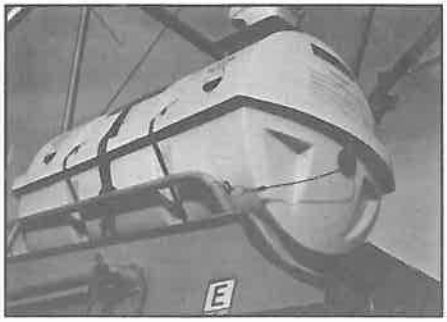


Figure 24. Inflatable Liferaft in a Canister.

Annually it will cost about $500 to repack. That assumes that it does not need anything significant, just a few batteries or a few bags of water. That is one of the big ticket items that has people grumbling. In a supplemental rule making we will see more clarification or more regulations on life rafts.



Figure 25. Many Antennas on the Roof of a Vessel.

The EPIRB, which Glenn (Sicks) talked about, is another fairly big ticket item. Do not leave home without it. Nonetheless, they will cost you anywhere between $1,000 and $2,000.

Looks like the antenna farm shown in Figure 25 is doing okay. Lots of growth on the wheel house of this boat. As I said, communication equipment is something that fishermen value. They want to have their secret radio channels to talk to their partners and families. They need back-up radios if they are going far from shore. Communication equipment by and large is not a problem on fishing boats.

We know that there are problems out there. It is time to get on with solving them. That is indeed what some of the safety equipment is for, and that is what these people, shown in Figure 26, are doing in the swimming pool.

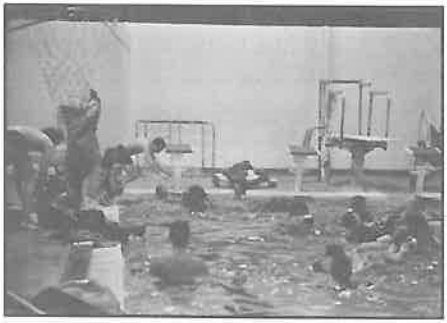


Figure 26. Safety Training in a Swimming Pool.

They are trying on different kinds of PFDs: work suits, and immersion suits, all in a safe, cozy environment, a swimming pool. People usually have a lot of fun.

Kids especially get off on this. To them, it is all a big game. By the time they follow in their parent's footsteps, or join a crew, they have already got great confidence and familiarity with this equipment whereas mom and dad are just learning.

When you take people out in the field, sometimes things happen,

things that do not necessarily happen on a video. Figure 27 shows an exercise I conducted where the painter on this life raft fouled.



Figure 27. Liferaft with Fouled Painter.

You see the person using a pair of pliers to break the metal band that holds the liferaft canister together. This is a non-standard procedure, but, boy, it is something a person better be exposed to at some point, because it could happen to you.

Now, getting away from the swimming pool, you people, a little more of a dose of reality. Figure 28 shows some people down in Corky's (McCorkle) country in Kodiak who are beginning to take a dip there in their survival suits. They had instruction on the shore, but now they are going to see how these things perform in the ocean.



Figure 28. People Entering Water in Immersion Suits.

Figure 29 shows that this is a lot different from a swimming pool. There were enough waves, the water was cold, there was current, and there were things going on that people began to sense a little more what their suits could or could not do for them. They could experience difficulties of getting in and out of a raft. All in all, it is training and education.



Figure 29. Raft and People Offshore.

The vapor trail shown in Figure 30 is the aftermath of a parachute rocket going off. In training programs, a very good way to impress people is to shoot off some parachute rockets.



Figure 30. Person Launching a Flare.

Once they compare a hand-held flare with a parachute rocket they realize the $40 that you spend for that rocket is going to be well-spent. Just

telling someone that they need to have three parachute rockets does not mean enough. They need to be able to use them.



Figure 31. People Putting Out a Fire.

The school I work at in the winter put on the fire training exercise in Homer, Alaska, which is shown in Figure 31. We had the local Fire Department for safety back-up. One of our instructors is in the black outfit, and those are two fishermen in silver suits going in to put out fires with extinguishers.

We all have heard the little song and dance about putting out fires. We pull the pin, squeeze, and sweep. But, when you get up close to a diesel fire of this magnitude, and realize that you can do something about it, you gain a sense of confidence that you do not get by watching a video.



Figure 32. People Working on a Seine.

The Coast Guard H-3 helicopters are very often used in Alaska to effect rescues such as pulling people out of the water. Let us hope that nobody ever has to be in that position, but people definitely need to be aware of how to respond when the Coast Guard arrives, if by chance you are the one in the water. Fishermen are folks. Figure 32 shows three people at the end of the salmon season this year in Sand Point stacking their seine. A relatively young man on top of the pile, the older man to the left, and the skipper are off running around doing what skippers do best, talking.

These are the people who we are talking about: real individuals. They are not numbers on graphs. They are people who are trying to make their money at a very arduous profession.

Figure 33 shows people who do a lot of manual work, such as baiting hooks, thousands of hooks. This is my boat on a halibut trip last year: lots of gear and lots of drudgery.

When you are out there, fishing can be grim. It is just no fun a lot of times. You just want to get home. But, when you get back on the beach, all you can talk about is fishing.

Then there are those days when you have managed to pull up some fish, and you have a sense of satisfaction that what you are doing out there gives meaning to your life. There is real production. You have produced a product through the sweat of your brow, and hopefully you have done it in a safe and effective manner.

CONCLUSION

One of my old friends has often said that one day on the water is worth a whole winter talking about it. I was not able to take you out on a fishing boat, but I tried to convey a

sense of some of the Alaska fisheries to you.



Figure 33. Baiting Halibut Hooks.

Perhaps you can understand what the people who are participants in the those fisheries are up against in terms of regulations. It is a complex issue trying to find the right combination of regulations that will not be a burden to the industry, and yet will make it safe.

We should probably try to target the easy issues first. An example would be making sure people know how to use key pieces of survival gear: immersion suits, liferafts, EPIRBs, and radio equipment to give a "Mayday."

As a person coming from the industry, I want to encourage you to keep the lines of communication open. That is what my wife tells me, and it is probably good advice for all of us.

If we can tell each other about problems and solutions in a non-adversarial manner, we will probably go a lot farther toward accomplishing the bottom line, which is to reduce the loss of life and property in the fishing industry. If this begins to have an impact on the industry, I think we will all feel better about it. □

National Fishing Industry Safety and Health (FISH) Workshop
Convened by the National Institute for Occupational Safety and Health
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SAFETY FROM MANAGEMENT'S PERSPECTIVE

By Mr. A.B. "Tony" Ford

Mr. Richard R. Arab: Our next presenter is Tony Ford, whose presentation is entitled *Safety from Management's Perspective*. Tony is the Safety Director for Arctic Alaska Fisheries Corporation, where he is responsible for the safety and health of approximately 1,200 employees on a fleet of 34 vessels. Prior to his current position he was the master of three fishing industry vessels in Alaska and an instructor in celestial navigation, piloting, seamanship, and fire fighting. Tony is retired from the U.S. Coast Guard where he attained the rank of Captain. He attended the U.S. Coast Guard Academy where he received a Bachelor of Science in Engineering. Tony also attended the University of Puget Sound where he earned a Master of Business Administration. Mr. "Tony" Ford:

ABSTRACT

This presentation will focus on a standard corporate safety program modified for a large fishing company. We will also discuss the unique Workers' Compensation system in the maritime community and why it encourages bogus claims. There are four basic elements of a fishing industry corporate safety program. These elements are needed in any size company — be it owners of one boat or an entire fleet. The elements are:

Periodic Safety Audits ▸ This is a comprehensive inspection of each vessel for compliance with the U.S. Coast Guard, OSHA, FCC, EPA, ADEC and other regulations that affect the fishing industry. It also included any company specific policies. The inspection includes a written report and follow-up mechanisms.

On Board Safety Training ▸ This program focuses on drill and instructions required by the Coast Guard, safety practices in the fishing operations and factory, and safety policies peculiar to each vessel. Industrial safety issues such as machine guarding, repetitive motion disorders, and back injuries are also discussed.

Individual Training ▸ Certain classroom training is necessary. Training in alcohol and drug awareness, vessel stability, survival at sea, marine firefighting, industrial safety in the factory, and proper use of shipboard cranes and cargo offloads are examples.

Injury Investigation and Analysis ▸ Analysis of claims is needed to define trends, ensure the employee receives proper medical treatment, and to limit the employer's exposure to liability. The Jones Act is a disincentive to proper accident investigation and analysis.

This morning I would like to take a few minutes and describe to you what we think a model safety program is for any size company, and I mean, any size company, not just a fishing company that has 34 vessels or a fishing company with one vessel. This could be a company that makes widgets.

The concepts of industrial safety programs are pretty constant and standard. All you have to do is find

a way to make variations to suit your own business in your own industry.

Just by way of background, I think our company represents a fairly good spectrum of different types of fishing vessels that you will find in Alaska with the possible exception of the low end of the scale that Jim (Herbert) spent some time discussing. As a matter of information as Richard (Arab) said, we have a fleet of 34 fishing industry vessels ranging from about 79 feet up to 340 feet, with crew sizes anywhere from four people on the low end to 160 people on the high end on board each vessel.

BREAKDOWNS

We have four surimi factory trawlers and ten factory trawlers that do not make surimi. These are in a state of transition at this time because of the nature of the seasons and the nature of the fishery business. We are beginning to put longline shacks on them, and when the trawling season is closed, we hope there is a longline season that is open. They are becoming more multi-purpose vessels than they have ever been before.

Added to the above are 11 crab processing vessels, which are also becoming converted over to longlines when the crab season is not open. We have one large processor, one fish meal boat, five small fishing vessels, and two freighters.

PLAN ELEMENTS

The plan elements of any good safety program are three fold. As I said earlier, it is pretty much standard for any type of safety program. I do not care if you have 34 boats like we do, or you have just one boat, you have to occasionally and periodically inspect or survey your boat, or inspect your fish plant, or inspect your widget plant.

Along with that, you need a good solid on-board training program for your employees, and you have to have what I loosely refer to as people programs. These are the three basic elements that we have and any good safety program for any fishing company will have them as well. I am going to go through these one by one now.

SAFETY SURVEY

The safety survey is done at least once a year, and, we are average, probably close to twice a year. Of what does it consist?

The scope of the program is an attempt to examine that vessel for every possible legal requirement that any agency — federal, state, or local — might have. As such, it will include examining the captain's license to make sure that it has not expired, all fishing permits and licenses, and the certificate of documentation.

We went through a problem not long ago when the company changed addresses. We forgot to change the address on the certificate of documentation. We pick up minor things like that and sometimes some major items. The survey also includes a comprehensive examination of all the U.S. Coast Guard required safety equipment. And, we have adopted some of our own variations to that, and our boats are carrying more than what the Coast Guard requires.

We also make an extensive effort to try to examine the boat for any and all OSHA regulations and requirements, personal protective equipment, hearing conservation, written plans, etc.

Meeting some miscellaneous regulations can be very expensive. For example, Environmental Protection Agency (EPA) regulations on the National Pollution Discharge Elimination System govern the fish

waste that is ground up and put over the side underneath the surface of the water. EPA can penalize you up to $25,000 a day.

We also have the Alaska Department of Environment and Conservation (ADEC), which is primarily concerned with the cleanliness of the fish factory and the galleys. We also have to worry about the Alaska Department of Fish and Game, Federal Communication Commission (FCC), and then there are several other agencies that I probably have missed.

Not only do we do an audit or a safety inspection of the vessel, but a key point in this program is that there is a written inspection report made and given to the vessel management. We follow up on all of these reports. If there is a major safety violation found, like the life raft is out of date, or not enough survival suits, the vessel does not leave port until that major safety violation is corrected. No ifs, ands, or buts. That is it!

What are the results of this safety survey program? Three years ago when we started, when we were getting a Coast Guard boarding, we would find ourselves with a laundry list of major and minor violations. These days if we get a violation, it is an unusual circumstance.

This has two benefits for us. One is that we are assured that we have our boats in the proper condition for safety and survival at sea, and the other one, quite frankly, is an economic decision. The penalties that the Coast Guard is assessing are getting larger and larger, and we recently paid a fine of $5,000 for a relatively minor oil spill. So, we have two things to gain by doing it the right way!

The other thing that we are real proud of is a recent examination by OSHA over in Dutch Harbor. We walked away with zero discrepancies. I hope to do that again in the future. This was a first for us.

ON BOARD TRAINING

By company policy and now Coast Guard regulations, the master must conduct drills and instructions monthly on fire, flooding, abandon ship, man overboard, orientation of new crews, testing of EPIRBs monthly, testing of the general alarm weekly, etc.

There is one other thing that we do in on board training, and this usually happens at least once a year and will happen when a ship comes to Seattle for a major overhaul. Before that vessel leaves port, one or more of my staff and I will spend four to six hours aboard the vessel conducting training in all of the emergency regulations as well as training in OSHA "right to know," personal protective equipment, hearing conservation, and a whole range of industrial safety subjects that are either required or desired.

Much like Jim (Herbert) was showing in his slides earlier with the people in the water in Kodiak, our training is very realistic. We use a 180-pound dummy and a smoke machine. We hide that dummy somewhere on the ship and light off the smoke machine and have at it! Let me tell you, the guys really learn quickly how to put on a self-contained breathing apparatus (SCBA) and a fire suit. It is a non-toxic smoke, which is vaporized mineral oil, and the penalty for not getting the SCBA on right, is a case of the runs the next day! Folks tend to be real careful when we do that! As far as abandon ship training is concerned, we have a lot of well used survival suits that we tote around Dutch Harbor and down in Seattle and some well-used life rafts.

Whether it be Dutch Harbor in February, or Seattle in June, we get the crew into survival suits, we get the liferaft in the water, we get into the water, and practice getting in and out of the boat as well as many of the same things that Jerry Dzugan and Jim Herbert do.

There is no substitute for doing it in Dutch Harbor in February, believe me! You learn a lot about what that suit will do for you!

PEOPLE PROGRAMS

As far as the people programs are concerned, I think this is probably one of our major successes. We have mandatory individual training standards for key vessel personnel as well as the entire crew. The programs that we use to do our training are primarily through the North Pacific Fishing Vessels Owners' Association (NPFVOA).

I will give you one or two good sea stories about how successful these programs have been. About a year and a half or two years ago, we put out a requirement that all our captains and chief engineers had to attend a one-day stability class at the NPFVOA. About two days before the class, I called up Leslie Hughes, and I said, "Well, how many people do we have signed up for this class?" She said, "Two or three."

I went to vessel management and vessel operations and told them about the response. My instructions were to call all the captains and chief engineers and tell them that they did not have a job unless they showed up for class.

We had 17 reluctant, disgruntled students sitting in the room two days later. The neat thing about it is, at the end of the day when they walked out of the room, they were converts!

Sometime later, one of the captains asked me, "You know, I understand how to do the stability now, and I can calculate it with a pencil and piece of paper, it sure would be nice if we had it on a computer, because I really do not have the time to sit down and do the calculations by hand." So, we bought some computer programs and developed some of our own.

That one captain, about three months later, sent me a telex and he said, "Tony, I just made another $80,000 today because of that stability program." What happened was that he was nearing the end of the season, had a full factory of fish, a bag of fish on deck. The fishing was great!

He asked, "Would it be safe if I got another bag on deck before this season's over?" He did his stability calculation on the computer and got a positive answer and another bag of fish on deck before the season was over. That is a successful program.

Fire fighting is another gem! One of the requirements that we have is that every cook and deckhand attend a one-day fire fighting class at the Washington State Fire Training Center in North Bend, Washington. This is a realistic hands-on — light-the-fire, go in there and put it out — type of training.

On Christmas Eve 1991 at 30 minutes after midnight, on the fishing vessel *Gulf Wind*, with 18 people aboard, one of the deckhands who had been to the one-day training was walking past the door to the engine room and sensed something was wrong. We do not know why, perhaps he thought that door felt a little bit warmer than it usually did.

He stopped, opened the door, saw a fire in the engine room, and did everything right. First thing you do is sound the alarm. He sounded the alarm. He grabbed a portable fire

extinguisher and started attacking the fire.

The chief engineer showed up, he grabbed an extinguisher, and they both started fighting the fire. While they are doing that, the deckhands and the cook (who had been to this class) were putting on their fire suits and their SCBA's. The captain had the rest of the troops up in the wheel house, and they went in, and put the fire out.

Nobody got hurt. In my opinion, we averted around $1 million worth of repairs, and God knows how many injuries and fatalities. If that had happened four years ago on many fishing boats, I can guarantee you there would have been a major disaster.

Note also the last five classes on that list: crane operations, cargo operations, trawl deck safety, ergonomics and industrial safety in the factory. This is a relatively new program, and it started at the beginning of this calendar year. NPFVOA is trying to get it off the ground, and it is looking good.

Also, as part of the people programs, we have an orientation program for processors. We are working anywhere from four to eight hours of safety training for processors and hope to have it in place by the first of next year before they leave Seattle to go up to Alaska. That training will include such things as prevention of back injuries, carpal tunnel syndrome, and some of the other normal safety programs and projects that you would expect us to have.

There is also a ship indoctrination program when an employee gets to the vessel. Former company policy, now required by the Coast Guard rules, is a familiarization with the vessel, the location of the safety equipment, and assigned duties during an emergency. We also have a method of communicating our safety policies within the company with a series of safety bulletins.

CONCLUSIONS

It would be logical at this stage to ask the question, "You have been doing this for almost three years, Tony. Does this work?" We have had in this three-year period, a major change in attitudes.

When we first started the program three and a half years ago, when I went to Dutch Harbor, I was the enemy. "Here comes that blankety, blank Ford. What is he going to make us do now?"

I learned something that was very important. I thought the negative attitude was because there was a bunch of people who did not want to change. What I found was the negative attitude was probably a defensive measure.

Rather than having a bunch of people who did not want to be changed, we really had a bunch of people who wanted to be taught how to do it the right way. That is the absolute truth.

For example, I was riding on one of our small boats from a place called Lost Harbor to Dutch Harbor. This is about a four-or five-hour run. The skipper and I had agreed beforehand that we were going to run through our safety drills on the way to Dutch Harbor. We took off from Lost Harbor, and while in the wheelhouse I said, "Well, anytime you want to let it rip, Jack, let us do her."

He kind of himmed and hawed and finally said, "Tony, I really do not know how to do it right. Will you show us?"

That is what it has been, a process of teaching and showing. That man became our biggest ally because we were willing to spend

four hours running through all these emergency evolutions on the boat. When we got to Dutch Harbor, that story hit the grapevine, and that was the beginning of the attitude changes that I spoke about. This has been a tremendously pleasing experience.

Results otherwise? We developed an indexed graph of claims per boat during 1990, when we started in the program. In 1991, we had a very slight decrease in claims per boat. We were just getting started with the program.

In 1992, we had a 44 percent decrease in the number of accidents and injuries aboard vessels in the fleet! That is remarkable, and it is not because of what Tony Ford did or the Safety Department did. It is what these vessel captains and vessel crews do. It is all in their hands, and they are doing a super job!

> We can document that we have saved at least two lives and prevented about a hundred injuries a year.

I figure that we have saved about $2 million out of pocket expense because of the actions some of our crews have made in mitigating the effects of fires and flooding aboard their vessels. We can document that we have saved at least two lives and prevented about a hundred injuries a year. That is the payback for you.

That is the bottom line. That is in the profit and loss statement. Anybody who complains that safety programs cost money, I am going to say "you betcha they do," but they are going to get you a lot more money back in the door when it is all over.

FISHING INDUSTRY CONSTRAINTS

One of the constraints that we have is what is called the Workers' Compensation System for the Marine Industry. Worldwide, it is probably the Cadillac of workers' compensation systems. It gives us some problems over and above the norm that you would expect.

The Jones Act provides for something called maintenance and cure, which is a workers' "comp" function. If an employee gets sick or gets injured in the work place, the employer should be responsible for paying the person while he or she is sick and solving their sick problems. There are, however, added on to this, provisions in some cases for an almost unlimited liability beyond that maintenance and cure, which is a step beyond the normal Workers' Compensation Program.

There is a concept called unseaworthiness. If the vessel is found to be unseaworthy by the court system, then you can have pain and suffering on limited liability. When a novice thinks of "unseaworthy" it is something in a rotten condition, there are holes in it, it is leaking, and it is sinking. Some of the court determinations of seaworthiness have been very minor. Still, it exposes boat owners to that unseaworthiness concept.

We think that 20 to 30 percent of our claims regarding injuries on board our vessels are bogus. There is no way I can prove it. If I could prove it, we would save the company a lot of money.

The other thing that happens that encourages bogus claims is the nature of our business in terms of where we fish, and that is Dutch Harbor. If you take a new employee on a three-month employment contract and pay his airfare to Dutch Harbor with a

promise that it will be paid back if you complete your contract, the person gets to Dutch Harbor, goes on the boat, and is on the boat for two days and says, "this ain't for me. I want out of here." What happens?

Well, if the person quits, they are ashore in Dutch Harbor. However, if a person fakes a back injury with no witnesses, the Jones Act requires maintenance and cure be paid and that means all the bills from Dutch Harbor to Anchorage or Seattle. It happens with a disturbing frequency.

Where can you all help us? I heard yesterday from someone that there was a Dr. Dorsett Smith at the University of Washington who had done some research on an illness that we have in our industry called crab asthma and that there was a conference — a bunch of government folks back somewhere (Morgantown, West Virginia) about crab asthma.

This is an area where NIOSH and all the associated agencies that are working with NIOSH can help the fishing industry. Why not have a NIOSH-sponsored industry seminar, for example, on the subject of crab asthma, pulling together all the experts to help us in the industry solve a problem that we have.

I would also encourage other government agencies to emulate what the Coast Guard has done in establishing the voluntary vessel examination program. It is indeed a no-fault, no-penalty examination. That Coast Guard person comes aboard and gives you a laundry list of discrepancies on the boat. They go away and come back. If you fix them, you get this decal.

We do not find the same area of cooperation with some of the other regulatory agencies that we deal with, specifically the EPA, OSHA, ADEC, and FCC. It would certainly be a plus if these regulatory agencies and federal and state government in general could join hands with us and help us try to comply with the growing number of regulations that we have in the marine industry. □

QUESTIONS

Mr. Melvin L. Myers: You mentioned that you saved $2 million by the program over a certain period of time. Do you have any information about what the cost was so you can take a look at the cost-benefit?

Mr. A. B. "Tony" Ford: As a result of several fires and floodings that we have had over the last year and in my own experience and my own estimation, I came up with a half a million dollars a "pop" saved by training mitigating the effects of that event. The cost-benefit analysis, I am not sure what you mean.

Mr. Melvin L. Myers: How much money did you pay to save that?

Mr. A. B. "Tony" Ford: The cost of the training. You have got 4, 5, or 6 people on the vessel at $250 a piece, roughly six people per vessel who are associated with the emergency response team.

Mr. Bob Nelson: Yes, I have a question for Commander Sicks and then one for Mr. Ford. I am Bob Nelson. I have been going to sea for 25 years, the last 15 years as an ocean master.

Commander Sicks, you mentioned when you started your presentation that you were in Hawaii when the research vessel, *Holo Holo*, went down with ten lives on board and that was operated by the University of Hawaii.

Mr. Glenn C. Sicks: Yes.

Mr. Bob Nelson: I have sat here for a day and a half, and I heard of great progress — a lot of progress being made and a lot of headway being made on vessel safety, but the one thing I did not hear about is human error. We talk about equipment, we talk about regulations, but I ask this question on the *Holo Holo*, I mentioned the *Holo Holo* because in 1978, it went down with 10 people on board. In 1986, I was running the *Arivikela*, and they had a fairly good safety program going. They had a port captain in there who spent about $26,000 for a load line certificate. He died, and they brought in a new captain. In fact, he was a retired captain of the Coast Guard, had gone to the Academy, had a degree in engineering, and first thing he did was cut the crew size. He said it was not required. We started sailing without an engineer.

The second thing he did is let the load line lapse because he had a contract with the State of Hawaii, and he knew he was in violation of the load line. The third thing he did was, we had no alarms, no general alarms, no alarms whatsoever. His response was, nice to have, but not required.

The fourth thing he did was, we had an inspection by the Natural Science Foundation by a surveyor from back in Washington, D.C. I can not think of his name right now, but a pretty famous person. There were 89 deficiencies found: 15 serious, 2 unseaworthiness. That survey was withheld from the master and all the crew on the boat. The next thing he did was send the *Arivikela* out in September of 1986 because there was a volcano erupting on the big island. It could make history, it could make the University of Hawaii famous, and they thought they could get a lot of grant money from the Natural Science Foundation. He sent it out without any insulation or legging on the exhaust systems. In the engine room on board, we were carrying 60 pounds of MK51 dynamite, submarine explosives. The vessel almost blew up in the Honolulu Harbor. The next thing he did, four months later, was send the boat down overloaded with no load line certificate, the boat flooded, and we did not have any alarms.

I am not here to tell my sad story, I am here to make a point. What do you do about human error?

I have one more thing. Flying up in the airplane on Friday I was talking to a young fellow about being a commercial fisherman — crabber for seven years. I asked, "How's it going?" He said, "Oh, pretty good." I said, "How's your safety of your company?" He worked for a big company. He said, "The company really cares about safety. They're really doing a lot. They warn me all the time about being safe." I said, well, how's your captain?" "He's a fallen-down alcoholic." Whoever heard about that?

Mr. Glenn C. Sicks: Tough questions, and I appreciate your comments. I think it comes from a combination between my presentation and Tony's that training and safety awareness is a good business decision. The company should realize that. The *Arbikela* as an oceanographic research vessel is probably the category closest to a commercial fishing vessel as being exempt

from almost every regulation that would normally apply to a vessel of that size, and that is unfortunate. There have been some changes recently, but not nearly enough. I think with the fishing industry, we have a criteria called particularly hazardous condition. If you have a skipper who is fallen-down drunk and that can be communicated by anyone to the Coast Guard, that vessel can be sent back to the dock. But it is a training and education format that we have to create the awareness in — the awareness that is good business, the bottom line.

Mr. Bob Nelson: I understand that the captain can be reported, but in the real world someone who reports his is probably going to be looking for a job, but you all know that. If anybody has gone to sea, they know that. Mr. Ford, I have a question for you. You mentioned when you were talking about needing some cure, and you were talking about workers' compensation. Now, what type of workers' compensation? Are you talking about the Jones Act workers' compensation or workers' compensation as we know as industrial workers' compensation?

Mr. A.B. "Tony" Ford: I was trying to relate in laymen's terms the Jones Act and worker's compensation as one normally thinks of it. In answer to your question, my remarks blended a little bit from normal worker's compensation and expanded into the Jones Act.

Mr. Bob Nelson: When you mentioned workers' compensation, you were talking about private insurance workers' compensation?

Mr. A. B. "Tony" Ford: I was talking generically, Mr. Nelson, that in a sense what I was trying to say is that the Jones Act is in fact a workers' compensation system.

Mr. Bob Nelson: So, you were not talking about the regular, as we know it, government and private insurance type?

Mr. A. B. "Tony" Ford: That is correct.

Mr. Bob Nelson: You mentioned the processors when you bring them up from Montana or Nebraska or someplace and they go on the ship and who in two days find out they do not like it, then they say they got hurt — just to get a flight home. What happens if they say they do not get hurt? They pay their own airfare?

Mr. A. B. "Tony" Ford: Well, if you quit any job, you terminate employment, and if you happen to be in Dutch Harbor, Alaska, when you quit your job, yeah, that is where you go.

Mr. Bob Nelson: So, he is in Dutch Harbor, Alaska with no ticket home? I guess my question is, if you got 33 percent bogus medical claims coming out that, would it not be more or less inexpensive to fly the guy home?

Mr. A. B. "Tony" Ford: Possibly so.

SESSION 6: PROTECTION AND INTERVENTION STRATEGIES

October 10, 1992

Moderator: LTJG Jennifer M. Lincoln
Occupational Safety and Health Specialist, Alaska Activity
Division of Safety Research, NIOSH

Jennifer M. Lincoln graduated from Indiana State University in August 1991 with a Bachelor of Science degree in Environmental Health Science. During the summers of 1989 and 1990, she participated in the Commissioned Officer Student Training and Extern Program sponsored by the U.S. Public Health Service. In 1989, Jennifer was stationed in Morgantown, West Virginia, where she worked for the Division of Safety Research (DSR), NIOSH, in the Protective Technology Branch. She was involved in a field study investigating respirators and conducted general industrial hygiene air sampling. In 1990, Jennifer was stationed in Anchorage, Alaska, where she worked with the Anchorage Indian Health Service sanitarians conducting field surveys in remote Native villages. Jennifer is currently employed by the Alaska Activity, DSR, NIOSH, as an Occupational Safety and Health Specialist in Anchorage.

QUOTES FROM THIS SESSION

"The proposed Capital Construction Fund rule making would allow the acquisition and installation of vessel safety equipment and modifications."
— Dorothy J. Bostic

"If you look carefully — even in a cursory way at the statistics yesterday— what you saw was that the most important cause of death among fishermen is a vessel losing stability." — Bruce H. Adee, Ph.D.

"The right survival equipment is equipment purchased by informed buyers who pick the tools that best fit the crew, vessel, and environment."
— Kenneth M. Coffland

"One thing you have got to understand — and the Coast Guard is constantly fighting this battle — is that just because you are wearing a flotation device that has a high buoyancy does not guarantee you are going to live."
— Alan M. Steinman, M.D.

"We are having much more success with the injury prevention process now that we are identifying risk factors and prevention programs, rather than viewing the injuries as accidents." — Ronald D. Perkins, M.P.H.

National Fishing Industry Safety and Health (FISH) Workshop
Convened by the National Institute for Occupational Safety and Health
October 9–11, 1992, Anchorage, Alaska

CAPITAL CONSTRUCTION FUND PROGRAM FOR SAFETY IMPROVEMENTS

By Mrs. Dorothy J. Bostic

LTJG Jennifer M. Lincoln: Our first presenter is Dorothy J. Bostic, whose presentation is entitled *Capital Construction Fund Program for Safety Improvements*. Mrs. Bostic has been with the National Marine Fisheries Service, Department of Commerce, and its predecessor agency, the Bureau of Commercial Fisheries, Department of Interior, for more than 32 years. Last week, October 1st, began her 20th year with the Fishing Vessel Capital Construction Fund (CCF) program. In 1973, her first CCF position was as a program assistant and from there she worked her way up to her present position as a financial assistant specialist. Regarding her education background, to quote Mrs. Bostic, "The only diplomas I have earned are from high school and the school of hard knocks." In addition to the above, she completed various law, tax, and accounting courses. Mrs. Dorothy Bostic:

I came here to talk about the new vessel safety regulation under the Fishing Vessel Capital Construction Fund (CCF) program, but there is a problem. The President has put a moratorium on certain new regulations. As of now, fishing vessel safety improvements have not been made a part of the CCF regulations.

I have been tracking this proposed regulation for months. At this time, it is in the Under Secretary's office in the Department of Commerce. If it is signed and returned to our office by the first of November, the CCF safety improvements could be adopted by the end of this year.

The CCF program is a tax-deferred program for U.S. citizens, which allows them to defer taxable vessel income to construct, reconstruct, or acquire fishing vessels with before-tax, rather than after-tax dollars. The CCF gives them the opportunity to put aside their taxable vessel income in order to accumulate the large amounts of capital necessary for the construction of a new vessel, acquisition of a used vessel, and/or reconstruction of their present vessel.

A reconstruction project means the rebuilding of and/or adding equipment to a fishing vessel, and the cost of the project must equal 20 percent of the original vessel cost (plus prior improvements). A reconstruction project is what safety improvements will fall under in the CCF program, with certain exceptions to the rule.

Hopefully, this CCF change will extend the life of U.S. fishermen and women also!

The proposed CCF rule making would allow the acquisition and installation of vessel safety equipment and modifications. The central purpose of the installation is to cause vessel safety to be treated, in its own right, as reconstructions for the purpose of withdrawing tax-deferred funds from a CCF to pay for them. Except for the capital expenditure requirement, these fishing vessel safety projects would be exempt from the normal CCF rules test.

When adopted, CCF monies could be used to pay for fishing vessel safety projects without regard to:
•The cost of the safety project.
•Whether the vessel involved in the safety project had its useful life extended, its value increased, or was converted to a different fisheries use.
•Conditional fishery requirements.

Hopefully, this CCF change will extend the life of U.S. fisher men and women also!□

CAPITAL CONSTRUCTION FUND: PROPOSED RULE, INTERIM FISHING VESSEL CAPITAL CONSTRUCTION FUNDING PROCEDURES[1]

Summary

NMFS proposes to allow fishermen to use the Fishing Vessel Capital Construction Fund Program for equipping and/or modifying their fishing vessels to increase general vessel safety and/or to comply with specific requirements established under the commercial Fishing Industry Vessel Safety Act of 1988. An equipment acquisition or vessel modification made for safety purposes would be treated as a reconstruction and exempted from certain Program rules so that payment for it would be a qualified Program withdrawal.

Dates

Written comments will be received through December 18, 1992.

Addresses

Send written comments to Michael L. Grable, Chief, Financial Services Division, National Marine Fisheries Service, F/TS1, 1335 East West Highway, Silver Spring, MS 20910.

Supplementary Information

The Program allows fisheries taxpayers to defer paying Federal taxes on fishing vessel income. Income on which taxes are to be deferred must be deposited in accordance with Capital Construction Funding Agreements and reserved for the equity portion of fishing vessel construction, reconstruction, or acquisition costs. All deferred taxes are eventually recaptured by reductions in the depreciation basis, for tax purposes, of vessels benefitting from tax deferrals under the Program.

Under present Program rules (150 CFR part 259), fishermen cannot use the Program to pay for safety equipment unless that equipment is part of a vessel construction or reconstruction project. Although this is not generally a problem when fishing vessel construction is involved, it can be a problem when fishing vessel reconstruction is involved.

Generally, improving a fishing vessel will not qualify as reconstruction under this Program's rules unless the cost of doing so, (a) is a capital expenditure, (b) amounts to at least $100,000 or 20 percent of the vessel's ac-

[1] *Federal Register*. Vol. 37, No. 223, November 18, 1992, Proposed Rules. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce, 50 CFR Part 259, (Docket No. 921065-22651, RIN 0648-AF22, [FR Doc. 92-27671 Filed 11-17-82; 8:45 am].

quisition cost (whichever is less), and (c), substantially prolongs the vessel's useful life and increases its value, or adapts it to a different fisheries use. The purchase and installation of fishing vessel safety equipment would seldom meet this rules test. Many fishing vessel modifications for safety purposes would also fail to meet this test.

Additionally, the conditional fishery requirements apply to fishing vessel reconstruction under this Program. These requirements restrict the availability of Program benefits in fisheries where the Government deems additional or increased harvesting capacity unwarranted. These conditional fishery requirements could also, under the present Program rules, prevent use of this Program for safety projects.

This proposed rule would allow the acquisition and installation of fishing vessel safety equipment and fishing vessel modifications whose central purpose is to increase vessel safety to be treated, in their own right, as reconstructions for the purpose of withdrawing tax-deferred funds from Capital Construction Funds to pay for them. Except for the capital expenditure requirement, these fishing vessel safety projects would be exempt from the normal rules test that now determines whether fishing vessel improvements can qualify as reconstructions.

This proposed rule would also allow fishing vessel safety projects without regard to the conditional fishery requirements that would normally otherwise apply to reconstruction projects.

Expected Effect of Proposed Rule

If this proposed rule is adopted, the fishing industry would be able to use their Capital Construction Funds to pay for fishing vessel safety projects without regard to (a) the cost of the safety project; (b) whether the fishing vessel involved in the safety project had its useful life extended, its value increased, or was converted to a different fisheries use; and (c) conditional fishery requirements.

Comments Invited

NMFS invites interested parties to participate in this proposed rulemaking by submitting any written views, data, arguments, or suggestions they believe may be helpful. Comments will not be individually answered. Comments will, however, be reviewed and considered, and may cause this proposed rule to be changed. Those desiring acknowledgment that their comments have been received should enclose a stamped, self-addressed postcard or envelope.

Classification

This action is categorically excluded, by NOAA Directive 02-10, from the requirement to prepare an environmental assessment.

The Assistant Administrator for Fisheries, NOAA, determined that this proposed rule is not a "major rule" requiring a regulatory impact analysis under E.O. 12201, because it will not result in an annual effect on the economy of $100 million or more; will not result in a major increase in costs or prices for consumers, individual industries. Federal, state, or local government agencies, or geographical regions; and will not result in a significant adverse effect on competition, employment, investment, productivity,

innovation, or on the ability of U.S. based enterprises to compete with foreign-based enterprises in domestic or export markets.

The General Counsel of the Department of Commerce certified to the Small Business Administration that this proposed rule will not have a significant economic impact on a substantial number of small entities because it relates to financial assistance programs in which participation is voluntary and does not impose any cost, economic burden, or reporting burden on the industry. As a result, a regulatory flexibility analysis was not prepared.

This rule does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under E.O. 12612.

This rule does not directly affect the coastal zone of any state with an approved coastal zone management program.

List of Subjects in 50 CFR Part 258

Fisheries, Fishing vessels, Income taxes, Reporting and recordkeeping requirements. Dated: November 9, 1992. Samuel W. McKeen, Program Management Officer, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 259 is proposed to be amended as follows:

Part 259 — Capital Construction Fund

1. The authority citation for Part 259 continues to read as follows: Authority: 46 U.S.C. 1177.
2. Section 259.31 is amended by removing the authority in the parenthetical at the end of the section and by adding a new paragraph (e) to read as follows: § *259.31 Acquisition, construction, or reconstruction.*

(e) Safety projects. The acquisition and installation of safety equipment for a qualified vessel and vessel modification whose central purpose is materially increasing the safety of a qualified vessel shall, regardless of cost, be treated as reconstruction for the purpose of qualifying a CCF withdrawal for such expenditure, shall be exempt from having to meet conditional fishery requirements for reconstruction as set forth in § 259.32, and shall be exempt from all qualifying tests for reconstruction set forth in paragraph (b) of this section, with the following exceptions:

(1) A safety improvement shall be required to meet both conditional fishery requirements and all qualifying tests for reconstruction if it serves the dual purpose of safety and meeting the reconstruction requirement of paragraph (a) of this section for qualifying a withdrawal for the acquisition of a used vessel;

(2) That portion of the actual cost of a safety improvement that is to be paid for from the CCF must be classifiable and treated as a capital expenditure for Internal Revenue Service purposes;

(3) Safety improvement projects whose clear and central purpose is restricted to complying with the requirements of the Commercial Fishing Vessel Safety Act of 1988 (46 U.S.C. 2101) shall, without further documentation, be considered to fall within this paragraph (e). Satisfactory documentation will be required for all other projects proposed to be considered as falling within this paragraph (e). Projects whose central purpose clearly involves something other than safety improvement will not be considered to fall within this paragraph (e).

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VESSEL STABILITY

By Dr. Bruce H. Adee

LTJG Jennifer M. Lincoln: Our next speaker is Dr. Bruce H. Adee, whose presentation is entitled *Vessel Stability*. Dr. Adee is an associate professor of mechanical engineering at the University of Washington. He received his Bachelor of Science degree in engineering from Princeton and his Master of Science and Ph.D. degree from the University of California, Berkeley. Dr. Adee has held several posts at the University of Washington including Director of the Ocean Engineering Program and Adjunct Associate Professor for the Institute for Marine Studies. He is a member of several naval and marine engineering and naval architectural societies. Dr. Adee has authored numerous publications regarding fishing vessel stability. Dr. Bruce Adee:

INTRODUCTION

The gentleman from the Department of Commerce pointed out that nobody had fallen asleep yesterday. Of course, that was before we started to discuss the subject of fishing vessel stability. I promise to do my best to keep the record intact and make the subject exciting for you.

While those who operate fishing vessels may regard vessel stability as a technical subject beyond their understanding, I believe this is a fundamental mistake. A basic knowledge of the principles of stability is essential to the safe operation of a fishing vessel.

We should begin by examining the vessel accident or casualty statistics. To this point, these statistics have been gathered primarily by the U.S. Coast Guard and examined in a number of studies. They have also been presented by previous speakers at this meeting. In particular, we should consider deaths associated with a vessel casualty.

Even a cursory review of the statistics reveals that the most frequent cause of death is a vessel losing stability. In addition to those casualties which are classified as stability casualties, there are a large number of fishing vessels which disappear and the cause of the casualty cannot be determined. One possible explanation of this is that they were unable to make a distress call, because they capsized very quickly.

We may also wish to group the vessel casualties attributed to foundering and flooding with the stability casualties. While the way in which the vessel is lost may differ, the method of reducing foundering and flooding casualties is similar to the method which should be used to reduce stability casualties.

What is clear from the statistics is that more than half the fishermen who die as a result of a vessel casualty die as the result of a stability-related casualty. It is also clear that the Alaska crab fishery has the worst casualty record.

It is ironic that the Alaska crab fishery should have the worst stability casualty/loss-of-life record. For at least 15 years, insurance companies have required stability reports and booklets for the Alaska crab vessels before they would issue insurance policies. These reports prepared by naval architects are based on the vessel's exceeding the International

Maritime Organization (IMO) stability standards for fishing vessels.

In September 1991 the U.S. Coast Guard issued final fishing vessel regulations which include stability regulations for vessels over 79 feet in length (most Alaska crab vessels are over 79 feet long).

The heart of the stability regulations which have been issued are identical to the IMO stability standards. So, what should we expect the effect of the new regulations to be? Nothing, unless there is a vigorous campaign to change peoples' attitudes and methods of operation.

Stability is not just a vessel-related problem. It is a people problem as well. Every fishing vessel has stability characteristics which result from the vessel's design and construction.

These are carefully documented in the stability report prepared by the naval architect. Each time the vessel is loaded and puts to sea the operator is determining the level of stability of the vessel by choosing how to load it.

This is where behavior enters because when that vessel leaves the dock its stability is determined. Every time a change is made during the voyage, such as where to load the catch or which fuel tank to burn from, the stability of the vessel is altered. Whether these decisions are made by someone who is cognizant of their implications for vessel stability does not matter; they completely determine the vessel's stability.

The first step in solving the "stability problem" is to have someone on the vessel who will consider stability and be able to make loading decisions consistent with maintaining proper stability of the vessel. Under these circumstances we must ask ourselves: What are the incentives to reduce the loading or leave the vessel tied to the dock if it is less stable than it is required to be?

The next step in averting tragedy will be up to the U.S. Coast Guard enforcement officers under the fishing vessel regulations which have been in effect for over a year. During a boarding at sea, these people need to quickly assess the vessel's stability and exercise the authority to send the vessel back to port if it has insufficient stability.

Another area of the safety activity where problems arise is in gathering statistics about vessel accidents and crew member injuries and deaths. Everybody would like to have complete and accurate statistics. However, we must recognize a serious problem. Determining the causes leading to a vessel casualty is often very difficult. This is far different than the normal attempt to determine the cause of death. To determine the cause of death, you perform an autopsy on the body. In most cases the required information is quickly obtained and conclusions can be reached.

For the most important fishing vessel casualty cases, you may start with nothing. All of the most relevant information is at the bottom of the sea. Even if you could locate the sunken vessel, the cost of recovery or underwater examination would be staggering.

As an example of the problem, consider two of the most celebrated casualty investigations we have had in the Pacific Northwest. These are the investigations into the loss of the F/V *Americus* and the F/V *Altair*, and the investigation into the loss of the F/V *Aleutian Enterprise*. While these investigations and reports were very enlightening and worthwhile, the conclusion of the investigation took place years after the casualties. We will never have perfect statistics for

marine casualties, but we must not let this deter us from pursuing a course of action which will improve safety based on the best available information.

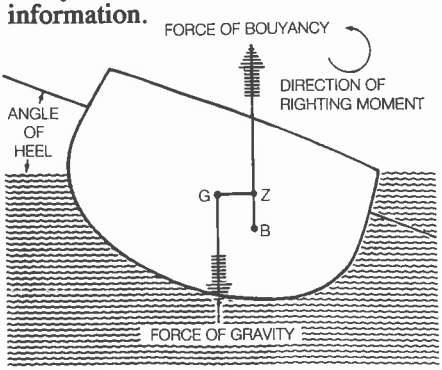


Figure 1. Buoyant Force and Weight Force for a Stable Vessel.

—Source: *Principles of Naval Engineering*

There is one other topic we have heard about at this meeting that deserves more comment, and that topic is Total Quality Management (TQM). TQM has become a "buzz" word that we are hearing more and more in the marine industry. My only warning is that we make sure that the word "TOTAL" really means total.

Consider the example of salmon fishing vessels. Over the past 10 years or so there has been a very strong incentive to improve the quality of the fish produced.

One method of improving the fish is to convert the fish hold in the fishing vessels from using ice to chill the catch to using refrigerated seawater cooling systems. What we have done is to make little crab boats out of the salmon fishing vessels. We have applied TQM to the product without considering the overall effect on vessel safety as part of the total system.

Now, with this introduction to the topic, let's progress to some of the technical aspects of vessel stability.

FISHING VESSEL STABILITY

The first thing to recognize is that the basic principles of vessel stability are very straightforward. The intact statical stability of a vessel is determined by examining two forces which act on the vessel. The first force is the buoyant force which results from the water pressure on the hull.

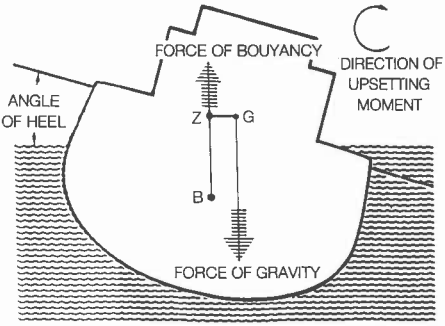


Figure 2. Buoyant Force and Weight Force for an Unstable Fishing Vessel.

— Source: *Principles of Naval Engineering*

The second force is the weight force which arises from the gravitational attraction. The buoyant force acts at a point we call the center of buoyancy and the weight force acts at the center of gravity.

An example of a stable vessel is shown in Figure 1. In this figure the points labelled G and B represent the center of gravity and the center of buoyancy, respectively. The large dark arrows represent the forces of buoyancy and weight.

The vessel is stable because when it is released from the angle of heel shown it would return to its original upright position. If you examine the combination of the buoyant force pushing upward and the weight force pulling downward, you will recognize that together these forces impose a torque on the vessel in the opposite direction to the way the vessel is heeling.

An unstable vessel is illustrated in Figure 2. Notice that in this case the center of gravity is higher and the relationship between the weight and buoyant forces has the opposite effect as for a stable vessel.

Here these forces act in concert to cause the vessel to heel to a larger angle. In fact a vessel in this situation is likely to capsize.

Although the difference between a stable vessel and an unstable vessel may be precisely determined, it is of little consequence in practice. At sea the effects of wind, waves, partial flooding, shifting cargo, and many other changes must be anticipated. So, a vessel must have a sufficient level of stability to ensure its survival.

To establish a baseline for the stability calculations, a loading condition called lightship condition is used. The lightship condition is a loading condition in which only the "permanent" equipment is aboard the vessel. The vessel does not have fuel, water, consumables, crew, or gear such as crab pots aboard.

When a naval architect is hired to prepare a stability report for a fishing vessel, the first step is to determine the weight of the vessel and the location of the center of gravity by performing a stability test. Since every vessel is different, an individual stability test is required for every vessel unless it is identical to another vessel.

The stability test consists of several parts. In preparation for the test the vessel should be in a loading condition as close to the lightship condition as possible. The deadweight survey is a survey to determine the loading of the vessel at the time the test is conducted. This information will be used later to adjust the results from the actual loading condition at the time of the test to results appropriate for the lightship condition.

During another part of the stability test the freeboard at various points on the vessel is measured. From this the position of the waterline on the hull is calculated. By referring to the hull shape shown on the plans, the displacement or weight of the vessel and the fore and aft location of the center of gravity can be calculated.

The remaining part of the stability test is the inclining experiment. In this experiment long pendulums are hung to accurately measure the heel angle as weights are moved around on the deck to cause the vessel to heel to a number of different angles. The result of this experiment is a determination of the vertical position of the center of gravity.

After the stability test the naval architect will use the measurements taken to calculate the lightship weight of the vessel and the vertical and longitudinal position of the center of gravity. To complete a stability booklet, the naval architect takes this basic information about the vessel and calculates the vessel's stability for a variety of different loading conditions which reflect the operation of the vessel.

One of the ways a naval architect will evaluate the level of stability is by examining the righting arm curve. An example of a righting arm curve is shown in Figure 3. The vertical scale on the left is the righting arm in feet. Looking back at Figures 1 and 2, the righting arm is the horizontal distance between the weight force and the buoyant force. If this is large, the vessel is very stable. As it gets smaller, the stability decreases and when it is negative the vessel is unstable and the relationship shown in Figure 2 exists.

The horizontal axis for the righting arm curve is the angle of heel in degrees. The curve is essentially a graphical representation of the tendency of the vessel to return to the upright from any angle of heel. The larger the righting arm, the more stable the vessel.

At the far right of the curve, the value of the righting arm goes to zero at a large angle of heel. This means that if this vessel, in this loading condition, were heeled to an angle greater than the point where the righting arm goes to zero, it would capsize. From zero angle of heel to the point where the righting arm goes to zero is called the range of stability.

In evaluating the vessel's stability by examining the righting arm curve, the important characteristics to look for are the shape of the curve (particularly how large the righting arm becomes), the area under the curve, and the range of stability. Figure 3 also illustrates a number of the IMO stability requirements which are based on the righting arm curve.

FISHING VESSEL STABILITY REQUIREMENTS

Traditionally, in the United States, fishing vessels have been exempt from most of the regulations applied to other commercial vessels. As fish tenders and fish processing vessels developed in the Pacific Northwest in the 1960s, the exemption was extended to them as well.

A dramatic change occurred with the passage of Public Law 99-509.

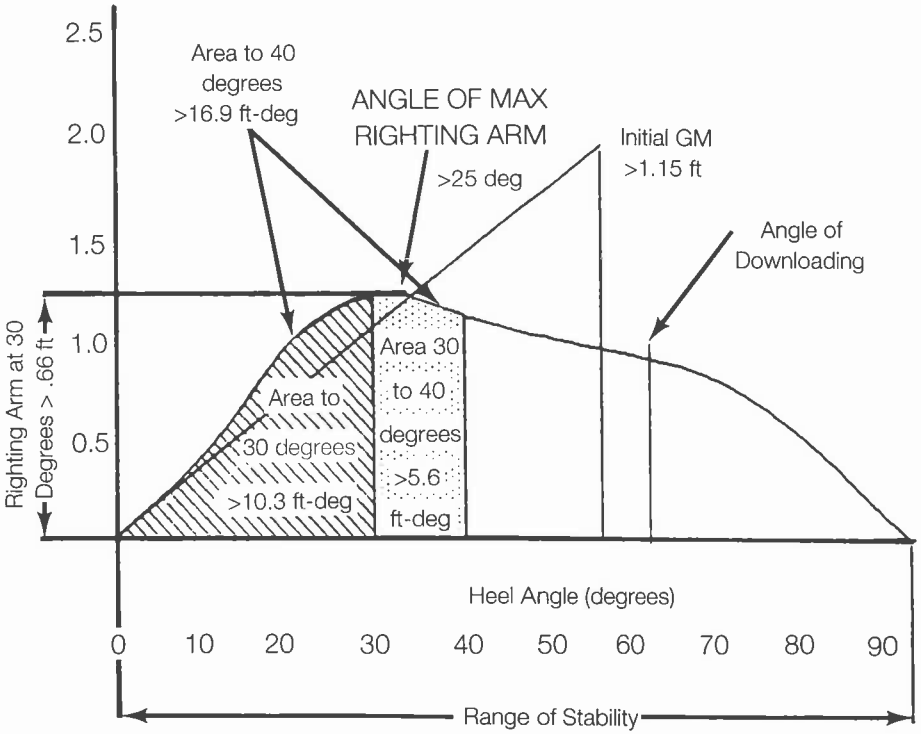


Figure 3. A Righting Arm Curve Illustrating IMO Stability Requirements.

— Source: U.S. Coast Guard, NVIC 5-86)

Section 5102 deals with the application of the load line regulations and states that exemptions are granted to the following:

- Fishing vessels.
- A fish processing vessel of not more than 5000 gross tons constructed as a fish processing vessel before August 16, 1974, or converted for use as a fish processing vessel before January 1, 1983.
- A fish tender vessel of not more than 500 tons constructed, under construction, or under contract before January 1, 1983.

Operators were slow to come into compliance with load line regulations until the loss of the F/V *Aleutian Enterprise* on March 22, 1990. The loss of this fish processing vessel accelerated the application of the load line regulations to vessels engaged in processing and tendering.

In a separate development the Congress passed Public Law 100-424, "The Commercial Fishing Vessel Safety Act of 1988." This law called for the creation of an advisory committee to assist the Coast Guard in developing regulations for commercial fishing vessel safety including stability regulations for newly constructed vessels. The rule-making procedure was followed, which eventually led to 46 CFR, Part 28, effective in September 1991.

The stability portion of these regulations applies to vessels over 79 feet long which are newly constructed or substantially altered. They contain many requirements, but a major portion of the requirements are the IMO stability guidelines which have been in use for many years on larger vessels.

Implementation of stability regulations for vessels less than 79 feet in length was deferred for further study and implementation at a later date. A proposed rule pertaining to these vessels was published on October 27, 1992, and the comment period was extended to February 28, 1993. The proposed rule splits vessels under 79 feet in length into two groups, those less than 50 feet and those between 50 and 79 feet. Differing stability requirements are applied to each group.

STABILITY DISCUSSION

We have discussed the basic principles of vessel stability, how stability is evaluated, and the applicable regulations. Now let us turn our attention to using this knowledge to examine typical decisions which face fishing vessel operators. Throughout this discussion it is important to remember that every vessel is different, and each situation we examine in this section is appropriate for a specific loading condition.

The first decision usually faced at the time of departure by the person operating a vessel equipped with circulating seawater or refrigerated seawater tanks is, "Which holds should I fill with seawater at the time of departure?"

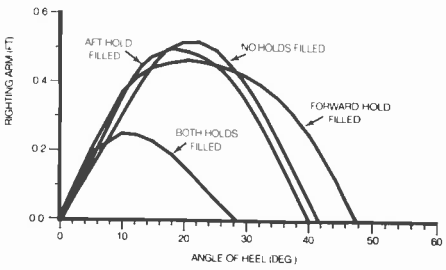


Figure 4. Righting Arm Curves for 107-foot Alaskan Crab Vessel with Different Holds Filled with Seawater.

Figure 4 shows the righting arm curves for an Alaskan crab vessel of 107 feet overall length. The condition shown is a departure condition with full fuel and water tanks and a heavy deck load of crab pots. The

vessel has two circulating seawater crab holds and the four curves represent possible alternatives for filling these holds.

The first thing to notice about Figure 4 is that none of these curves meets the IMO stability standards. There is not much difference in the vessel's stability with no holds filled or with either forward or aft hold filled. However there is very marked decrease in stability with both holds filled. This vessel departed with its forward hold filled and capsized shortly after filling the aft hold while underway. The decision to fill the aft hold was made in order to "increase" the stability.

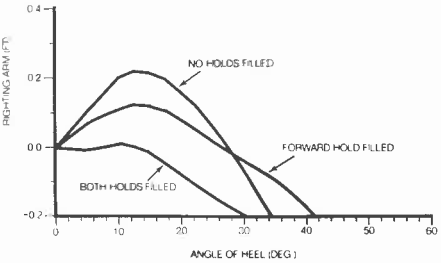


Figure 5. Righting Arm Curves for 84-foot Alaskan Crab Vessel with Different Holds Filled with Seawater. (Note righting arm scale includes negative values.)

Figure 5 shows a similar situation for an 84-foot Alaskan crab vessel. In this loading condition this vessel is in extreme danger (note the different scale for righting arm curve which includes negative and unstable values). This vessel also capsized when operated with the forward hold filled.

Figures 6 and 7 should be viewed together. They show an Alaska limit seiner which is used for salmon seining. In Figure 6 the vessel is lightly loaded meaning it has very little fuel, fresh water, and stores aboard.

In this case, filling the forward hold with seawater has a positive

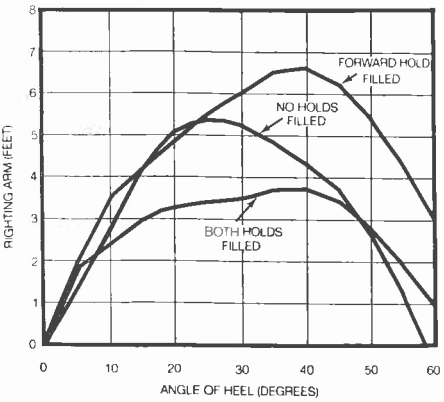


Figure 6. Righting Arm Curves for an Alaskan Limit Seiner Lightly Loaded with Different Holds Filled.

effect on stability. In fact, with no holds filled, the vessel does not meet the IMO stability standards, but with the forward hold filled, it does. Filling both holds reduces stability significantly.

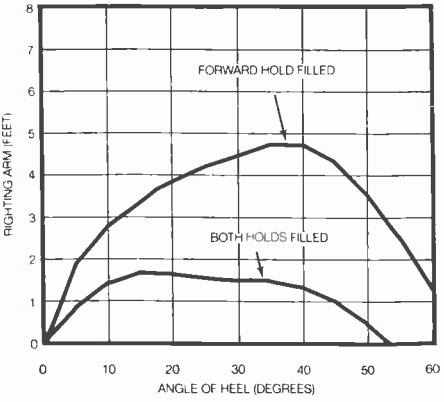


Figure 7. Righting Arm Curves for an Alaskan Limit Seiner in Intermediate Loading Condition with Different Holds Filled.

Figure 7 illustrates an intermediate loading condition for the same vessel with the fuel, fresh wa-

ter, and stores about half full. In this case the vessel does not meet IMO standards in either situation shown and would be in an extremely dangerous condition with both holds filled.

If this same vessel were operated with fuel and fresh water tanks filled, there would be a further decrease in stability for each possible combination of holds filled.

Figure 8 shows an 86-foot long Alaskan crab vessel which is equipped with three holds. The curve shown is with a maximum load of crab pots on deck. Again there is improvement when one hold is filled but the stability deteriorates when more than one hold is filled.

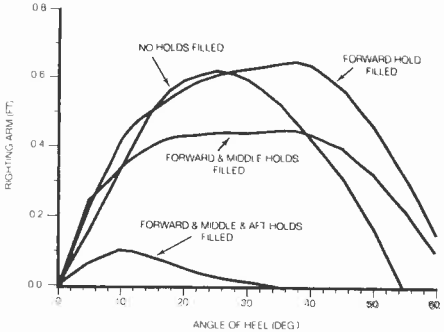


Figure 8. Righting Arm Curves for an 86-foot Alaskan Crab Boat with a Large Number of Pots on Deck and Different Holds Filled.

One of the many problems that fishing vessels encounter at sea is the problem of partial flooding of the vessel. This may occur because of the failure of the seal for a hull penetration such as a rudder or propeller shaft, a leak resulting from a crack, failure of a through-hull fitting or failure of a closure such as a hatch cover, permitting water to enter the hull.

The end result will be influenced by factors including the ability to dewater a space, loading conditions at the time, placement of watertight bulkheads and the ability to recognize and correct the problem quickly.

Many vessels have been lost as water usually enters through the seal around the rudder or through the hatch to the main deck. A vessel for which the consequences of lazarette flooding are very severe is shown in Figure 9.

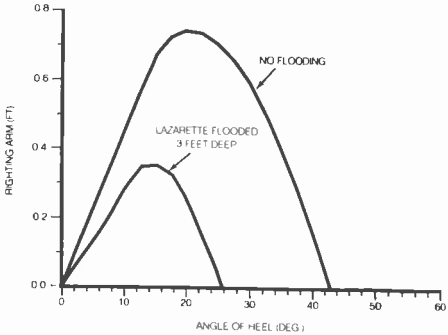


Figure 9. Righting Arm Curves for a 123.5-foot Alaskan Crab Vessel without Flooding of the Lazarette and with the Lazarette Flooded to a Depth of Three Feet.

The length of the Alaskan crab fishing vessel is 123.5 feet overall and it has a large lazarette which extends across the vessel from side to side. The initial condition shown without flooding does not meet the IMO requirements. The second righting arm curve indicates the vessel's stability under the same loading condition with three feet of water in the lazarette. The reduction of stability is dramatic and puts this vessel in an extremely dangerous situation.

The unintentional flooding of any compartment within a fishing vessel is a severe problem which should be avoided or dealt with very rapidly. If the initial flooding is not dealt with quickly, the problem may cascade into a vessel-threatening situation in

short order. Compartments should be monitored with alarms where feasible. In addition, an inspection should be made as part of the regular watchkeeping procedure. Finally, there should be the capacity to use a pump to dewater all compartments.

A poop deck is a raised deck at the aft end of fishing vessels. It may extend from 10 to 20 percent of the length of the vessel forward from the stern. It is a break in the line of the main deck aft and is raised on the order of 9 to 12 inches at the break. On most vessels it would not be noticed because the false wooden deck extends forward from the poop deck to the house at the raised level of the poop deck.

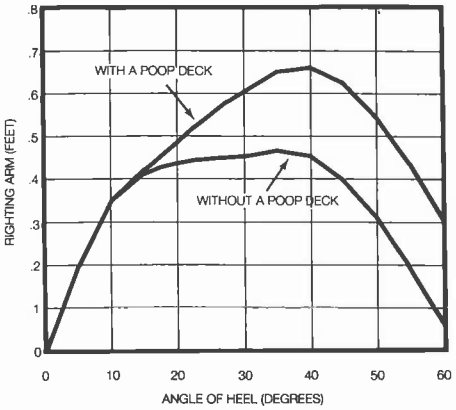


Figure 10. Righting Arm Curves for an Alaskan Limit Seiner with and without a Poop Deck.

Figure 10 shows the effect of the poop deck on the stability of an Alaskan limit seiner. The effect is quite clearly demonstrated. The vessel meets the IMO stability standards with a poop deck and is well below without.

Icing is a major problem in many fisheries in the waters off Alaska, which operate during the winter months. In order to anticipate the detrimental effect of icing on stability, IMO has developed a standard loading allowance for icing. They recommend that the ice loading of horizontal surfaces be 6.15 lb./ft^2 and vertical surfaces be 3.08 lb./ft^2 be added to the vessel.

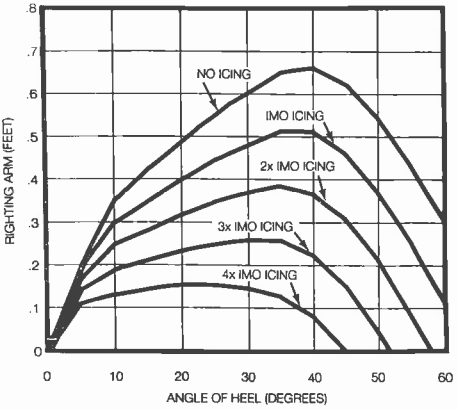


Figure 11. Righting Arm Curves for an Alaskan Limit Seiner with Various Levels of Icing.

If seawater froze perfectly into ice this would be an ice thickness of 1.15 inches on horizontal surfaces. In order to evaluate the effect of icing, the surface area of exposed surface is determined and then the additional loading due to icing is added to the vessel.

As an example of the effect various icing loads have on stability, consider the Alaskan limit seiner shown in Figure 11. Without ice the vessel meets the IMO stability criteria. With various levels of icing, the stability of the vessel decreases.

Figure 12 shows the effect of icing on a 98-foot trawling vessel which survived a major icing storm. The vessel does not initially meet the IMO stability criteria (no icing condition). When ice is added, the decrease in stability is again evident.

There are many vessels for which the stability falls well below the IMO

standards, making them unsuitable for their intended purpose. One method of increasing the stability of these vessels is to increase their beam by adding sponsons to each side.

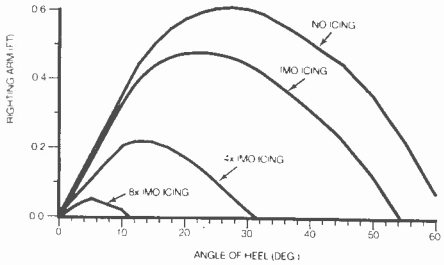


Figure 12. Righting Arm Curves for a 98-foot Trawler with Various Levels of Icing.

The bow is left unchanged and the additional beam starts about one-

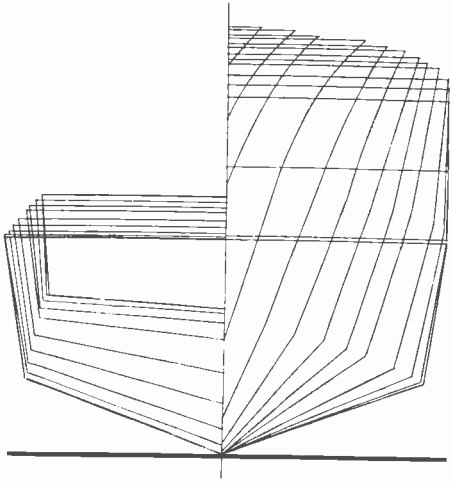


Figure 13. Cross Sections of a 98-foot Alaskan Crabber/Trawler as Designed and Built. (Forward sections on the right, aft sections on the left.)

fourth of the length aft of the bow and increases to a constant value a small distance aft. The constant increase of the beam is carried aft all the way to the stern.

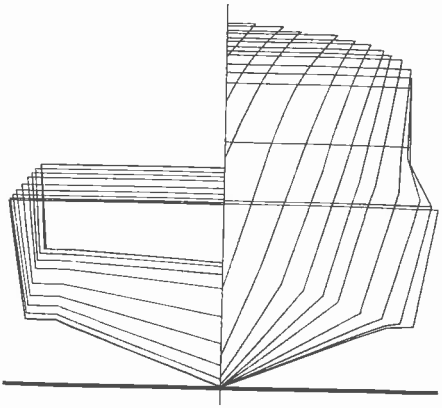


Figure 14. Cross Sections of a 98-foot Alaskan Crabber/Trawler with Sponsons Added.

Figures 13 and 14 show a sectional view of a vessel as it was designed and built and with the addition of sponsons. For this vessel, the sponsons increase the beam by about 1.5 feet on each side.

Figure 15 shows the dramatic positive effect that the additions of sponsons have on this vessel. The peak in the righting arm curve is more than doubled as is the area under the curve.

For many vessels the addition of sponsons would provide an opportunity to increase the fuel-carrying capacity of the vessel. Turning the sponsons into additional fuel tanks might enhance the operation of the vessel and would be beneficial so long as this did not seriously reduce the positive effect on stability.

Figure 16 shows the stability for the same 98-foot crabber/trawler shown in Figure 15. In this case the internal volume added by the sponson is filled with fuel. The calculation illustrates the effect of using 25 percent, 50 percent, 75 percent, and 100 percent of the added volume as fuel tanks. This figure shows that the stability is reduced only a small

amount when the sponsons are used as fuel tanks.

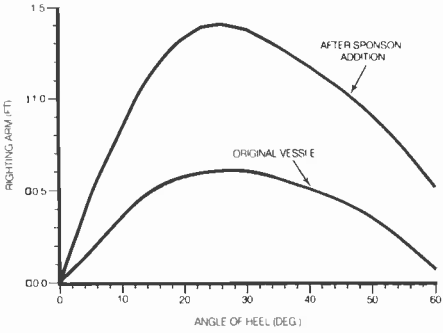


Figure 15. Righting Arm Curves for a 98-foot Alaskan Crabber/Trawler Before and After the Addition of Sponsons.

At first glance one might not have expected the results shown in Figure 16. When the sponson is 100 percent filled with fuel, there is essentially no gain in freeboard because the added weight and buoyancy are almost equal. However, when the vessel is heeled over, the buoyancy, which the sponsons add, is far from the center of the vessel, providing a large restoring moment to increase the stability.

WHAT YOU SHOULD DO

As an owner/operator you bear a great responsibility for the safety of your crew and vessel. Based upon experience examining a number of stability related casualties, I have prepared the list shown in Table I to suggest several important safety considerations related to vessel stability. With a little thought you should be able to add other items to this list.

The first item on the list is to obtain current stability information. In his presentation Jim Herbert discussed the stability report for a fishing vessel. Did you notice the date on that report? It was 1979. One should assume about a five-year life on a stability report. The reason is that in most cases the operation of the vessel changes dramatically and the vessel most likely gets heavier because of added equipment. You need the current information applicable to the vessel in its present condition.

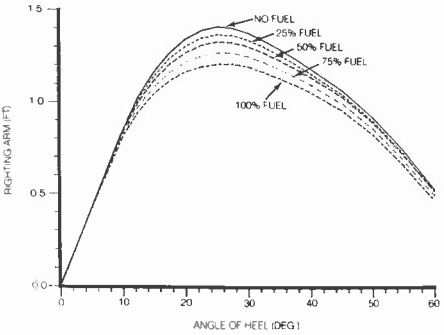


Figure 16. Righting Arm Curves for a 98-foot Crabber/Trawler with Sponsons Added and Various Portions of the Sponsons Volume Used to Carry Fuel.

One way to keep the stability data up-to-date is to maintain a log of the weight changes. Keep a list of everything that is added or removed from the vessel. Enter the weight of the item and the location it is installed. This will help you recognize when a new stability test is needed and how to modify the stability calculations to account for changes. The cumulative effect of continually adding weights over a long period of time has contributed to the loss of many vessels.

A method of keeping track of weight changes is to regularly monitor the waterline. For the same loading condition you should see if the vessel's draft is the same. Maybe you should take a picture of the vessel in profile at the time of departure. If you measure a change in the

waterline position, then it is time to reexamine the stability.

Table I. Items to be Considered to Maintain the Stability and Safety of Your Fishing Vessel.

1. Obtain current stability information.
2. Keep a log of weight growth.
3. Regularly check the waterline and record.
4. Maintain watertight integrity.
   — Bulkheads
   — Openings
5. Be able to monitor all spaces.
6. Be able to pump all spaces.
7. Close openings to holds not in use.
8. Learn everything you can about stability.
9. Use your stability information wisely.
10. Plan what you would do under various "disaster" scenarios.
11. Load your vessel to maintain adequate stability.

Maintaining watertight integrity is crucial. You would not think of drilling a hole through the hull. Why would you consider putting the same hole through a watertight bulkhead?

The difference is that you would notice a hole through the hull immediately but the hole in the bulkhead would not become critical until your vessel was sinking and your life depended on the bulkhead's holding water. In addition, all through-hull fittings must be checked on a regular basis and the hatches and openings must be maintained and renewed.

You also need to monitor all spaces within your vessel to prevent them from flooding. This means a visual inspection as part of the normal watchkeeping and alarms in areas that cannot be observed or where rapid flooding would result in the loss of the vessel.

The dewatering system on the vessel should include the capability to pump any space which has the potential to flood. Gravity drains have proven to be insufficient in many cases. In fact you must remember that water may flow either way through an open drain depending on the trim or heel of the vessel.

Openings to holds not in use should be closed. This is particularly true for the overflow openings on crab holds. In many cases these openings are left open which allows water to flow from the deck down into the hold. To compensate for this, the crab pumps are run continuously and a suction is maintained which pumps any water flowing into the hold overboard. In theory this procedure sounds fine, but the problem often arises when there is flooding somewhere else in the vessel which causes more rapid flooding of the hold through the openings.

Because of the way the valves are set to maintain a prime on the pump, only a small fraction of its capacity is being used to pump the hold. When water flows rapidly into the hold, it is more than the pump can keep up with and rapid flooding of the hold takes place.

Another problem arises when you have an electrical failure or pump failure and water flows from the sea chest through the pump and into the hold. Exactly the opposite of what is desired.

Learn as much as you can about stability. The more everyone aboard the vessel knows about stability the better. The stability book which has been prepared contains an extraordinary amount of information about the vessel. It should be used as an integral part of the operation of the vessel.

Disaster always seems to strike at the most inopportune time at sea. If you are not prepared, there is nothing you can do. Plan for your response in any emergency situation. Ask yourself: What will I do if hold number one floods? What could I do? Should I abandon ship or try and save it? These questions should be answered before you leave the dock.

The ultimate act that would save most vessel and human losses related to stability is very simple. Load your vessel to maintain adequate stability.

CONCLUSION

I would like to close by discussing a severe frustration that one experiences when looking back at the record of fishing vessel losses related to stability. In many of these cases the required facts and information were available to the people on board the vessel to make an informed judgement about the prudent operation of the vessel.

If they had considered their situation in light of the stability of their vessel, they would have made different choices. In many cases people did not even consider the information available. We must make every effort to encourage operators to continually assess the stability of their vessel.

The U.S. Coast Guard investigation into the loss of the F/V *Americus* and F/V *Altair* was long and very thorough. They concluded that there were many factors which contributed to the loss of these vessels with all hands. One estimate of how the F/V *Americus* went to sea is shown in Figure 17. In this condition it had reasonable initial stability up to a few degrees of heel. No one would notice any difference in the "feel" of the vessel at the dock. However, the stability of the vessel was well below the level required by the IMO and the range of stability (less than 30 degrees of positive stability) was very low.

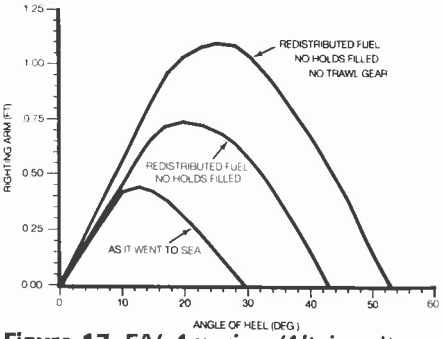


Figure 17. F/V *Americus/Altair* as It Went to Sea and with Variations on That Loading.

Now, if we examine the stability of the vessel after redistributing the fuel on board to other available tanks and after the seawater in the fish hold is removed, we arrive at the stability curve for the vessel marked "redistributed fuel, no holds filled" in Figure 17. There is a large increase in the stability of the vessel. In this condition the vessel would not quite meet the IMO stability criteria, but it is very likely that the vessel would not have been lost.

If we take one more additional step and remove the weight of all the trawling gear that was added to the vessel, then the stability of the vessel is shown in the final stability curve. In this loading condition this vessel is extremely stable and exceeds the IMO stability criteria.

What we all need to realize is that the stability characteristics for every vessel are different. The concept of stability may seem like a complicated subject, but it can be considerably simplified by focusing on the vessel's stability curve. This is usually available in the stability information provided by the naval architect.

A vessel's stability will not take care of itself. It is just as important on every trip as the fuel for the engine. If you run out of fuel, you can at least call for help. If you capsize, you will be in the water or dead. □

SURVIVAL EQUIPMENT USE

By CDR Kenneth M. Coffland, USCG (Ret.)

LTJG Jennifer M. Lincoln: Our next presenter is CDR Kenneth M. Coffland, whose presentation is entitled *Survival Equipment Use*. CDR Coffland is a retired U.S. Coast Guard Commander with 24 years of service. During his Coast Guard career he had several assignments including New Orleans, Louisiana; Washington, D.C.; and Annette Island, Kodiak, and Sitka, Alaska. CDR Coffland is a graduate of the U.S. Coast Guard Academy and the U.S. Navy Flight School. He is currently serving on the Board that advises the Alaska Marine Safety Education Association (AMSEA). CDR Ken Coffland:

We are going to spend a few minutes chatting about equipment. Equipment is kind of wonderful in the field of regulation and the field of life and death because it is a really quick solution. Someone died. Part of the cause of death is because they did not have the tools — the equipment — that they needed to stay alive.

So, we are going to prevent that problem in the future by throwing money at it. We are going to throw some toys (equipment) at it, and we will all feel good. Our conscience feels better, and the problem is solved. Right? Makes sense. It is quantifiable, it is measurable, and it can make a difference. Unfortunately, we have to take an additional step.

I am delighted that the new regulations have added that next step. It is a lot more expensive than equipment. That fact I have mixed feelings about. To start with, I know a few millionaires in the fishing industry, but the vast majority of my friends who fish for a living are not.

That next very essential step is training. It must be integrated with the equipment or the fisherman has been saddled with spending money on meeting a requirement — filling a square without a good enough return on the investment. Does it sound like this guy is saying that survival equipment does not work? That kind of statement does quite a number on my friends who are manufacturers. It gets the attention of my friends who are fishermen, too. Are they spending their hard-earned money on a fix that does not work? The only problem that sort of statement fixes is low blood pressure. It boosts it right on up.

EQUIPMENT AS TOOLS

Let us talk about equipment. When you go out and buy survival equipment, it is kind of like this necktie that I am wearing.

I have been on the road a while. A week ago, in Orlando, I bought a necktie. It filled the necktie square. It is black, it goes with a suit — that is nice. While it fills the square for a necktie, those of you who have better eyesight might notice that this neck tie may not fit every occasion. Some might even say that it is a Mickey Mouse kind of necktie (because Mickey is a major part of the colorful pattern). It fills the square. It meets the minimum requirements. It may be effective, it may do the job of making me look proper and businesslike, unless someone gets too close. Does it really do the job in every case?

To start with, no tool does the job in every case. In particular, you need to find a tool or tools that are going to fit the needs for the individual situation, for your vessel in the case of those of you who fish for a living. For the rest of us, we bureaucrats, experts, trainers, we need to help people find the right tools.

A DEMONSTRATION

Let us take a few seconds out and show you a prime example of how buying a tool that works may backfire. I go into the local store, and I say that I want to buy a survival suit. So I buy one. My helpful friends from Homer just loaned this nice, new survival suit to me. Who else in this room gets to take their shoes off (as shoes are removed for the demonstration)?

By the way, there are two people in this room watching me put on this suit standing up who are absolutely appalled. Those two people remember that it is vital to practice putting on the suit while lying on the deck because the deck is not going to be level and flat in an emergency. (The immersion suit is fully donned and zipped up.)

Does this suit fit? What is your consensus? Does this suit fit reasonably? Yes. It does the job. When people walk in a store, this is what they go through. They wear street clothes, they put on the suit, they say, "Ooh, this fits nicely."

Even if they go to a pool to do a training exercise, they hop in the survival suit wearing their street clothes or bathing suit; they have a great time. They can say "I trained in my suit, and I'm prepared for the emergency." (Immersion suit is unzipped to the waist to add more layers of clothing.)

People do not fish in street clothes. Amazing revelation. People put on their "pollypro" because sometimes it is cold on deck fishing. They put on their foul-weather gear. Guess what? If they try to don the immersion suit with the clothes they fish in, they start to worry about their weight gain when their suit does not fit anymore.

In a non-emergency, it sounds funny. This was the experience of two out of three crewmen on one vessel whom we recently trained. This crew was the epitome of well-prepared.

They drill regularly with their equipment. They were absolutely appalled when we did a drill on the deck of a vessel on a rainy day, and they wore normal work gear, and they could not get into their immersion suits. They were crushed.

Is this a defective suit that I am wearing? No. Is it a bad suit? No. Should we sue the people from New Jersey who made it? No. But it does not do the job. It fills the square.

If I am inspected by a Coast Guard boarding crew, they would see suits that are well-maintained, suits that can do the job. I could even demonstrate that they fit.

So, where does this all take us? Well, survival equipment is a set of tools — tools for doing the job. While we are preparing to do this job, this surviving kind of job, it is absolutely vital that we find tools that fit us, not just to fit a law or a rule.

THE RIGHT EQUIPMENT

The right survival equipment does work. How do we get the right equipment into the fisherman's hands? Well, in the generic words of the Washington insiders, it would be called education so that we can have an informed consumer. The ultimate

responsibility for life and death out there is with the person who is doing the surviving.

The person who buys that suit to keep themselves alive or the owner of the vessel who buys this suit needs to make informed decisions. The difference between that suit and the next size up is not significant in cost when you get right down to it. You have already made the big investment when you filled the square.

The right survival equipment is not just what meets the letter of the law. The right survival equipment is equipment purchased by informed buyers who pick the tools that best fit the crew, vessel, and environment.

EDUCATION

We need to educate people so that they can make informed decisions. Who is the "we" who are going to make that happen? Is the consumer going to go out and say, hey, I am a fisherman. I am going to be the smartest fisherman in the world.

In a sense they do. They are going to be the smartest fisherman who know how to catch fish to make a living. They are really good at it. They work their tails off to make that a reality. They are also going to have to devote a little of their time and energy to this secondary mission. So, who is going to train them? Are they going to rush in and say, "I want to be an informed consumer. Could we have a consumer advocate course, please?"

No. That is not going to happen. How do we become informed consumers in the world of buying automobiles, buying furniture, buying clothes, or buying anything else? Where is the education process coming from? Advertising. The manufacturers have a responsibility (and opportunity) through advertising to help educate the consumer.

Why? Because, they can keep their legal fees way down if they have people who are buying the product that fits best. "Buy ours because look at all these really good features. Look for these features, when you buy any suit."

If you will look around this country, you will find your most creative writers who come out of the colleges do one of three things. They go off to write their great American novel, they go off to do creative writing for the politicians, or they go off to do creative writing for Madison Avenue.

> The ultimate responsibility for life and death out there is with the person who is doing the surviving.

They can make education of the consumer entertaining. If we encourage the manufacturers, they can play a major role in helping to train the people buying the products.

AMSEA, by the way, has done a real nice job of helping to facilitate that. People like Hank Pennington and Jerry Dzugan have conducted several excellent manufacturer training programs. These classes (which often include competitors) learn about the realities of using the equipment.

In these programs, people who manufacture and sell the products actually come in, put on the gear, get in the water, and do hands-on work with the system for survival, which includes a broad variety of equipment and training. That is a start.

There is another area where experts from organizations like AMSEA and NIOSH can make a big difference, too. That is in broader public education: public service education — the little one-liners that teach

people who are out there making those decisions — through public safety announcements. It is already done in many other areas.

How many of you know that the government office for buying publications is in Pueblo, Colorado? Why? Because there are all these little 30-second sound and sight bites on the tube (television) saying "Did you know? You can know more about this if you write to ..."

We have a responsibility in government to help consumers make informed decisions about equipment as well. The next critical link that you are going to hear about later is, of course, training. Because you can have all the toys in the world, and if the people do not know how to use them, it does not matter. □

PROTECTIVE CLOTHING IN COLD WATER SURVIVAL

CAPT Alan M. Steinman, USPHS

LTJG Jennifer M. Lincoln: Our next presenter is Captain Alan M. Steinman, whose presentation is entitled *Protective Clothing in Cold Water Survival.* Dr. Steinman earned his Bachelor of Science degree from MIT in 1966 and his MD degree from Stanford University in 1971. He did his first year of residency training at the Mayo Clinic and joined the Public Health Service in 1972. He has served as flight surgeon at various U.S. Coast Guard air stations and in 1978 was assigned to Coast Guard Headquarters as Chief of Operational Medicine and medical advisor for search and rescue operations until 1984. During these years in the Coast Guard, he designed and performed numerous studies on hypothermia, sea survival, and protective clothing. He completed an occupational and preventive medicine residency at the University of Washington in 1987, earning a Master of Public Health degree. He was board certified in Occupational Medicine in 1988, and he was designated a fellow of the American College of Preventive Medicine in 1989. He served for 18 months as Chief of the Medical Branch, Division of Commissioned Personnel, Office of the Surgeon General, USPHS, before rejoining the Coast Guard in his current assignment as Chief of Wellness Branch, Operational Medicine Division, Office of Health and Safety. Dr. Steinman has an international reputation in hypothermia and cold water survival. He has published numerous research papers and text book chapters on the subjects and has served as advisor on cold water operations and sea survival to all branches of the armed forces.
Dr. Alan Steinman:

We are going to talk about sea survival, particularly in cold water. I want to tell you of the results of some of the experiments that we have done — looking at some of the suits, in fact, that Ken Coffland has shown you.

COLD WATER SURVIVAL

Cold water survival is an interesting topic, particularly for Alaska. You always have cold water up here. The problem with humans in cold water is twofold:

- First, you have to avoid drowning.
- Second, once you avoid drowning, you have got to avoid dying of hypothermia.

Avoiding Drowning

You are going to hear a little bit more about drowning from CAPT Perkins, our next speaker, I will not talk about that a lot. To summarize some of the obvious things of what someone has to do to avoid drowning, you have got to know how to swim, basically keeping your mouth and nose above the water. You must avoid panic. The sea state obviously impacts your ability to avoid drowning: what kind of clothing you are wearing, what kind of flotation device you are wearing, whether you have got a life raft or you have anything else to hang on to for buoyancy, and how close the Coast Guard is to coming to pick you up.

Controlling Hypothermia

The other half of the equation of survival in cold water has to do with hypothermia. That is what we are going to talk about here in the next few minutes. Here is the factor that impacts

on your ability to withstand hypothermia in cold water: how big you are.

Basically, human beings, from the standpoint of cooling rate, the bigger and fatter you are, the longer your survival time. It is one of a few advantages of being obese in our society. The closer you are to a perfect sphere, the longer you are going to survive. It has to do with the surface-area-to- volume ratio.

> Just because you are wearing a lot of buoyancy does not mean that you can be passive about your survival.

Obviously, if you are in a good state of health, you will survive longer. The colder the water, the quicker you will get cold; that is a no-brainier.

The rougher the seas, the faster you are going to cool. We are going to talk about rough seas a lot here in a few minutes.

What kind of protective clothing you are wearing has a major impact on your ability to survive. How much flotation you have has an impact. Finally, what you do in the water affects your survival. If you thrash around or hold still, each type of behavior is associated with a different cooling rate.

One thing you have got to understand (and the Coast Guard is constantly fighting this battle) is that just because you are wearing a flotation device that has a high buoyancy does not guarantee you are going to live. You have to understand that all those flotation devices are approved by the Coast Guard for their performance in calm water.

Often times, a swimming pool is used for these tests. That is not where people fish. That is what you have to understand about buoyancy. Just because you are wearing a lot of buoyancy does not mean that you can be passive about your survival.

You have got to do something to keep yourself alive. Your ability to hold your breath and to avoid panic, your degree of physical fitness, and your ability to move in the water and keep your mouth and nose above the water are critical survival skills in cold, rough seas.

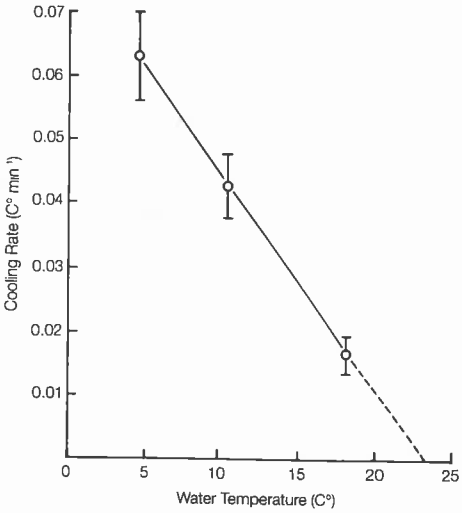


Figure 1. Relationship Between Water Temperature and Cooling Rates in Lightly Clothed Lean Males.

— Source: John Hayward

SURVIVAL SCIENCE

Now for a little bit of science. Data show the colder the water, the faster you get cold. People do experiments on these things. Figure 1 shows a linear relationship between water temperature and cooling rates, at least in lightly clothed lean males. Another interesting experiment, as discussed before, is that the fatter you are, the longer you are going to live in cold water.

We are going to talk about rough seas because this is what you have a

lot of in Alaska and all over the Pacific Northwest. We are going to talk about protective clothing.

As I mentioned, Dr. John Hayward of the University of Victoria probably has done the biggest and most complete study on protective clothing back in 1976.[1] He has a lot of graduate students. He got his graduate students to participate in his experiment.

He got 20 of them and 20 different suits, and he had a 20-by-20 matrix of these suits and students. He looked at dry insulated suits, wet suits, uninsulated suits, and even a little one-person life raft that you could inflate orally.

We found that the next best thing in terms of insulation was uninsulated dry clothing, a dry suit that kept the water away from their body as a shell. This cut the cooling rate in half and doubled their survival time.

If you had a wet suit, custom fit and foam insulated, it quadrupled the subjects' survival time. It cut their cooling rate down to 0.23. If they had a dry, closed-cell, foam-insulated suit, they got seven times the protection — seven times the survival. That is what Dr. Hayward found in that big 20 by 20 matrix study.

Remember, this was all in calm water. That is not where people go fishing. This kind of situation in calm water is interesting, but we in the Coast Guard were interested in what happens if you put some of these folks in rough water.

We devised a calm-water versus rough-water experiment on the different kinds of equipment that we use in the Coast Guard and that are commonly used by the boating industry and the fishing industry. In our rough water situation, we used a Coast Guard rescue boat that was designed to take a 360-degree roll and come up fighting, but that is another story.

We went to a Coast Guard station in Washington on the mouth of the Columbia River. This is one of the world's nastiest and largest river bars and usually a reliable source of rough water. We got some volunteers from the Coast Guard. They were all air or boat crewmen, were very physically fit with about 12 percent body fat, lean and mean, experienced, good swimmers. This experiment was a bit risky. We wanted to minimize the chance of injury, and we wanted to have people that were fit enough to do this.

We outfitted them with a rectal temperature probe and the various skin temperature thermometers, and we had them all wired up — the subjects themselves called it probed up — and then we outfitted them in a variety of different suits. One was a standard military flight suit, equivalent to street clothes in insulation. Very little insulation. If you fell into the water wearing lightweight street clothes, this would be the kind of insulation you would have.

Then we put a shorty wet suit under the flight suit and measured the cooling rate. We looked at a custom-fit, two-piece wet suit. The custom-fit is the key. We are looking at the best possible insulation this garment could give our folks.

We looked at a couple of coveralls that are common in the fishing industry and the boating industry and even in the Coast Guard. One was a nylon, a loose-fitting coverall equivalent to what our helicopter crews use.

A similar suit was made out of Nomex® material; It is loose-fitting, foam-insulated suit is the key here. Both of those suits are loose-fitting, foam-insulated, which is in contrast

to the wet suits that are tight-fitting foam-insulated.

We also had a float coat. This is a popular item. It is an insulated coat which, if you fell in the water, you could pull down a little beaver tail between your legs and create little wet suit panties for yourself. We wanted to see how that coat performed.

Finally, we had a couple of foam-insulated dry suits. These are similar to the one that Ken (Coffland) just showed you. They are dry suits, so they keep the water away from your body.

Next we took our subjects out to the bar and put them in the water. It was four- or five-foot swells, an occasional break, 0 to 2 knots of current, 50°F water and the drill was that they stay in the water for 90 minutes or until their rectal temperature went down to 35°C or 95°F, or they could come out anytime they wanted to. We measured their cooling rate.

Just because you are wearing a lot of buoyancy in the water does not mean that you are going to stay afloat all the time. You have got to fight to keep your head afloat and indeed these guys had to do that. They had to do a lot of swimming around, maneuvering in the water to keep their head above the water in a rough-sea situation. We also compared these same guys wearing the same suits in calm water. Here are the results.

The flight suit, which is the equivalent to street clothes, had the fastest cooling rate of all the garments. These guys in that garment cooled about 3 or 4°C per hour. It is very fast.

That was the control garment. If you fell in the water with street clothes, then you would have a very short survival time.

Let me just switch to the dry suits. They do quite well. The suit that Ken (Coffland) held up and the other suit that was a foam-insulated dry suit did the best. That is what we expected. We had no doubts that they would do quite well.

They both did well in the calm seas and actually had slower cooling rate in rough seas; that is a little bit misleading. They are only out there for 90 minutes, and by struggling to keep their face afloat and out of the seas, they were generating heat inside that dry suit and thereby slowing their cooling rate.

We looked at three loose-fitting garments: the float coat and the two coveralls. In calm water, if the subjects held still, they did quite well. In fact, these coveralls are almost as good as this wet suit. But in rough seas when they had to move around and swim, they generated a lot of flushing through that garment and doubled their cooling rates. Those are significant differences.

The wet suit was not too bad. It was tight-fitting. It did pretty well in calm water, and had an insignificant increase in cooling rate in rough water and the same with the shorty. That is because they are tight fitting suits and there is very little flushing underneath. So that was an interesting experience.

Basically, we learned that rough seas significantly degrade certain types of survival garments. Particularly the ones that are popular on some of our fishing boats. The float coats and those two loose-fitting coveralls are not going to give you the protection that the advertisers say, or you might think you get, if you go into a rough-sea situation.

To raise an issue, we come to a situation in which four USCG helicopter crewmen lost their lives. The helicopter ditched off Cape Cod

in 1979. There was only one survivor.

We know that rough seas are a difficult survival situation. So suppose we have a boat capsizing or an aircraft ditching in rough seas, what should you do if you are the survivor? Let us have you take a little quiz so you get a stake in the results of this next experiment.

Suppose you are on a boat or an aircraft like this and it is ditched and let us say — let us make the situation worse this time. Let us say it is 40°F water — real cold water. Let us say it's 45 or 40°F air temperature with an 18-to-20 knot wind blowing. Okay. Now, you have got the choice. You are in the water next to this boat or aircraft. You can either stay in the water and hang onto the boat or the aircraft and then you run the risk of hypothermia if you stay in that cold water, or you can climb out of the water and get on top of the boat or the aircraft.

Now you have the cold air and waves hitting you and you have wind chill to worry about. So which is best from a survival stand point? From a hypothermia stand point? Should you stay in the water and risk hypothermia or get out and risk the wind chill problem? So, how many people would opt to get out of the water on top of the boat or aircraft? Okay. How many people would opt to stay in the water?

Some of you just made the wrong survival decision. Now you have a stake in this next experiment.

In one incident a family boat capsized, and they have opted to stay in the water. In another situation, a man opted to get out of the water onto the boat. That is basically what we did.

We got another crew to volunteer. They were all males again, and this time they were even leaner and meaner. Eleven percent body fat, pretty good state of physical fitness, 5'10"; 165 pounds was the average weight. Here are the garments again. Here is the flight suit we used as a control. There was our friend the wet suit again, a custom-fit, two-piece wet suit and the coverall, the loose-fitting coverall. Then we tested a Navy garment. This is a suit that the Navy uses for their jet pilots. It is a dry suit with some very thin, uninsulated rubber shell, basically a sandwich of Gortex® and Nomex®. Underneath it, they wear some loose-fitting thinsulate insulation.

Their problem was that in some of their ejection seat aircraft, the ejection seat goes through the canopy and sometimes tears the garments, so they wanted to know how a torn garment compares to an intact garment in terms of survival. So we tested this in an intact condition and then we put a big tear in the shoulder and did it again with a big hole in it. If you have a hole in a dry suit, it does not stay dry very long!

For weather conditions, it was either raining or overcast, so we avoided sunlight. Therefore the globe temperature, which measures radiant heat, was about the same as the rest of the air temperatures. We also had 15-to-18-knot winds in a sea state of three or four-foot breaking seas. Here is our experimental condition.

There is our capsized boat, some subjects in the water, one subject on top of the boat. For creating rough seas, we realized that in a great big 20-foot wave with a five-foot break, you do not get a lot of rough water up here on the face of the wave. You can ride up the face up this wall of green water, and it is okay.

It is not real turbulent until you get to the break. Then you are going to tumble. Well, we just picked this

five-foot break here and gave our subjects that.

We used the wake of one of our rescue boats to make waves, and it did a very nice job of it. We hit them with the wake of the boat. It creates about a four- or five-foot breaking wave. Let me back up here and show you one other thing.

We also had to make wind. So we had three red devil blowers all hooked up together and funneled it through this ventilation duct and so that sits there and blows on the guy who is sitting on top of the boat, so he is sitting in front of an 18-knot wind speed and then there is this little garden hose with a sprinkler head to make sure that he stayed wet the whole time, simulating rain. So it was really a nasty little experiment.

That was very tough for these guys to do — but they were pretty good sports about it. So here we go: there are two guys in the water and the guy on the boat. Here comes our wave, and indeed, the wave is pretty nasty, basically buries the people in the water as they are trying to hold on. There is another guy over here somewhere and there are two people under here somewhere and even the guy in the boat gets blasted with this wave and, of course, this sprinkler head is a little superfluous in this kind of situation, but that is about what you see in a survival situation.

When you are out of the water in the wind, you are still getting waves breaking on you. There is a wave breaking right on top of the guy and a couple subjects under here.

We also tested a one-person life raft that we are still trying to get for our aviation crews. So they can egress a helicopter with a life raft on their back and this was a prototype life raft that had never been tested in cold water before and there is a wave breaking on that life raft.

Here is what we found. So you can see no matter what you are wearing, you are better off out of the water. So those of you who voted to get out of the water, you made the right survival decision. Actually, this audience did pretty well. Most of the time when I give this lecture, about half the audience votes incorrectly. You are always better off out of the water, no matter what you are wearing. That is what we found here. Then again, you see the distribution of garments. The flight suit provided the least insulation, of course. Since it was quite cold water, look how fast the cooling rate was — 6°C per hour. These lean guys would have had a survival time of probably one hour or less in this kind of situation.

The Navy dry suit, when it stayed intact, did quite well, as good as the suit that Ken showed you, the immersion suit. But when you put a hole in it, you find that a leaky dry suit without insulation does not do very well, and by the way, a leaky dry suit with insulation, which most of these things will do, also degrades your survival time.

The two loose-fitting coveralls were sort of intermediate between that and the wet suit. The wet suit, again, did quite well. But, you can see, if you get out of the water, even wearing a wet suit, you increase your survival time.

Here is how much water came into the suit when we put a rip in it. When the suit was intact, no water came in, basically. When we put a hole in the thing, it got about 7 kilograms of water by the time they had to come out. Even on the raft, it shows you how much water came in when the waves hit them, about 3 kilograms of water.

When you talk about survival time, it is not a real easy situation.

People always want to know "How long can I survive in whatever I am wearing in this kind of condition?" Well, it really depends on a lot of factors. What do you mean by survival time? We broke it down into three different categories. This one NATO uses — time to incapacity, with a core temperature of 34°C. I am not sure that I agree with that, but it is pretty conservative. They think at that temperature, you are not going to be able to activate your survival equipment, use your radios, use your signalling devices. So that is one estimate of survival time. A better one might be how long it takes you to become unconscious. If you are unconscious in rough seas, you are dead. That is basically it. I do not care what kind of buoyancy you have, if you are unconscious in rough seas, you are going to drown. There is going to be water in your face.

The other one, the ultimate one, is how long it takes to cool to cardiac arrest. We sort of assumed a temperature of 25°C — a core temperature for that. Basically as has been stated before, people who are fatter will have a longer survival time. □

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COMMUNITY-BASED DROWNING INTERVENTION PROGRAM

By CAPT Ronald D. Perkins, USPHS

LTJG Jennifer M. Lincoln: Our last presenter for this session is CAPT Ronald D. Perkins, whose presentation is entitled *A Community-Based Drowning Intervention Program*. CAPT Perkins received his Bachelor of Science degree in environmental health from Utah State University and his Master's of Public Health degree from the University of Minnesota. He has worked for the U.S. Public Health Service for more than 20 years with assignments in Arizona, Montana, the Philippines, and Washington, D.C., as well as in both Dillingham and Anchorage, Alaska. CAPT Perkins has conducted several studies including carbon monoxide poisoning among Bristol Bay fishers. He has lived in Alaska for 13 years and is currently assigned to the Alaska Area Native Health Service as an Injury Prevention Specialist. CAPT Ronald Perkins:

I have enjoyed the presentations so far, but I would like to switch gears a little. I am going to leave the commercial fishing injuries for a few minutes to discuss small Alaskan community intervention projects — how we can prevent drownings from a real-people perspective?

EPIDEMIOLOGY OF DROWNINGS

Around the turn of the century, some people still thought that diseases were caused by bad luck, bad air, or evil forces. I think that epidemiology, the science of how diseases are transmitted and prevented, sheds a lot of light on the subject. People began to realize that every disease has its own specific set of risk factors, and the more risk factors you are exposed to, the more likely you are to get the disease.

Recently, this same scientific approach or epidemiology, has been aimed at injury prevention. We are having much more success with the injury prevention process now that we are identifying risk factors and prevention programs, rather than viewing the injuries as "accidents."

The first thing that we need to do whenever we begin working with a city, a community, or a village is to identify and prioritize their health problems, by severity; death is obviously the highest priority. In Alaska, the leading cause of death is heart disease, with unintentional injuries a close second.

Of the unintentional injuries, motor vehicle is the leading cause and drowning is second. With the Alaska Native population, drowning is the leading cause of injury death.

In the Yukon Kuskokwim area, we have injury statistics gathered by Ms. Sherron Smyth from death certificates for 1979 to 1989. She found a total of 157 drownings in this 10-year period. Of those drownings, 15 percent were people who broke through the ice, and 48 percent were alcohol-related .

Typically, boats in rural Alaska are not the large fishing boats that we have been discussing, but instead are small aluminum or wooden skiffs. It is a different problem altogether from commercial fishing drownings. These small skiffs are used for fishing, travel, hauling groceries, hunting, berry picking, etc.

In the study of diseases, there are three factors that an epidemiologist

would normally look at: the HOST, the AGENT, and the ENVIRONMENT. To prevent diseases like polio, you might try to change the HOST with vaccinations, or in the case of malaria, mosquito repellent might be used.

The AGENT might be controlled by the use of pesticides. In this same example, the ENVIRONMENT, which allowed malaria to flourish, could be changed by draining the swamps.

These same types of solutions can be used when designing injury prevention programs. In the case of drownings, the susceptible hosts are those people who use the waterways. We have tried to change the host by getting them to use personal flotation devices (PFDs).

We felt that it was impractical on a community level to change the agent, which is the boat. Attempts to change the agent are difficult. For example, some of the skiffs have flotation in the seats, but the flotation is removed to allow for more room to store gas or groceries or whatever.

FLOAT COATS

The principle solution used by the Alaska Area Native Health Service has been to influence consumers to buy float coats. We also conduct water safety programs in several villages and communities throughout the state, but our primary effort is in float coat sales.

We work under the basic premise that the only effective PFD is one that is worn.

The first PFDs available were bulky, ugly, and uncomfortable. Even today, many of the PFDs, which are Coast Guard approved, are little more than rectangular pieces of foam with a hole for your head to stick through.

This type of flotation device meets the letter of the law because it will keep you afloat, but no one wants to wear it. Typically, people think that if an emergency arises, they will grab the PFD that they have been sitting on, put it on, and be saved.

Of course everyone in the business knows that if you are not wearing your PFD at the time of the incident, it probably will not save your life. We work under the basic premise that the only effective PFD is one that is worn.

We have spent a great deal of time analyzing the reasons that people have for owning PFDs and also the reasons for not using them. Some of the reasons people have expressed for not using PFDs is that they were ugly and uncomfortable.

Gradually, the demand for flotation devices increased, and we started seeing more attractive and more comfortable PFDs. The devices then started to become more functional with the introduction of flotation vests, with pockets, and fly fishing vests.

In rural Alaska, if a PFD was onboard the skiff, it was typically found in the bottom of the boat or being used as a seat cushion. If you find yourself falling overboard, you just lift the anchor out of the way, grab the vest, and put it on.

Basically we had two problems: one was getting people to buy a PFD, and the other was getting them to wear it. We felt that both problems could be resolved through more appropriate marketing.

We had to find out what the consumer wanted out of the product. We then had to meet their needs, while still fulfilling our need to save lives. We started to promote

flotation jackets and de-emphasize vests. The flotation vests basically only have one purpose: they are a safety garment.

The flotation jackets or "float coats" are a utility garment as well as a safety garment. They are warm, they are comfortable, and they are stylish. I have seen people wearing these float coats when riding their four-wheelers, shopping for groceries, or doing any number of other activities besides just being in the boat. If a person owns a float coat and goes overboard in a boating mishap, chances are good that they will be wearing their float coat.

Some of the other types of flotation gear available to consumers include float coats in a variety of colors including camouflage, which is popular with the hunters. Raincoats are one piece of equipment that is found in every boat in Alaska.

Some of the new PFD raincoats are equipped with inflatable rubber bladders for flotation. "SOSpenders" are another type of inflatable flotation device that may be more comfortable for people in hot weather.

Some of the other inflatables are very stylish and can be worn anywhere, for almost any occasion. We just wanted to promote a jacket that people would wear full-time, whether they were in a boat or not.

THE PROMOTION PROGRAM

Our drowning intervention program started with the Alaska Native Health Service providing seed money to several Native Health Corporations for the purchase of float coats. The Native Corporations can buy these float coats at half the retail price, about $70, and sell them at cost to their Native constituents.

Any money generated from the float coat sales is used to buy additional coats. This revolving account is self-perpetuating and inexpensive to start. Retail stores in the rural areas have been very supportive of the program, and we work with them as much as possible.

The Yukon Kuskokwim Health Corporation (YKHC) has the most successful drowning prevention program in the state. Ms. Sherron Smyth and her staff have sold about 2,000 float coats at cost over the past three years. Having a variety of colors and sizes available for people to try on is helpful.

Timing is also important. Nearly 120 float coats were sold during a Christmas sale by YKHC, using a 10-percent discount coupon.

There are also several other ways that have been effective in influencing people to buy float coats. Newspaper, radio, and TV stories are very effective in providing the public with facts about the extent of the drowning problem and success stories of people that have been saved. Public Service Announcements and TV documentaries have also been effective.

YKHC also makes school presentations in the surrounding villages where they contact about 900 kids a year in giving presentations on floatcoat use. Summer water safety programs let the kids get in the water and try on PFDs so they can see how buoyant and comfortable they are.

One of the best public education methods available to us is free! It is contacting the news media and troopers to have them report use and non-use of PFDs when reporting drownings or near-drownings. This lets the public clearly see the effectiveness of using PFDs. Pretty soon it becomes common knowledge that float coats are effective in saving lives. The problem and the solutions need to be in the public eye often.

Public displays, health fairs, and demonstrations were also used in

Bethel. Float coats were given away as prizes and raffled at health fairs. YKHC contacted the canneries to give float coats away for the fisherman selling the most fish. Special sales were used at Christmas, the Fourth of July, and other holidays. The Bethel Veterans of Foreign Wars organization even had 4th of July rippy sales (rippies are a popular game of chance). Over $5,000 was raised and donated to YKHC to buy children's PFDs.

Kodiak, I know, has had survival suit relay races where the public can see the suits demonstrated and have a great time. It is fun; it is a big public entertainment-type thing.

The float coat sales have been strongest in the YKHC area, but several other corporations have also been involved (i.e., the Tanana Chiefs Conference in Fairbanks, the Maniilaq Association in Kotzebue, and the Bristol Bay Area Health Corporation in Dillingham). Altogether the corporations have sold about 3,500 float coats in the past three years.

Success in this program is also most evident in the YKHC area. From 1979 to 1991 the YKHC area had 174 drowning deaths with an average of 14.5 a year. So far in 1992, they have had only eight drownings.

At least 16 people were saved last year with float coats that were purchased through YKHC. Eight of those almost certainly would have ended in deaths, but all 16 found themselves in the water wearing a flotation device.

CONCLUSION

In conclusion, I believe that to be successful with any type of injury prevention program, you need to identify the problem, get the statistics concerning the problem, determine an appropriate solution, marshal your resources, and then act on it. I think we can achieve success if we involve individuals and communities in the solution of their own problems. □

SESSION 7: PROMOTING A SAFE AND HEALTHY COMMERCIAL FISHING INDUSTRY

Moderator: Mr. Michael L. Klatt, M.S.
Senior Public Health Advisor, Alaska Activity
Division of Safety Research, NIOSH

Michael Klatt is a Senior Public Health Advisor for the Alaska Activity, Division of Safety Research, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (CDC). Mike worked for the CDC National Center for Prevention Services for five and a half years as an Immunization Program Manager for the states of Missouri, New Mexico, and Alaska. For the past year and a half he has worked for the Alaska Activity, first as the Acting Chief, and currently as the Health Educator and Information Management Officer. Mike recently received his Master of Science degree in Community Health Education from the University of New Mexico.

QUOTES FROM THIS SESSION

"We have much higher and enforced safety standards than almost anywhere else in the world, except for Norway and one or two of the other countries that have voluntarily complied with IMO safety requirements."
— Jerry Dzugan

"It is one thing to require equipment, but it is another thing to require the fisherman to stand up in front of his crew and try to teach them formally in drills."
— Hank Pennington, M.S.

"We firmly believe that there is a need to require the licensing of captains of commercial fishing vessels, including a requirement that they demonstrate, not just pass some kind of paper test, minimum understanding of how to handle safety problems that they may confront, including stability, fire fighting, and use of life saving equipment."
— Bill Gossard, M.P.A.

"Over and over again we see that rafts get put in places where people would never be able to access them if they were iced and the boat took on a serious list."
— Leslie J. Hughes, B.A.

MARINE SAFETY INSTRUCTOR TRAINING

By Mr. Jerry W. Dzugan

Mr. Michael L. Klatt: Our first presenter is Jerry W. Dzugan, whose presentation is entitled *Marine Safety Instructor Training*. Mr. Dzugan has been a teacher for the past 20 years, instructing high school students and adults in a variety of subjects. Since 1985 he has been an instructor-trainer in emergency medicine and marine safety. From 1980 to 1988, Mr. Dzugan was a part-time commercial fisherman in Southeast Alaska. He is a member of the U.S. Department of Transportation's Commercial Fishing Vessel Advisory Committee and the Chair of this committee's Training and Licensing Sub-committee. He is also the chair of the Alaska Task Force on drowning and boating safety. Mr. Dzugan is the director and training coordinator for the Alaska Marine Safety Education Association (AMSEA) located in Sitka. Jerry Dzugan:

Recently, I attended a worldwide conference on fishing vessel safety that was held in Europe. It was sponsored by the International Maritime Organization (IMO), the United Nations, and the European community. The presenters represented people from a variety of backgrounds, from Southeast Asia, South America, Europe, and North America.

SIMILARITIES IN PROBLEMS

They also represented vessels both small and large. Despite these differences, however, what really struck me were three similarities in their safety problems.

Small Boats

One of the similarities in most of the fishing fleets of the world is the large number of boats that are small. The owners do not have a lot of money, especially in fisheries outside of North America and Europe. Even in North America and Europe, which we consider fairly affluent societies, many fishermen are not really "flush" economically.

These fishermen usually do not even perceive themselves as a business entity. Most of them certainly do not have the corporate awareness that a bigger business entity has in terms of the cost effectiveness of putting money into safety.

Small Boat Casualties

One of the problems which I noticed, that provided some continuity to many of the presenters at this conference, was that most of the casualties and the casualty statistics that those nations suffered were from the small-boat fleet. Although yesterday we learned that in the United States and Alaska the fatality rate may be higher in larger vessels.

In terms of the number of people who die in fishing vessels around the world, it is the small-boat fishery that is impacted the heaviest.

We know this in Alaska because we have been having people who have lost their lives due to fishing for years. The largest loss of lives has been one here, two there. It just does not make banner headlines like when you get a big vessel that has a problem with a large loss of life.

I think sometimes because it is a little bit here and there, all over the world, all over Alaska, it does not have the same headline impact in the media and in people's minds.

IMO is going to come out with regulations for fishing vessels around the world. Those regulations, if they come into force, will impact about 15,000 to 35,000 fishing vessels world-wide. That is out of a total of about 2 million fishing vessels. So, even when those regulations come out, it is only going to affect a small percentage of the world-wide fleet, and larger vessels at that.

Human Factors

The third point of similarity in that conference was the fact that the human factor was seen by almost everybody as the most common cause of casualties. The human factor can mean many things.

Human factor refers to more than just whether or not you decided to buy a piece of equipment or not or whether you maintained it, but how was the piece manufactured. Did the guy at the life-raft company have a bad day and just not put the glue in the right spot at the time? Human factors permeate the whole area of safety. It includes people fishing, as well as manufacturers of equipment, search-and-rescue personnel, etc.

TRAINING REQUIREMENTS

We know that training is an important factor in whether or not you can survive a casualty. We know that from interviews with survivors. We know that from Coast Guard reports and National Transportation Safety Board (NTSB) reports that have been written as well.

Almost consistently, especially in the past seven years, they are pointing out one casualty after another in which training or education, or the lack thereof, had an impact on the loss of life in that particular situation. Much of this loss of life, tragically, took place when survival equipment was available.

We have the technology now to improve safety. It is even satellite technology now, as a matter of fact. But, this new technology will not work if it is not used or if it is used improperly.

Due to a lot of efforts that you have heard about earlier, a recent federal regulation is now requiring an increased amount of safety and survival equipment to be carried aboard U.S. commercial fishing vessels. Presently, U.S. fishing vessels are probably one of the most stringently regulated fisheries in the world in regard to safety. We have much higher and enforced safety standards than almost anywhere else in the world, except for Norway and one or two of the other countries that have voluntarily complied with IMO safety requirements.

Also these new requirements include a small but important section of regulations requiring training. That is what I want to concentrate on during this talk. The hope of everyone is that this training will have some impact on safety. The training being referred to in the regulations is for first aid and survival equipment procedures and drills.

SAFETY PROBLEMS

There are a lot of ways to look at the safety problem in any industry. One of the ways to look at it is from the perspective of a USCG helicopter pilot who had been doing search and rescue work out of Kodiak for about 12 years. This pilot was asked, "In the years that you have been flying out of Kodiak, what have you seen that has made the difference between the people that have survived and the people who did not survive?"

This particular pilot had picked up a lot of bodies, both dead and alive. What were the determining factors that made the difference?

Equipment

First of the important survival factors, he felt, was whether or not that person or that boat had survival equipment available. He was referring to obvious equipment such as immersion (survival) suits, life rafts, EPIRBs, etc., but I would also include equipment like stability books and some of the things that you usually do not think of as "survival" equipment, but help keep you out of trouble. If they had this equipment, that was one factor that helped them survive.

Knowledge

The second factor was, did they know how to use the survival equipment? This pilot had also picked people out of the water who did not survive even though survival equipment was available. The equipment was not used properly, or it was not used to its maximum designed potential.

Attitude

The third factor in survival was attitude, the attitude of the survivor. I think what he was speaking to specifically was the attitude of the survivor when he is in the water, cold, and uncomfortable. In that situation, a lot of the time it is just a whole lot easier to give up and die than it is to keep living because it is very painful and uncomfortable.

But attitude also includes the attitude of the person before the emergency. In other words, what was the person's attitude about safety on the boat in terms of prevention. The attitude that makes a person go out to the Cape, look at the weather, and decide to go back in, even though there is only a short fishing opening. This is in addition to the attitude during the emergency, oftentimes called the "will to survive," something that cannot be legislated or bought off the shelf.

In that situation, a lot of the time, it is just a whole lot easier to give up and die than it is to keep living because it is very painful and uncomfortable.

It also includes the attitude after the incident. What did the person do afterwards to improve the situation? Interestingly, there are a number of people who have survived casualties at sea, and they are in a similar situation again. Sometimes the learning curve was not as high as perhaps it could have been.

Equipment, knowledge, and attitude: these three things, I thought, summed up the essential aspects of safety. We know, through independent studies, that instruction can enhance all of these three areas. It can enhance the survival equipment that you have. Not just by your use of it, but also by making people recognize the need for it. It can obviously enhance your knowledge of survival equipment, and how to get the best use out of it. It can also enhance your attitude.

UNIQUE DIFFICULTIES

Although training can be part of the solution to safety problems, training in Alaska has some unique difficulties to overcome.

Large Area

For example, Alaska is a big place. I like to tell my friends from Texas when they are giving me a bad time, that if they do not straighten out their act, we will divide the state in two, and then they will be the third largest state. If they still do not

straighten up their act, we will do it at low tide, and they will be the fourth largest state. In other words, it is a big area.

Small Population

It also has a relatively small population. That presents a number of problems. Not just for fishermen and for people in the safety industry, but also for people doing search-and-rescue. The distances covered are great.

Sometimes the availability of safety training and instruction to those people is scarce. We are talking about people living in Western Alaska whose big trip to the city is Anchorage once or twice in their life. These are not people who are likely to come to Anchorage for training.

A lot of the training is needed for people who live in rural areas of the state. The training needs to come to them. There needs to be some kind of delivery system brought into that community so training can be accessed.

The other problem has been a lack of standardized curriculum and information. People hear conflicting information about what to do in an emergency, which would confuse people when the emergency happens to them.

To do effective safety training, you need to have equipment. It needs to be hands-on. The equipment that we are talking about is expensive. Life rafts, EPIRBs, and immersion suits cost a lot of money.

The training also needs to be hands-on because that is the most effective for retention of information. A lot of rural communities, especially in Alaska, do not have a cash economy. It may seem unrealistic that somebody cannot afford to pay what seems to be a relatively small amount of money to do training. But, in fact, it is a real severe hardship for a lot of those people who do not have an income, who live subsistence lifestyles, and who use cash very infrequently. So, that is also a problem.

Harsh Environment

The harsh Alaskan environment poses problems for safety training. If you make any mistake in training, you are going to hurt people. So that is another concern if training is going to be carried out. The water is just as unforgiving to fishermen as it is to trainers.

Effectiveness

Last but not least, the effectiveness of training is directly related to the effectiveness of the instructor. And since we are concerned with instructing life-saving skills, the quality of the instruction needs to be as high as it can be. So insuring instructor quality will be an ongoing concern.

A TRAINING NETWORK

To help address some of these problems in the mid-1980's, a group of people formed together in the State of Alaska from a number of different agencies and organizations — federal, state, and local.

It was a real grass-roots network. It did not come from the top down. It was not the government coming in and saying these things had to be done. It was a group of concerned people working within those agencies who realized that something needed to be done about all these problems. AMSEA came out of that creation. What we have tried to do in order to address some of these problems is establish a network of instructors.

This instructor network consists of over 200 people. They teach a wide variety of people within the state. Not just commercial fishermen, but a lot of other water users as well. Instructor courses are held periodically

around the state. To keep that instructor network alive, on-going training including refresher training is conducted.

Since 1986, 25,000 people have been trained through this network. Last year alone, there were over 6,500 people trained. There were about 2,200 fisherman trained, and 300 of those have gone through the newly required training in drills. There are 6,500 more fishermen to be trained in drills in Alaska in the next two years, so there is still a lot of work to be done.

Standardized Curriculum

AMSEA has tried to address some of the training problems that I spoke of earlier. One of the problems was the development of a standardized curriculum. This standardized curriculum was completed in 1986. Just this morning, I picked up the latest edition from the printer.

Updating and revising this standardized curriculum is a yearly process. This is very important since a lot of the information regarding safety and survival is changing with technology. The curriculum is also appropriate to the Alaskan environment.

Instructor Training

Instructor training classes are conducted. We did five last year, and we are going to do a few more before the year ends. In those instructor training classes, there are four things that we try to emphasize as much as we can.

One area of emphasis is safety practices. We try to give instructors a realistic view of what some of the potential safety hazards are in training. What you are trying to balance is a realistic training scenario but provide for a safe learning environment. If we start injuring people, the entire training infrastructure will start to fold.

The second thing that we try to emphasize in instructor classes is methods of instruction since we want these people to be effective instructors. We also go over teaching tips with them. We like to draw people who are going to be teaching people of their own background whenever possible. So, if the instructor is a fisherman, we will try to put him in a class where he is training other fishermen.

In our society, we have not treated teaching very seriously in some ways. I know that you can go all through college and end up with a high degree and teach classes, but you are never given any skills in methods of instruction. These instructor classes are an opportunity to give a potential instructor the opportunity to pick up these methods of instruction skills.

In the instructor courses, we go over personal survival procedures and try to give these potential instructors as much hands-on experience with the equipment as we can. Again, providing that safe environment, but making it realistic. We know, through research on education, that we only remember 10 percent of what we read; 10 percent of what we read if you are reading the newspapers is maybe a good thing sometimes. This is not good enough when you are teaching life-saving skills.

In contrast, however, instruction involving hands-on use of equipment increases student retention up to 90 percent. So we are trying to get instructors to do as much hands-on activities as we can. This type of training is also accepted a lot better by fishermen and other boaters who undergo the training. They can see the immediate value of what they are doing.

In the past few years, we have also worked more with giving these instructors tools so that they can be

effective in giving on-board emergency drills on their fishing vessels. Through this network of instructors, there will be a structure to offer this mandated training for fishermen.

Instructor Course

The instructor class is an intensive six-day course. A prerequisite to the course is certification in first-aid and CPR, as well as one-year background in the marine industry.

Instructors must also complete a performance-based skills check-off list that is based on the skills that need to be performed in an emergency at sea. They must also pass a written exam with a score of at least 90 percent. We want instructors to know the information, not pass out false information. Instructors must also present several successful teaching topics.

We try to keep instructors updated with quarterly newsletters, new equipment that comes in, new videos, etc. We offer refresher training on an ongoing basis and periodically when it is appropriate.

We maintain an inventory of equipment that we can send out to instructors around the state. Not every instructor in a rural community needs to have a whole selection of life rafts, immersion suits, EPIRBs, etc. Many of these instructors only instruct one or two courses a year. We can send them training equipment only when they need it, and it makes for an effective use of limited resources. The survival equipment manufacturers love it because they are not getting asked by 200 instructors for a life raft!

New Coast Guard regulations go into effect by September of 1994 that will require someone on a documented fishing vessel to be trained in how to conduct drills and emergency procedures. Right now there is a problem because many people know they are supposed to do this drill but do not know how it is supposed to be done.

If you have a 100-ton license or more, you do not need to be trained on how to give a drill according to the regulation. Yet, in the process of obtaining that license, nobody tells you how to conduct an effective drill either.

What should a drill cover? A drill should include abandoning ship, recovery of persons overboard, how to minimize flooding on-board a vessel, how to launch and recover life rafts, and donning of immersion suits and other types of flotation devices. One also needs to cover how to effectively fight a fire in several locations, and how to don a self-contained-breathing-apparatus (SCBA) and a fireman's outfit (if so equipped). It needs to cover how to give radio distress signals and use of visual distress signals as well as how to report inoperative alarms.

> One of the things that the study discovered was that 58 percent of all students who went through a course purchased additional safety or survival equipment.

One of the things that is not required in drills, but an item of great importance, is how to effectively debrief after a drill. It is in this debriefing session that the crew is going to find out how they can make their own survival systems on board work more effectively. It also gives a forum for fishermen to give a bit of feedback to their crew on how things could go better. A lot of times there is a very hierarchical structure on board a boat, so the debriefing is very important.

We are hoping to use this instructor network to provide communities,

many of them rural, with port-based instructors who can provide training for their fishermen in their own home ports. They can thus, resolve some of the problems with which trainers have to deal.

TRAINING EFFECTIVENESS

How effective has the training network been to date? Early in 1990, we contracted with the McDowell Group to do an independent study on the effectiveness of training so far. This study was looking at training that had been undertaken through this network for a three-and-one-half-year period from early 1987 to 1990.

This was during a period of time when training was not required in the commercial fishing fleet. It is a bit biased data to some degree, because we know that in some ways we were "preaching to the choir" in those days.

The results of that study were valuable. They are shown, in part, in Table I. This was partially because it was the first time that we were able to look at the effectiveness of training.

The McDowell Group interviewed about 20 of the most active instructors. We also gave them a sample list of people who had gone through training, which was about 100 people. Through the phone book and the limited entry commission, they were able to find fishermen who had not been trained to use as a control group. They then compared those two groups — trained and untrained fishermen — and also interviewed instructors.

One of the things that the study discovered was that 58 percent of all students who went through a course purchased additional safety or survival equipment. Remember that at this point you were only required on a fishing boat to have not much more than a life vest and a fire extinguisher. As a result of training, people felt that they were lacking in survival equipment or realized the equipment they had was insufficient. Without regulations for additional equipment or any other prods, trained fishermen just went out and bought more effective survival and safety equipment.

Table I. Summary of Training Effectiveness.

- 60 percent of instructors were able to detail actual cases where the training they provided saved lives.
- Documented cases from this one study alone accounted for the saving of 21 lives.
- 82 percent of students stated that their marine safety behavior was affected positively by the training they took.
- 58 percent of students purchased additional safety equipment or updated their existing equipment after taking training.

Of all participants in courses, 82 percent stated that their marine safety behavior was affected positively by training. People learned preparation tips, things like putting their survival suits in more accessible locations when they were fishing, etc. Of all instructors, 60 percent were able to document students who had been through their class who came to them later and told them that the training they received is the main reason they survived a subsequent emergency onboard.

About three dozen other instructors noted that the training, which their past students received from them, affected in some way their survival. In addition, there were 21 students who credited the training they received with directly saving their lives.

CONCLUSION

We have just started a long process here. With mandated equipment and training, the percentage of lives saved will continue to rise. There are other factors that affect safety, which we do not always have control over, such as fishery management schemes for intensive "derby" fisheries.

The sea is always going to present a very hazardous working environment. With appropriate survival equipment, the knowledge on how to get the most out of it, and confidence and familiarity with survival procedures, I think we are going to read more about "saves" than we have in the past.

Survival involves a systems approach. Training is just one important component of it. And, right now, it is a small component, but it is growing. It takes the efforts of a lot of people — a lot of the people represented here — especially that of the commercial fishing industry to make this whole thing work.

One of my favorite Scottish bards is Robert Burns, and I remember one remark that he made to a woman who was in the fish market. He saw this woman going through the fish market, looking over fish, and he came up to her and said, "Those are not fish you are buying ma'am. Those are men's lives."

We really do not consider the cost of men's lives in this whole industry. I think many of you here share a desire to see a lowering in this price of fish. □

National Fishing Industry Safety and Health (FISH) Workshop
Convened by the National Institute for Occupational Safety and Health
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SHIPBOARD DRILLS AND ORIENTATION FOR NEW DECKHANDS

By Mr. Hank M. Pennington

Mr. Michael L. Klatt: Our next presenter is Hank M. Pennington, whose presentation is entitled *Shipboard Drills and Orientation for New Deckhands*. Mr. Pennington received his Bachelor of Science degree and his Master of Science degree from Humboldt State University. He has authored several publications and edited several videos on marine safety and survival. Mr. Pennington is the chairman of the Kodiak Island Borough OCS Advisory Council and the chairman of the Alaska Marine Safety Education Association. Mr. Pennington is currently Assistant Professor of Fisheries Extension, Marine Advisory Program in Kodiak for the University of Alaska.
Mr. Hank Pennington:

I think for frame of reference that it is important to take a few moments to tell you a story, so we can all see from the perspective of the fisherman, what the safety law looks like coming down to him. It is one thing to require equipment, but it is another thing to require the fisherman to stand up in front of his crew and try to teach them formally in drills.

We are actually invading his space on the boat and trying to tell him how to run it. It is a significant change in our relationship with fishermen when we do that.

A fisherman was running his boat and the next thing he knew, he was standing in front of St. Peter. To say the least, he was kind of shocked, as was St. Peter, because the fisherman was not supposed to be dead yet.

They had a brief discussion and St. Peter said, "Well, we're going to send you back, but in order to make up for the mistake, we'll give you a tour of Heaven."

The fisherman walked into Heaven with St. Peter and he was at first relieved — Heaven was just like he had always heard it was. But it started to occur to the fisherman that St. Peter was talking about eternity, and those people in heaven were just standing around singing and looking angelic and smiling. It looked awfully boring.

So, they walked back outside and St. Peter said, "Well, we're sending you back now, but before we do is there anything else you want to know?"

The fisherman said, "Well, you're going to think this is crazy, but what's hell like?"

St. Peter says, "We can send you there."

The fisherman says, "Now wait a minute."

"We'll bring you back; it's just a quick look."

The fisherman said, "Okay, well, yeah, send me to hell, and I'll look it over."

Poof! He was suddenly in hell, and he could not believe it. People were lying around on sunny beaches, there were parties, the sun was shining, and it was warm and nice. The fisherman stood there in a state of shock, just looking.

Poof! Suddenly he is back in front of St. Peter, who then sent him back to his boat. The fisherman kind of

remembered the incident, but it was only a vague memory.

A few years later, sure enough, the fisherman really died and found himself in front of St. Peter again, who said, "Things just don't work right with you, do they? You're a borderline case. You've got your choice of heaven or hell. Which way do you want to go?"

The fisherman looked over St. Peter's shoulder into heaven and saw the people still singing and standing around. The fisherman says, "Well, you better send me to hell."

St. Peter said, "Now, this time there's no coming back. For sure, when you go there, you have to stay."

The fisherman says, "Yeah. I know hell's the right place for me."

So, St. Peter sent him to hell and the fisherman panicked because it was everything we heard about hell. It was hot. There were people being tortured. He was getting very uncomfortable very quickly and went running to the Devil and said: "There's been some mistake, I was here a few years back and there were sunny beaches and everything else. You gotta send me back."

The Devil says, "I'm sorry, we can't do that. You made the choice and you're here for eternity."

The fisherman said, "But, what's the difference? Why is it so different than before?"

The Devil smiled and said, "Back then you were a prospect, but now you are a client."

I think it is incumbent on all of us now to come through on some of the promises we made when we were dealing with fishermen as "prospects" before the law was in place. We have to keep in mind the things that we are trying to achieve, yet really become a partner with the fishermen and remain sensitive to their lifestyles and needs, especially the awkward position we are putting them in when forcing them to take an active teaching role.

Jerry Dzugan gave you a good look at what it's like to train instructors. Within that context, I am going to try to become more specific. In training instructors we have a filter between us and the fishermen. We are training instructors to train fishermen to train their crewmen. It is a long reach from here to there.

At the risk of all my credibility as a mariner and educator, I am going to show you the first minute of a video tape we did in 1982. Even at that point in time, we recognized the short-comings of just putting equipment on the boat without adequate training.

[Video playing.]

Okay. That is enough. That tape has become affectionately known as the *Three Stooges Go To Sea.* Interestingly enough, each single episode on the tape is based on actual incidents. We did not make those things up. They did not all happen to one crew, but each depicts the results of improper maintenance and lack of training. I would not ask fishermen to make fools of themselves like that in training. I get a regular paycheck to do that if it helps make a point.

We are asking fishermen to do the same thing: to stand up in front of their crews and risk making a fool of themselves. We have to be in partnership with the drill instructors, as I will call the fishermen who are actually standing on deck training their crews, to assure that they can do a credible job.

Jerry Dzugan has already listed the 10 areas required to be covered in the drills. I would like to discuss drills and what we try to teach the fishermen who ultimately do them. Then I

will discuss orienting new crew members and guests.

DRILLS

Drills have to be realistic above everything else. If you help a fisherman make a drill realistic, you help preserve his credibility. You are not asking him to put on a "bozo" suit. The drill scenarios must be something out of his life, something the crew can relate to.

Believability

The scenarios have to be practical, and the drills have to be truly spontaneous. There has to be some flow to them. You cannot say, okay, tomorrow at noon we are going to have a drill. They work a lot better if there is a little bit of surprise in them, and they are hands-on.

A point that Jerry Dzugan briefly mentioned was the use of community trainers. You cannot expect every fisherman in Alaska to have a smoke generator, but if you have got one in each community, as do many fire halls, you have the opportunity to make the drills more realistic, to put a little pressure on them.

If you want to see some panic, even though it is fake smoke, have a crew try to perform a few tasks when their boat is filled with smoke. Even if a smoke generator is not available, putting exposed x-ray film over the lenses of swim goggles will accomplish a similar effect. You can only see dim outlines of things around you, yet the drill instructor can monitor people so they do not run into things.

There is a need for an on going element of safety in the drills. If you make a drill believable enough that people get enthusiastic, they could run into something, fall down a ladder, or trip over something.

You can read the instructions on a fire extinguisher all day long, but it does not mean anything until you use it and find its limitations and how little time you have to work with it. If those functions are attempted in a smoke-filled space and you have to quickly determine the source of the fire and choose the right type of extinguisher, suddenly the instructions mean a whole lot more.

If you take away our principal sense of sight, the drills take on a different component. You may not be able to ask a fishermen to do that on each of his monthly drills, but if you provide access to those kinds of experiences for the crew, I guarantee they will come away talking about it, and they will remember it. Most important, they will look at their boat in different light, asking themselves the question, "If the boat is on fire, it is dark, and we have a 45-degree list, where is my survival suit?"

Attitude

Here is an interesting exercise: How many of you here today are staying in hotels? Two-thirds. How many of you have looked at the back of the door to your room? We have got some pros here. Usually in a group like this, almost nobody can tell you how many doors between their room and the fire escape or emergency exit. Yet we have had some horrible accidents in hotels.

I like to sit at the back of an airliner and watch heads during the safety briefing by flight attendants. If you do a quick survey, how many heads are up and listening? Never as much as 10 percent. Yet some of our most catastrophic accidents are in airplanes. We have a bad attitude as a nation about safety. As trainers and as safety advocates on the fishing boats, we have to try to overcome it. Anything we as trainers can

do to bring drills to life, to make them more realistic, to make them acceptable on the decks of the fishing boats is going to be critical. The key to that is to make the drills hands-on and pertinent. You cannot just sit and talk to a crew.

Drills have to be progressive. They have to build on each other. You cannot simply have people stand in a room full of smoke. In our drills, we use a scenario in which people are expected to perform tasks, with a fire leading to flooding, leading to an abandon ship.

Fishermen look at their boat differently if they have to think in terms of evacuating an injured crew member. The Coast Guard has been a critical resource for AMSEA in bringing in people off the ships and helicopters to demonstrate how they will work with fishermen. The whole process is safer for everyone if the fishermen know what to expect in a rescue.

Access to Equipment

Access to the equipment for some of this training is a critical component. The time to learn how to use a hoist basket is not when the helicopter is hovering overhead. Training that provides an opportunity to get into one before-hand is really worthwhile.

Another great drill is to try to operate a portable pump used by the Coast Guard. Talking to some of the ASMs that maintain them in the Coast Guard, you would not believe what people do to them in trying to operate them.

I do not think the immersion suit manufacturers regard their product as icebreakers, but they may well be used in ice. In one exercise, the life raft is sitting essentially on a rocker panel, so when the people are in it and trying to do real basic things like turn on an EPIRB, we can add a little sea action. We even turn off the classroom lights to let them work with the gear in total darkness.

Visual Distress Signals

Another area of great concern to me is the use of visual distress signals. In any drill, particularly when you start using distress signals, you have the opportunity to cause quite a stir with the Coast Guard or anybody else who might see or hear you and not know what you are doing. Without going into too much detail, we did a drill here in Anchorage using parachute flares. We had Elmendorf Air Force Base pretty well convinced that somebody was trying to shoot down their jets. They were not amused.

There are significant hazards in using these pyrotechnics. Even in a controlled situation they are hazardous. I cringe at the thought of fishermen setting them off just for practice, even though they have told the Coast Guard about it. People need to know how to do it safely.

Equipment Degradation

One of my sincere concerns in the drill requirement, which is addressed adequately only in formal training programs, is the degrading of the survival equipment itself during training. Fishermen need a really functional survival suit, one that works well, one that can be depended on. If you use it in Alaska's boat harbors, or in any other boat harbor around the country for that matter, it will not be a good survival suit for very long. Petroleum products degrade neoprene very quickly.

We have to make informed judgments about how long this equipment is good and serviceable. We certainly discourage fishermen from inflating their own life raft before sending it back to be repacked because of the wear and tear involved. Yet

for their training being meaningful, the fishermen must have access to life rafts. They do not necessarily need rafts in their monthly drills, but at least annually they should have the opportunity to practice with them in the water.

Realism

In trying to achieve realism you can get carried away. North Star Survival in Kodiak provides outstanding first-aid training using combat injury simulators, which really rattle up the fishermen. The simulators, really a professional make-up kit, very convincingly show injuries with fake blood, blisters, compound fractures, amputations, et cetera.

I think the highest compliment I have ever been paid was by a fisherman in Kodiak. The guy is pretty cool and collected, and it is hard to get any emotional reaction out of him. He came out of this particular training class and said to me, "You scared the hell out of me."

Debriefing

As Jerry Dzugan said, too, the bottom line in achieving effective training that will result in lives saved is the debriefing. The drills are only entertainment if they are not brought back into some kind of context.

Probably the best way to summarize all of the drill requirements is through the station bills required by law. You can certainly buy standardized station bills spelling out who does what in any situation. It is much more meaningful to have the fishermen sit down before the drills and decide in different scenarios who is going to do what.

Then after going through the drills you ask, "Okay, who actually did this particular job?" If the captain was supposed to send out the May Day, but he had a heart attack, who sent the May Day? Each drill must be followed up by the crew sitting around the galley table and doing a critique and revising the station bill.

ORIENTATION

That all seems reasonable and logical until you add a joker in the deck. Where do they fit in? In the rush to get out of town, the captain got mad at a crewman and fired him. There was a hot body standing on the dock looking confused and the captain says, "Come on, we are going fishing." There are a lot of young people who get started that way. Spike, I think, that is the way you started was it not?

Spike Walker: "Yes."

Institutionally, we are putting a lot of people on boats through the observer program: crab observers, groundfish observers, and even researchers. We, the Marine Advisory Program and the Observer Training Program here in Anchorage, in a 60-hour observer training course, are providing 16 hours of safety training. We are building the same expectations into them that we hope to instill in young crewmen who do not have experience. What should they expect when they get on the boat in the way of an orientation? What questions should they ask?

I know of a fair number of accidents here in Alaska in which only one person was lost. In a high proportion of those accidents, it was the inexperienced crewman, the visitor, or the new cook who was lost.

That person is the one who most easily falls through the cracks in an emergency. It is incumbent on any vessel operator to give them an orientation, much like you expect on an airliner. It should include emergency assignments: What to do in case of an emergency. Where your immersion suit is, and how it works. Where

the life raft and the EPIRB are mounted and how they work. What to do if we have to abandon ship. Where to find the radio and how to work it. What the alarms sound like, and what they mean.

It is awfully hard to find out what an alarm means in the middle of night when you step out of your bunk and everybody is running up and down the companionways screaming. That is not the time to figure out what an alarm means.

Point out dangers of entrapment and other hazards on board the boat and make sure the newcomer knows it is all right to report any problems or hazards or malfunctions. Two critical problems are brought on by the observers themselves:

The most critical is leaving a hatch cover off after taking a sample. We have numerous incidents in our experience where a regular crewman discovered that the hatch cover was not where it used to be. No fishermen have been badly hurt yet, but one fell almost 14 feet into a hold and fortunately landed on a pile of fish rather than a hard deck.

Another example of the kinds of trouble a newcomer can get into is also drawn from the experiences of observers. One of the most convenient places to hang scales for weighing fish samples is from the trawl warp right in front of the winch. I leave the outcome of that stunt to your imagination. The list of communication problems that we have to help fishermen overcome would seem endless when newcomers are involved.

The best way to pull all these pieces together and summarize the needs, components, and players in assuring good drills and orientation on fishing vessels is to think of "hobo stew." Hobo stew was kind of a campfire potluck developed in the hobo jungles of the 1930's. Everyone brought whatever they could contribute to a pot of stew, and ultimately a little bit of food fed a lot of people.

No single agency or company has the resources or expertise to provide the drill training needed on the boats, and no fisherman can be expected to become an effective drill trainer without help. The resources available and the nature of the fishing are vastly different from one region to the next, so there may not even be one solution for the whole country.

Meeting the challenges of implanting effective drills and orientation on fishing vessels will demand a spirit of cooperation, not just between the fishing industry and agencies, but **among the agencies** unlike any in the history or tradition of the agencies involved. Now that the fishermen are "clients," it behooves us to work together and with them to fulfill the promises we made when they were just "prospects." □

EDUCATION, TRAINING, AND SURVIVAL

By Mr. William Gossard

Mr. Michael L. Klatt: Our next presenter is Mr. William Gossard of Centerville, Maryland, whose presentation is entitled *Education, Training, and Survival*. Bill has been a staff member of the U.S. National Transportation and Safety Board (NTSB) since September 1977. He has attended Ottawa University, Ball University, and Harvard. Bill has worked as an assistant oceanographer, Peace Corp volunteer in Tonga, and college professor. He has also participated as an observer and a U.S. delegate to the International Maritime Organization. He represents NTSB on the Electronic Chart Information Display System — Testbed Project, and has been a member and secretary of the Transportation Research Board Committee. He is a member of the U.S. Marine Safety Association and has sailed competitively in a Cal25. Bill's latest efforts concentrate on improved training and education in marine areas including recreational boating and fishing vessel safety. He is a member of the Fishing Vessel Curriculum Advisory Committee. His additional areas under study are one-man bridge and "expert systems" and the results of voluntary training and education programs in the fishing vessel area. Mr. William Gossard:

It is a great pleasure to be here today, and I thank NIOSH for having me. Before I get started, I would like to indicate that there is a lot to learn in fishing vessel safety, and the first time I tried on an immersion suit, I was standing up, too. That lasted about five seconds until I tumbled to the floor, and I learned real quick that it is a lot easier to put it on when you are down instead of up.

It is a pleasure to be here today. The National Transportation Safety Board (NTSB), for those of you who are not familiar with what it does, I would like to give you some idea of our size and what we do. We are the accident investigation agency for the federal government in transportation safety. We have approximately 10 folks that work in the Marine Accident Investigation Division.

Don Tyrrell is here today from that Division. He has been an accident investigator on such cases as the *Aleutian Enterprise* and the *Star Connecticut* and others. We have a Marine Accident Investigation Division but we also have other people who support that division in survival factors, human factors, and then the area that I work in, which is safety studies.

By trade, I am not a marine accident investigator. My job is to take those accidents which the NTSB has investigated over a period of years, and, if in fact we have not been successful in accomplishing the safety corrections we have recommended, put them together in what we call national studies.

THE 1987 REPORT

In 1987, I finished a study in the area of fishing vessel safety, and along with the efforts of many people, the timing of the report was very fortunate. I think it had a great impact in directing a number of fishing vessel safety issues where we have had long and lengthy discussions and was catalytic in moving forward both legislation and other safety activities. I think it is the result of these efforts that calls us together today to explore

new approaches to fishing vessel safety. Many actions are ongoing and there are many actions still to complete.

Most of the NTSB's focus is on investigating many large-vessel accidents such as the recent grounding of the *QE-2* and the grounding of the oil tanker, *Exxon Valdez*. We also are fortunate that we can focus or target programs in those areas where we have lesser loss of life and accidents that may not have the media attention as larger accidents. For example, the accidents in fishing vessel safety often do not meet our investigation criteria. As a result we issued our study focusing on fishing vessel safety.

The NTSB has investigated approximately 250 fishing vessel casualties. Historically, many of those casualties were investigated for the NTSB by the U.S. Coast Guard. We have a very close working relationship with the Coast Guard in that area.

Our job in many of those cases was to determine probable cause and to make safety recommendations. However, many accidents we fully investigated with our staff and support personnel, such as the *Amazing Grace*, the *Sea Dancer*, and the *Santa Rosaria*, the *Americus*, the *Altair*, one that we are familiar with recently, the *Aleutian Enterprise*, and even more recently, the *Sea King* casualty in Oregon.

The NTSB, as the result of these accident investigations, has made a number of recommendations, many of which originally dealt with the need for safety equipment improvements. Prior to the early 1980's, the focus of most organizations was on technical equipment requirements.

There was very little emphasis on human performance or human behavior in accidents. That included such basic things as alcohol and drug use, which was addressed by one of the questions in an earlier session this morning.

Since the mid-1980's, there has been a greater focus in the areas of human performance and behavior in accidents. This is a shift in many of the transportation modes, not just particularly in the fishing vessel area. Indeed, in the 1985 accident, the *Amazing Grace*, which you may be familiar with off the Atlantic Coast, the NTSB not only recommended that there be licensing for masters of fishing vessels, as a result of that accident, we recommended that fishing vessels should be required to carry operable emergency position indicating radio beacons (EPIRBs).

In other words, you could have required EPIRBs for all 31,000 of the documented fishing vessels that we estimated there were for the cost of the search and rescue.

What we found out and determined, was that in that accident alone, the search-and-rescue cost was $12 million for that one accident. We did some cost analysis at that point, of course in 1985 the EPIRBs did not have the high cost that we have with the satellite EPIRBs today. We computed the cost at that time of the EPIRBs and the cost of the search and rescue, which almost balanced out. In other words, you could have required EPIRBs for all 31,000 of the documented fishing vessels that we estimated there were for the cost of the search and rescue. You can see there is some interplay between the cost of accidents and the cost of the safety improvements.

The NTSB recognizes that there are many approaches to fishing vessel safety. We recommend that the Coast

Guard take actions in certain areas. We also recognize that there are a number of voluntary approaches which can assist in handling some of these safety issues. We do not bury our heads in the sand and say that everything needs to be fixed by regulations. Indeed, many of our recommendations are crafted with such words as urge, ensure, expedite — words that try to motivate people in a more voluntary posture to move forward with safety corrections.

SINCE 1987

Since our 1987 study we have had another round of casualties such as the *Uyak 2*, the *Wayward Wind*, and the *Njordfjord*. I am sure you are familiar with these. I am not going to go into them. I think it is interesting to understand very carefully what the NTSB tries to dissect when we do a full accident investigation and try to break that investigation down to the basic components — where the failures occurred and what, in fact, we can do to correct that. Tony Ford is here today, and I appreciated his presentation this morning on the changes made and the safety improvements now required for fishing operations of Arctic Alaska. I would like to, with Tony's permission, to dissect carefully what happened on the *Aleutian Enterprise* accident.

That report is available, if anybody wishes to have their own copy or you can obtain a copy at the Coast Guard booth. I think it is very important that we understand that when you dissect these accidents down into small components, you see the various interactions that we need to work on, whether that is a preventative mode or a reactive mode — how important they are. We know that the vessel was a 162-foot fish processing vessel. We know that it was fishing for cod, pollock, and rockfish in the Bering Sea. It had 31 people on board; 30 of those were crew and one was a National Marine Fisheries Observer.

The vessel, of course, had a full load of fish and was hauling in a last net full of fish. Approximately 14,000 pounds of fish spilled out of that net on to the deck. When the net broke, the vessel listed about 5 degrees to port, it was already fairly heavy with fish and the ship rolled further to port and sea water entered the port side of the processing deck through openings designed to discharge unwanted fish and fish parts from the vessel.

The master was on duty — a 26-year-old. He was in the pilot house, very good at finding fish — but he had no safety training. He transmitted a May Day radio message, and he did not have much time. As the vessel flooded and the list worsened, crewmembers working below came topside as quickly as they could. Many tried to holler and beat on doors to awaken other crewmembers as they went running past those doors, trying to warn those who were off duty and sleeping in their quarters.

There were immersion suits, the suits were stowed in three lockers on board the vessel. They were not readily available to the crew. Some of the crewmembers did not even know where the equipment was located, others knew where the suits were, but were prevented from obtaining the suits because other equipment was stowed in the lockers with the suits.

Most of the crewmembers had never donned an immersion suit. Of the crewmembers who were able to obtain suits, only a few were able to put them on before the vessel capsized. Many, of course, had to enter the water with none at all.

Crewmembers crawled up the side and then the upturned bottom of the

vessel as it continued to roll over to port. The crewmembers jumped, fell, or were washed into the sea as the vessel capsized and sank within five minutes from the time the vessel started to list. That is really a quick time. Many of them only had three minutes to make any kind of decision at all.

The water temperature was reported to be 1°C; that is 32 to 34°F. That is cold, cold water. You have seen what Captain Steinman reported in terms of survival time. The survival time for the crewmembers in such water without an immersion suit would be absolutely minimum if rescue was not quick.

It is estimated in such waters, of course, that perhaps they would have 15 to 30 minutes. I would estimate probably closer to 15 minutes for most people without any kind of protective clothing before exhaustion and then unconsciousness. Perhaps they would last 30 or 90 minutes if they were in very good health and there was a way for them to get out of the water.

His background gave him no formal training or experience in how to respond adequately to flooding and attendant stability issues, nor had he ever been required to have a Coast Guard license or a merchant mariner's document.

Crewmembers in the water clung to nets, net floats, anything they could get their hands on — floating fish in some cases or debris — to stay afloat. There were life rafts.

One of the vessel's life rafts did not inflate. Another had to be manually inflated in the water. The other two life rafts inflated automatically as they were designed to do when the vessel sank. Two life rafts inflated bottom side up. Some crewmembers righted and boarded one of the inverted life rafts, while others climbed on to the other life raft without righting it at all.

It is not a good time to try and read the instructions on the life rafts as some the survivors in the post-accident interviews said they were doing. That probably is not the best time to take time to know what you are doing in a situation of this kind. It is very important that we note these kinds of things.

Fortunately, 22 survivors were rescued within 15 minutes because the sister ships, the *Northwest Enterprise* and the *Pacific Enterprise*, were fishing within two miles of the vessel. They received the emergency radio message. Unfortunately, eight crewmembers and the National Marine Fisheries Observer were missing and are presumed to have drowned. Six crewmembers were injured. As a result of that accident, we have made a number of recommendations for safety improvement. Those recommendations are discussed in great detail in the accident report made available for your review.

A more recent accident is the *Sea King* in Oregon. This vessel was not a large vessel, and the accident scenario is entirely different. Basically in this accident, again, you had a young man operating the vessel who had 10 years in the industry. He was not prepared for the situation that he faced. His training and experience, again, were not unlike those of many commercial fishermen. After high school, he began fishing full-time with his father and his uncle. This is a very common pattern.

His background gave him no formal training or experience in how to respond adequately to flooding and

attendant stability issues, nor had he ever been required to have a Coast Guard license or a merchant mariner's document.

The *Sea King's* operator lacked the knowledge necessary to operate a fishing vessel safely. His understanding of a fishing vessel's stability was particularly deficient. This accident is addressed in detail in the report, which is now available. I suggest that those of you interested in the mechanism of this accident obtain a copy.

Fortunately, there have been many successes because of training and safety equipment requirements. On February the 16th of this year, we saw the results of an accident involving the 86-foot fishing vessel, *Holy Cross*, with five crewmembers on board. The master and crew of this fishing vessel were prepared. Just two days prior to the sinking of this vessel, the master had conducted an immersion suit drill. Two of his crewmembers had never been in their suits.

I can tell you, if you have never been in one, it took me a good five minutes the first time, that is after falling over. After that, I got down to probably a minute, minute and a half. I felt fairly comfortable with it. That was on the floor. I have no idea what it would be like in any other kind of environment such as in an emergency.

When the master determined the vessel was lost, he ordered everyone into immersion suits, the EPIRBs were made ready, and the life raft was launched. They were quickly rescued by the crew of the fishing vessel *Elden*, who saw the condition of the vessel and quickly responded.

On February 22, a similar story unfolded when the seiner long liner, the fishing vessel *Lady Ann*, put out a May Day in a blinding snow storm. The crew of the seiner indicated in their radio dispatch that they were not in their immersion suits. Fortunately, for this vessel, the fishing vessel *Sound Pacer* heard their May Day and with only the correct longitude was able to pick out the foundering vessel on its radar.

The master and crew of this vessel had taken the North Pacific Fishing Vessel Owner's Association safety course and had reviewed the training videos and credited this training in preparing for their survival. I think the important thing to note is that training in advance pays off.

CONCLUSION

The NTSB continues to press for certain requirements. There are debates over these requirements. We have done many investigations:

- We firmly believe that there is a need to require the licensing of captains of commercial fishing vessels. This licensing should include a requirement that they not just pass some kind of paper test, but demonstrate minimum understanding of how to handle safety problems that they may confront, including stability, fire fighting, and use of life-saving equipment.
- We feel very firmly that crewmembers on all fishing vessels should have safety training commensurate with their safety responsibilities. That means if a crewmember is responsible for the bridge of that vessel, they should have the same training in that area as well. If the crewmember's function is basically to handle lifesaving equipment or to handle his own lifesaving equipment, then he or she needs training in that.
- Additionally, we feel as a result of the casualties that we have investigated that there must be an independent body — the U.S. Coast Guard — or some organization that the U.S. Coast Guard designates, that must

provide an independent inspection and certification of commercial fishing vessels. That could be done a number of creative and innovative ways, and we believe that this must be done and done soon.

• Finally, we received a letter in 1990 dealing with fish processors. We think there are a number of concerns raised as a result of the *Aleutian Enterprise*. We still believe that training needs to be required for the operators and crew on fish processing vessels, that includes, of course, the young people who handle the processing lines themselves.

Quite often they do not receive training commensurate with the situations that they may find themselves. Those vessels have a high number of people on board, and we need additional emphasis in those areas. Some fish processing owners have made extraordinary steps to address safety; others, I fear, have not. I hope that the lessons learned from the *Aleutian Enterprise* are not lost on this industry.

In conclusion, I would like to say that the NTSB will continue to investigate fishing-vessel casualties. Although we are not blessed with large numbers of investigators, we will continue to focus attention on fishing vessel safety as our limited resources allow. Thank you very much for your attention, and I appreciate the opportunity to address this workshop. □

VESSEL SAFETY PROGRAM

By Ms. Leslie J. Hughes

Mr. Michael L. Klatt: Our last presenter of the day is Mrs. Leslie J. Hughes, whose presentation is entitled *Vessel Safety Program*. Leslie Hughes is the Executive Director of the North Pacific Fishing Vessel Owner's Association (NPFVOA) Vessel Safety Program. She worked with the U.S. Coast Guard and industry to develop and implement this program, which is now in its eighth year. The Vessel Safety Program is regarded as the prototype safety training program for commercial fishers in the United States. Programs have been modeled after it in other regions of the country. She will describe this program to you. The North Pacific Fishing Vessel Owner's Association has recently made an important change. After 22 years as a non-profit association representing vessel owners of crabbers and trawlers, in 1990 the members decided to move away from the political arena and focus solely on safety at sea. By focusing on one subject, the program has been able to expand in a number of ways, which will help improve the commercial fishing industry's poor safety record. This expansion includes the five-part industrial safety program in cooperation with OSHA. Ms. Hughes will describe this program, which includes educational materials and 14 hands-on training courses. Ms. Hughes has been involved in various aspects of the commercial fishing industry for 18 years — from working with Naval architects, a boat builder, maritime attorneys, as a consultant, and as Executive Director of the Vessel Owners' Association Vessel Safety Program. She was awarded the Jerry Jerkovitch Award from the National Marine Fisheries Service in 1989 for her outstanding dedication to promoting safety at sea and helping to bridge communication between industry and government. Ms. Leslie Hughes:

I want to thank Michael Klatt and the people at NIOSH for making it possible for me to be here at this very important workshop. I feel, looking at this being the last presentation of the day and who is here, that I am preaching to the choir. I know you are all tired and looking forward to the next event of the evening, so I will try not to let this go on too long.

Most of the points that I wanted to make have been made very eloquently by other people and many of the things that North Pacific Fishing Vessel Owners' Association (NPFVOA) offers in our program in Seattle is done on the highest level in Alaska by the AMSEA and the Alaska Vocational and Technical Center (AVTEC) people in Seward. We are getting so that we can work more and more closely together, which is something I very much treasure.

I have put on the table a copy of our brochure so that if any of you wants to pick this up, it describes the program and the elements of it, and I will go over that with you. I wanted to sum up a little, being the last speaker today. We listened to the definition of the problem yesterday, and today, we have been working on solutions to the problem. From my perspective, I think we know what the problems are. I think we also pretty much know what the solutions are. Safety is a hard sell.

I know that Jerry Dzugan and I talk often that we are constantly scratching around trying to convince fishermen that the safety training is for their benefit and NPFVOA's

program was developed by fishermen for fishermen that worked with the Coast Guard.

The Coast Guard had identified the causes of casualties and then fishermen in the NPFVOA sat down and tried to figure out how could we get a program that would address these problems and have hands-on training that would save lives. There was also a concern at that time that they could impact the insurance market. I am not going to belabor the insurance industry, but I do think they are a factor in the equation. They seem to be a missing element, and it is a big problem. They could provide an incentive for fishermen that would encourage training. I will get into that a little bit. I have some good news with that, but not enough.

> I am not going to belabor the insurance industry, but I do think they are a factor in the equation.

Of the solutions that we have heard, so many casualties could have been prevented. The difficult part of all of this that we have identified is the human-error factor. It is really hard to predict how a human is going to respond in an emergency. We have heard over and over that fishermen work in an inherently dangerous occupation in a harsh and unforgiving environment.

We are not going to be able, realistically, to reduce all of the dangers or eliminate them. We can certainly reduce them. The way that we can do that is by helping them be prepared and having a plan to deal with emergencies. We have all said that it is by having the right equipment, maintaining it properly, having it readily accessible, and knowing how to use it in an emergency.

Preparedness, that results in confidence, is absolutely essential, and that comes from training. During the 7 years, and now embarking on the eighth year of this program, I talked to Peggy Barry about whether we have a half-full or a half-empty glass. In the 7 years that I have been dedicated to this safety program, I have seen an enormous rise in the level of consciousness in the industry. However, we are not where we need to be. I cannot tell you, unfortunately, that we have a full glass. That is what we are working for.

I have seen, as Jerry Dzugan and Hank Pennington have described, a reluctance among fishermen to take the training. If it is not required, like Tony Ford described from a management level, sometimes we can never get them to the classes. Once we get them, they leave wondering why the classes are not required, why their companies or the owner did not send them sooner, and why they did not hear about this and do this a long time ago. In fact, we just had to recarpet our entryway where people walk in because they come in scuffing their feet, and they go out saying this is fantastic. It is very hard to convince them to take the time, spend the money, and come to training that has been designed for them.

A SAFETY COMMITMENT

I want to describe NPFVOA because it is a unique organization in that it is comprised of a membership of vessel owners. Like I said, they started the program. It gives us an opportunity to work very closely with the industry. We are also in Seattle where we have so many of the seafood companies based, we have a better chance of catching people.

We are a non-profit organization of vessel owners and operators and people involved in support industries. Our members now number over 200 vessel owners, about 100 associate members or support businesses, and about 50 individual members. The individuals are independent marine surveyors and naval architects, some attorneys, and some fishermen as well.

Our membership, in my opinion, is characterized by people in the industry who are proactive about safety. Their dues that they pay give us a base from which we can expand our training. During the time that we have had this program, we have been able to go from 5 to 14 classes. Now, we have others that we know are needed, but we need a base to be able to produce additional training aids and programs.

The program at NPFVOA is open to the entire industry. It is not exclusive to its members. I want to stress that. The proactive people support us and makes us able to be there from eight until five every day of the week for people to be able to walk in, not just to take classes, but to come for information and resources.

I want to say that on behalf of everyone whose lives and limbs have been saved as the result of NPFVOA's program, I have to express a profound appreciation for the membership's foresight and support. It has enabled us to do some very good things.

When I look back on this in what seemed like the old days, when the association use to represent crabbers and joint venture draggers and was very much involved in management issues, we have come a long way in safety. I think that the program has made insurance available and affordable. We have been able to influ-influence some of the regulations and work with government agencies to try to make the regulations more practical.

VESSEL SAFETY MANUAL

Our program has consisted of the vessel safety manual. I brought one just in case there was anyone who did not know it.

I do not know if there is anyone who has not seen this. This book was developed in cooperation with the Coast Guard. It is roughly what is regarded as the operational standards for the industry. It is about 300 pages, it has more than 300 illustrations, and we just recently updated it so that it would include some things that had changed since it was published in 1986 that are part of the regulations now. That book was actually a nationwide effort. Much of the information that is in it was out there in various parts of the country but had never been pulled together and put under one cover.

There are people in this room that contributed significantly to that publication. It has been a very useful tool, and it is what I call the spine of our program. It is the curriculum base. There have been two other versions that were adapted for the Gulf and the Atlantic regions; it is a national document.

HANDS-ON CLASSES

After we developed it, we knew that fishermen were unlikely to be reading that big book, so we knew that we needed the hands-on classes. That is when we initially developed five, and they were medical emergencies at sea, safety equipment and survival procedures, fire prevention and control, and navigation and stability. Navigation and stability were and still are our least well-attended courses.

The safety equipment and survival procedures is the most frequently

attended course. All of these classes have as much hands-on training as possible. They are basically one-day classes. They are very basic, but they have saved a lot of lives. We also developed video tapes to be used as refresher training tools.

The program was initially funded by grants, but since 1988 it has been self-sustaining through the tuition from the classes, the training aids, and the membership now. If the manual is the spine, the heart of our program is comprised of the instructors. With 14 classes, we have about 30 instructors that we draw from. They are all experts in their various fields.

The program would be much simpler from my perspective to run if I had a handful of instructors, but I think the effectiveness of this particular program is that each class has a team of instructors who are experts in their various fields.

It takes a lot of coordinating, and they all work full-time. This keeps them current so they can continue to be experts in their field. They have shown an incredible amount of dedication. Many of the instructors started with the program at its inception. We set the dates for the classes a year in advance and, with few exceptions, these instructors have had nothing interfere with their commitments to the dates.

We have, also, expanded some of out training materials. One that we expanded recently was on the 406 EPIRBs for which we developed a videotape on how to arm, test, and mount seven of the models.

This was a direct result of what happened on the *Discovery* when five crewmembers on that crab boat found themselves in a life raft for twelve days in the Bering Sea. It was an incredible experience. It is not one that can be talked about right now, unfortunately, because of litigation.

There are tremendous lessons that this industry could learn from that experience, and I hope that they will be shared. Rescues are normally done within 72 hours. For a crew to find themselves in a life raft for 12 days and be able to survive it presents a lot of things that need to be looked into. When life rafts are manufactured, what kind of life are you expecting to be able to sustain? When the durability tests on all that equipment goes through, what is a reasonable expectation for this equipment to be able to operate or function?

OTHER PROGRAMS

We publish a newsletter. We just did an in-house video on flares. One of our concerns, also, was all these different pyrotechnics or different EPIRBs and they all operate a little differently. In the classes that we do, and I think this has proved true for other trainers as well, you cannot necessarily have them work with every type of equipment.

What they learn in one instance, they may assume is the way all pyrotechnics would trigger or EPIRBs would arm or whatever. We are trying to get that message across, that these things are not standardized. To go aboard another vessel is common practice in this industry. What you have been familiar with may not be what you encounter in another place. These are other lessons to be learned in the training. However, stability tests are standardized.

We conduct a lot of seminars. Our classes are more for the crewmembers and operators. Our seminars are more for the management or owners. We are finding that there is a lot of educating that needs to be done there, too. There is a tremendous gap between office or company management and what is going on aboard the boats. We are trying to

bridge that gap and help the managerial people better educate the crewmembers of some of the documenting that they need to do, such as the accident reporting.

You cannot just send those people on boats any more and tell them to catch fish. They almost need to have a secretary on board, there is so much reporting. It is all very important and part of the process from drug testing to how to do all of these things right. Companies need to take the time to tell those people how to do a good job and to better look after the crews that they are responsible for. More and more onus is being put on skippers, and they need help.

We have heard Hank say this and we have heard Tony say this on drills. They know they need to do drills but somebody has to help them do a good job. A lot of that is in showing them better ways to do things that they want to do, but they need to be shown and assisted with the jobs as their responsibilities expand.

FACTORY TRAWLERS

One of the things I am most excited to report about is a new program that was conceived and funded by the American Factory Trawler Association (AFTA). This is a group that is commonly maligned in the industry, but many of the members of AFTA were traditionally NPFVOA members, and I have probably a very, very strong affection for this group. They run sophisticated vessels that have some of the best life-saving equipment, and they deserve a lot of credit for being a very sophisticated fleet. They decided to embark on a project that was similar to what NPFVOA did initially.

Since NPFVOA area programs started, we were looking at voluntary standards, and the industry set some self-regulatory standards.

AFTA was willing to do that too and go into industrial safety. We spent nearly a year developing five industrial safety courses that we now offer.

AFTA holds the copyright, but they licensed NPFVOA and they are also working with AVTEC here in Alaska to help train some natives in factory processing hazards. Some of those things that will help those people work on their boats more safely. It is a fairly exciting program, and OSHA sat in on a meeting that we held at NPFVOA weekly for almost a year. Tony Ford can attest to that because he was a technical advisor on this program.

It has been slow, like other NPFVOA programs that started, you train people in handfuls. For us to say that we have trained 8,000 fishermen may not sound like a lot of people to you, but if you are getting them in stability classes in numbers of three and four, it is a lot of people and it is taking a lot of time. The industrial safety classes deal with the five areas:

1. Crane operations.
2. Cargo handling.
3. Troll deck safety.
4. Processing deck safety.
5. Body mechanics or ergonomics.

They are beginning to fill up, and we are starting to get good input from the word of mouth that goes out. There is nothing better for training programs than word of mouth. If fishermen go and tell other fishermen that it works, then that is what will get them to respond.

RESOURCE CENTER

We have a resource center, and another thing that I think we do that has been very effective is to try to get industry to work with government agencies. They have been skittish to sit down with OSHA and actually reluctant to work with them, but I

think we have heard here that OSHA is going to become more of a factor. They are going to be working cooperatively with the Coast Guard and industry needs to help to educate because OSHA and the Coast Guard do not have all the answers. Industry has a lot of the answers, and if they will sit down and work together, they will come up with something that is more likely to be self-regulatory and more practical. In the end, we will do what we want to do and that is to save lives and reduce injuries.

INSURANCE

The measure of success may not be easily done in the numbers. This year, an insurance company gave Icicle Seafoods a rebate for $9,000 of $12,000 they had spent on training in NPFVOA's program last year. I never thought I would see it happen.

I would say that was a company that certainly deserved it, too. They are very proactive. I am hoping that other companies can benefit from that sort of boost from insurance companies.

We are looking at another downturn in insurance and more increases in calls coming up in February, so the insurance news is not very good. At least someone has been able to benefit by money spent on training.

RESULTS

The things that we see that are encouraging after we do the training: we see an upgrade of equipment.

When you do drills, and you are trying to get out of different spaces as you work through different scenarios, you find that while the boat was in the shipyard, somebody inadvertently carpeted over an escape hatch. You find incredible things when you do the drills.

We have had people come out of the classes, go back to their boat, pull out the survival suits, look at them, go to the skipper and say, "These suits are too old; we need new suits."

The skipper will say, "Well, you know we spent a lot of money here in the shipyard, we are not going to do it this time. I promise you, we will do it next time."

We have had these guys come in the office, talk to us, think about it, go back and say, I am sorry, I am not going to work on your boat anymore. Those are important changes. Fishermen need to be making sure that drills are being done. They need to go to the skipper and say, "I expect that these things be done in a realistic and meaningful manner."

We have seen people change where they keep their equipment. We have also been called upon to help them with their placement. I think this program has been successful because we have been able to work effectively with the fishermen. They feel that it is their program. They continually evaluate it and help us keep it improved, and we have an open-door policy.

SUMMARY

I think it has been said earlier, and I will just reiterate this, we have come a long way. We no longer have to have mariners resorting to lashing a few pieces of cork to their torsos.

We now have some of the best life-saving technology imaginable. So your chances of having your life saved if you are in an incident at sea are better than they have ever been. Again, you have to be prepared and know what you have got. Make sure you have got all the right stuff and know how to use it. Survival suits are really one of the most wonderful inventions.

I have not heard anybody say that when fishermen get in trouble, it is the Coast Guard that is the one that

rescues them and risks their lives in doing so. They put themselves at tremendous risks many times.

I think that fishermen need to look at that as well and not expect the Coast Guard to do what they would not do for themselves. We need to get mariners to be much more aware.

They need to do the right thing. They need to get themselves out of the water. Cold water robs the body heat 25 times faster than air will.

It is very hard to find people when they get lost at sea. We try to teach them to make themselves bigger, brighter, and different with flares and all the different types of equipment that are out there. I think the Coast Guard does an incredible job of finding them, and so often, people who are in boats even when they are in a 150-foot boat, think that it will be easy to find them. They do not appreciate, as Jerry Dzugan discussed, the vastness of the Alaskan area when search and rescue is looking for them. Again, the Coast Guard to the rescue.

Our classes go through an array of safety equipment and different procedures, and then after we get a theoretical base, we go out and do the hands-on training. All of our classes need to have to see the life raft inflated. There is just no substitute for it, and if you have a 100-foot painter line going out, it is too easy in an emergency to give up after about 20 feet and say, "This thing is not working. I am going over the side."

They need to see how long. Some of the boats have 250 foot lines, but they need to experience the behavior of the equipment so that they have confidence, will continue to work with it, and will not panic.

We have a lot of equipment. We can provide it for the classes, but we have encouraged people to use their own. There is no substitute for them knowing how their own equipment will operate. Time and time again, we see people bring their equipment to the classes, they go to put their immersion suit on, and they find the zipper is rusted. It is so much better that they find this out when they are in the pool, and they can go back and either get new equipment or find a way to fix it.

We came up to Dutch Harbor right before the crab opening and the whole community donated their services and their resources. Interestingly enough, we conducted a short class in an evening. We had about 50 people show up, the incident on the *Discovery* that I told you about, the skipper had this training at Dutch Harbor and felt that it helped him make some pretty critical decisions while he was in the raft for 12 days.

We do a medical and an advance medical class. The advance class is not as in-depth as it should be. The Maritime Health Services does a 40-hour class that is excellent in Seattle. In our advanced class, we do suturing, and we use cow's eyes for removing objects from eyes and eye injuries and some things like that. It is also a refresher for a lot of the skills that we teach in our basic class.

We are lucky in Seattle to have nearby a fire fighting center that includes a 147-foot vessel mock-up. We are able to simulate fires in engine rooms and galleys that are realistic. It is just amazing that this one-day training class has saved so many vessels in our industry.

We also stress the importance of learning how to use SCBAs. That is a minimum for our class in Washington State. There are only a handful of companies that have taken the time and trouble to teach their people formally how to use this equipment.

At the fire center, they put them through a maze where they go backwards and in small crawl spaces. It

is tremendous training. I am amazed that the industry has not seen more value in learning how to use that equipment.

We have onboard safety orientations. We go to the boats and help with drills. I want to make a point that one thing that does concern me about the Coast Guard's drill requirements is that, as important as they are, drills are drills.

It is most important that the people get the hands-on, in-depth training first. It is one thing to go use a smoke simulator on a vessel, pull out your hoses, and pick up your fire extinguishers, but it is not going to be the same as having a hands-on training class of learning actually how to put fires out. You are not going to set the boat on fire when you are doing the drills.

I am concerned that I am seeing companies think if they just do these onboard safety drills that they can short circuit the other hands-on training classes that are available. I see a tremendous hazard in that shortcut.

I also have had a big concern over where people place their lifesaving equipment. Over and over again we see that rafts get put in places where people would never be able to access them if they were iced and the boat took on a serious list.

We have a van that we are able to take. It is full of lifesaving equipment. We can also take the vessels. This was a donation from the Seattle Fishermen's Memorial.

We work with a wide variety of all segments of the fleet.

The trawl deck is filled with hazards. We have finally got the industry so it will pretty much not allow workers on the deck without a hardhat. In our classes, we show the different kinds of hardhats, and we take some of this troll gear and drop it on bumphats and real hardhats with cantaloupes underneath. People are amazed. If a company is taking a shortcut in handing them a bumphat instead of a hardhat, they are pretty offended after they see a piece of gear drop down and smash a cantaloupe, which could be their head.

CONCLUSION

I want to read an accident report that appeared in the *National Fishermen* in August of 1990:

"Nobody knows exactly how the accident happened says Anthony Rose, Jr., skipper of the Miss Linda. My two deckhands were working with backs to one another, each spooling wire on a separate winch with the hydraulic screaming. It sure was impossible to hear Scott when he got in trouble.

Coast Guard Petty Officer Steve Terry says that by the time the crew realized what had happened, it was too late to help. The wire rope had already wrapped around the victim 30 times. He was literally cut to pieces. So traumatic was the accident says Terry that the surviving crewmen could not bring themselves to unspool the toe wire until a Coast Guard cutter arrived on the scene. Central Coast Guard Officers say accidents such as this are not common, but they are not uncommon either. It happens now and then. But it is always shocking notes one veteran troll skipper. It reminds us of how careful we must be and powerful and unforgiving deck equipment is. Especially on drag boats. If nothing else, tightly fitted clothes to avoid being snagged and a vigilant eye are essential to a safe operation."

We have already heard for the past two days how dangerous crab fishing is. You have got stability factors, and

you have fishermen who work in crab pots. I guess we have an example here of live bait. Scary. A lot of times, what should happen on the boats and what does happen are two different things.

Over and over again, the message that we found when we developed the program in factory processing safety was that safety in the processing factory is fairly simple. You do not take machine guards off. You do not put your hands in the machinery. OSHA has standards that the industry was kind of shocked to find out that applied to them such as lock-out, tag-out. Before you go clean a machine or you go pull something out that is stuck, you turn the machinery off, and you make sure it stays off.

> Safety has to be an integral part of every vessel owner and operator's business plans.

Working in factory processing, you need hearing protection and respiratory protection. Lifting heavy weights is another problem.

We teach navigation. We take the folks for the stability class in small handfuls.

My main message is that industry has to be proactive. It is the only way that we will have an impact on safety. I am becoming concerned that we have got an industry that is also driven by compliance. They are very worried about having a stability report that is required or having emergency placards that are required, but they are missing the boat. They are not knowing how to use the information that they have got.

There is so much more to it that they need to know from training. There is too little emphasis on owners, management, and operators who need to go through the vessels and identify all the hazards and fix them themselves, and not to wait for regulations. They need to be more proactive. With better education and training, a lot of these problems could be resolved before we got rigid standards.

The industry, again, has to invest the time and the money to educate their employees. Without proactive and progressive initiatives on the part of industry, we can expect that liability costs will go up, that government-imposed standards will continue to grow, and that we will not necessarily get the right things.

If fishermen think that complying is tough, they need to think about what it is like to be in court and explain why they were not complying. It is no longer acceptable to gloss over safety. There are a lot of companies out there that are reinforcing high standards.

What the regulations give you are minimum standards, but there are companies out there that are working very hard to raise the level of the standard of operations in this industry. Our goal, as we leave today, is to remember that we are trying to fill the glass.

Safety will reduce costs. I am convinced. It will reduce lost fishing time, the liability, the litigation, and all of the problems that occur when industry is not taking care of matters that they need to. Safety has to be an integral part of every vessel owner and operator's business plans.

I think the old days are gone. It is like the notion of the independent fisherman like the lifestyle that he can go out and answer to no one but himself. He has a responsibility to others, and they must not forget that. □

SESSION 8: PREVENTIVE SAFETY AND HEALTH SERVICES

Moderator: Mr. Gary L. Bledsoe
Occupational Injury Prevention Program Manager
Epidemiology Section, Alaska Division of Public Health

Gary Bledsoe, a native of Huntington, West Virginia, graduated from Marshall University with a Bachelor of Science degree in zoology. He did graduate work in public health at Tufts University and studied electronic engineering technology at the State Technical Institute at Memphis. Mr. Bledsoe began his 18-year career in public health with the Centers for Disease Control (CDC) in 1974. He had assignments with CDC in North Carolina, Alabama, Tennessee, Florida, Alaska, and Georgia. During this time he received the Superior Work Performance Award, and participated in a number of scientific studies, including the Belle Glades AIDS study, a testing program for Hemophilus ducreyi, and case-control recruitment in the early phases of CDC's AIDS activities. Prior to leaving CDC he was the Georgia Disease Intervention Specialist Training Center director, and the Region IX consultant for AIDS Surveillance and HIV Seroprevalence in San Francisco, California. Mr. Bledsoe currently works for the State of Alaska's Division of Public Health, Epidemiology Section, as the Occupational Injury Prevention Program manager. He is studying the epidemiology of traumatic death in Alaskan workers and collaborates closely with the staff of the NIOSH Alaska Activity. He is a member of the Federal-State Interagency Collaborative Working Group on the Prevention of Occupational Traumatic Injuries, Alaska Occupational Health Network, Alaska Marine Safety Education Association, and the Federal Safety and Health Council. He is also a member of the American Industrial Hygiene Association, American Society for Circumpolar Health, and the Alaska Public Health Association, where he is a board member and the newsletter editor.

QUOTES FROM THIS SESSION

"The strait (Shelikof) is probably one of the most hazardous areas in the world for fishing."
— Reuben Eaton, B.S.

"Under the Commercial Fishing Industry Vessel Safety Act, the Coast Guard has a new authority that allows us to terminate voyages when a vessel has an especially hazardous condition."
— Glenn Sicks, M.S.

"When they start saving money, they appreciate your expertise and help with the 'bottom line'."
— Emmet Heidemann

"To reduce losses and save lives, we have to start before a problem turns into a SAR case."
— Roger Whorton, M.S.

"I can not stress enough how important it is that at least some of the crew-members onboard have some type of medical training."
— George Angus, M.I.C.P.

MARINE WEATHER FORECASTING

By Mr. Reuben B. Eaton III

Mr. Gary L. Bledsoe: Our first presenter in this session is Mr. Reuben B. Eaton III, whose presentation is entitled *Marine Weather Forecasting*. Mr. Eaton's career in the National Weather Service has spanned 18 years, the past 13 of which have been in Anchorage. Previous stations include: Charleston, South Carolina; Cleveland , Ohio; and Providence, Rhode Island, his home state. His work in Anchorage has sent him to many marine communities in the southern half of Alaska. Also, he has been one of the substitute meteorologists on Alaska Weather, a half-hour statewide television weather show since 1981. His presentation will include a discussion on how the National Weather Service predicts weather and a brief overview of future technology.
Mr. Reuben Eaton:

The National Weather Service's (NWS) primary mission is to provide weather warnings in the most timely manner possible. We also provide broad area forecasts around the state. In order to complete these missions, there are three NWS forecast offices in the State.

The main forecast office is in Anchorage. There is also a forecast office in Fairbanks and another one in Juneau. Anchorage takes care of the southern half of the state, Fairbanks takes care of the northern half of the state, and Juneau takes care of the southeast panhandle.

WEATHER OBSERVATIONS

We have a huge area to cover, so sometimes we have a hard time collecting enough information to make a good forecast. Weather observations are the backbone of our forecast products. We must know what is going on right now before we can predict what is going to go on in the future.

Hourly observations are taken at almost every commercial airport in the state. We get other observations from cooperative observers such as harbormasters. Ships provide most of the observations over water.

What can observations do for us? The more observations we get, the better we can analyze the low pressure patterns and other weather features. Every 6 hours we take all the observations available and plot them on a surface map. With just a few observations, we get a very simplistic view of the weather patterns. The more observations we get, the more detailed the picture of the weather becomes.

Just a few more ship observations can change our perception of an approaching low pressure system. Add a couple more ship observations to a simple low, and the unexpected storm may emerge. The sooner we know that the storm is there, the better we can forecast its movement.

The ship observations we get are from "ships of opportunity." Usually, it is commercial shipping that gives us weather observations. National Oceanic and Atmospheric Administration (NOAA) ships and U.S. Coast Guard ships are also very good about giving us observations.

Fishermen generally will not report to us. That is because one of the most important things about an observation is its location. We need to know their position. Fishermen have their favorite and secret fishing

spots. They will not broadcast that particular information over the radio.

We have had some luck with the processors. They have to be in a known location so everybody can find them. They will send observations when they are not too busy.

One of the best sources of observations that we have is Peggy Dyson. She lives in Kodiak, Alaska, and has a single-side band, high-frequency radio in her home. She started out by just talking to her husband, Oscar, when he was out fishing. Other people started listening in when he asked for weather forecasts. So the NWS contracted with her to give our forecast twice daily, at 8 a.m. and at 6 p.m.. She is always there and always on time.

> Fishermen have their favorite and secret fishing spots. They will not broadcast that particular information over the radio.

People can count on her. They trust her. After all, she is a fisherman's wife. Mariners respond to her broadcast by giving her weather observations. She, in turn, sends them to us. Twice daily we get an extra batch of observations to use in our analyses and forecasts.

Every 12 hours, weather stations all over the world, including 13 NWS stations in Alaska, launch radiosonde balloons. These are used to measure the wind, temperatures, and humidity at many layers in the atmosphere. We also get pilot reports and satellite information.

Twice a day, we take all these observations and enter the information into a CRAY computer analysis, one of the biggest computers in the world, in Washington, D.C. It does the number crunching. It runs through all the mathematics and physics that go along with weather prediction. After the CRAY, the results are entered into some more computers. Finally we come out with prognostic charts or computer-generated tracks, which storm systems are expected to follow for the next few days.

FORECASTS

We look at the computer-generated charts and use the experience that we have had from similar systems and make predictions about the weather. It really amounts to pattern recognition.

I have seen many low-pressure systems move toward Prince William Sound. Every low has a warm side and a cold side. If the low moves right into Prince William Sound then Anchorage will end up on the cold side. That generally means snow in the wintertime. If the low heads toward the west of Prince William Sound and more toward Cook Inlet, then Anchorage is more likely to be on the warm side. Then it will probably rain, even in the winter.

There are a lot of things that can happen in between when we are making the forecast and when the event occurs. Last year, a new regional director for the Alaska NWS had just moved into town. On one of his first days here, I had to give him a weather briefing and forecast. I definitely wanted to make a good impression. After studying all the available information, I made my forecast.

A low-pressure system had run up on Kodiak Island and dumped 10 inches of snow. It was heading right toward Anchorage. It looked good to me. I went for 5 inches of snow, told him that, showed him all the maps, showed him everything that

pointed to it, issued the forecast, and warned the public. About a half hour after that, the storm made a right hand turn and we did not get a flake.

As a weather forecaster, you have to live with that kind of thing. We really enjoy about a 70 percent to 80 percent accuracy in one- to two-day predictions. After you get out over five days our accuracy goes down to about 50 percent.

SATELLITES

One of the things that helps us is the Geostationary Operational Environmental Satellite (GOES). A GOES satellite orbits about 22,000 miles above a fixed point on the equator. We can get both visible and infra-red pictures from it. The visibility is like taking a black-and-white picture from 22,000 miles up. We get a scheduled picture every half hour.

A problem with the GOES satellite is that Alaska is above 55 degrees north latitude. It ends up on the top edge of the picture. The earth is curving away from the satellite. We see things at an angle and have to take that into account when we are analyzing a picture.

Infra-red satellite pictures show the different cloud top temperatures of a weather system. The colder the cloud top is, the whiter it shows up in the picture and the colder it is the higher up it is. High clouds show up very white.

In the newspaper, you may have seen that the US GOES satellite is dying. It is a very old satellite. It remained operational much longer than we expected. We can no longer maneuver it because it is running out of fuel.

We did have two satellites over the United States: one on the east coast and one on the west coast. The east coast satellite died. The west coast satellite was moved back and forth across the United States. It was moved east in order to get a better picture of the Atlantic Ocean during the hurricane season. Then it was shifted back toward the west coast for the winter storm season that affects the Pacific Northwest.

We have been able to reach an agreement to use the European GOES satellite for information over the Atlantic Ocean. We also use the Japanese GOES satellite for information over the western Pacific Ocean.

The new GOES satellite, which will be called the GOES NEXT, is due to be launched in late 1994. There have been several delays in the production of the satellite. There was a problem with the GOES NEXT mirror, similar to the problem that was suffered by the Hubble Space Telescope.

We are fortunate in Alaska, however, in the fact that we have polar-orbiting weather satellites. They orbit about 450 miles up. Because they are running in a polar orbit and the earth is rotating underneath the orbit of the satellite, we get three overlapping passes from each satellite about every 12 hours. When passes are joined together, we get a very good view of the state.

There are two active NOAA polarorbiting satellites. We also have access to a military weather satellite. In the near future we hope to have access to the Russian and Chinese polar orbiting satellites as well.

The satellites beam back digital information to Earth, and we collect it in a computer system called HIPS. It is a High-resolution Image Processing System which takes a regular picture and reprocesses it to show different facets of a weather system. Different points of interest can be highlighted.

The HIPS system is highly advanced technology. Currently Alaska is the only state using this equipment. It is a very fast multi-processing computer which processes the pictures in real time. We can manipulate the pictures as we look at them on the computer screen, not just have a fixed picture. As a meteorologist, I can manipulate an image many different ways to see many distinctive weather patterns.

We do not use HIPS only for cloud systems. We use it to locate ice edges and determine ice thickness and concentrations. We can determine sea surface temperatures. We can also monitor volcanos. We were very successful in pinpointing ash plumes from the recent eruptions of Mt. Redoubt and Mt. Spurr.

Satellites are excellent tools. On a clear day, we can get spectacular views of a volcano or an ice edge. But many times there are layers of clouds in the sky. Clouds will hide the surface and lower levels of the atmosphere from a satellite's view.

SURFACE OBSERVATION SYSTEMS

Meteorologists need to know what is going on underneath the clouds. To determine this, we need observations. The NWS and the Federal Aviation Administration (FAA) have developed some new automated surface observations systems. The first NWS system has been placed in Kodiak. It is called ASOS (Automated Surface Observation System). The NWS is putting in about 50 of these systems in Alaska. The FAA has had several of their systems, called AWOS (Automated Weather Observation System) operating for many months now. They will be putting in about the same number of systems as the NWS. Both systems are very similar and both are designed to automatically give temperature, humidity, wind, cloud cover, and visibility every hour.

One of the advantages of these automated systems is that they will be consistent. The observations will be available every hour. We have a problem here in Alaska in that many places close at night. We do not get any observations and do not know if anything has changed until the next morning.

DEEP-WATER BUOYS

We also have three-deep water buoys in Alaskan waters that we use to make forecasts. One is in the Bering Sea and two are in the Gulf of Alaska. We have a wish list of up to 70 coastal buoy sites to be established in the future.

An example of what we would like to do with these buoys is the area around Shelikof Strait on the west side of Kodiak Island. The strait is probably one of the most hazardous areas in the world for fishing. Winds can really howl there. We do not have any regular observation sites in Shelikof Strait. We just have to guess what is going on by inference by what we have seen going on around it and what has happened to it in the past.

Occasionally, we get a ship report in Shelikof Strait. If it is bad weather, the ship is probably so busy trying to stay afloat that it does not have time to send in a weather observation. What we propose to do is to place a buoy on either end of Shelikof Strait. That would help us tremendously when we make a forecast.

RADAR

In the future, we are going to be getting a new radar system called NEXRAD (NEXt generation RADar). It is a new generation doppler radar combined with a multiprocessing

computer. It will detect not only precipitation, as the old radars did, but also wind patterns. The old radars showed precipitation patterns around the site and would differentiate the most intense areas of precipitation.

NEXRAD does this and more. It will also differentiate wind patterns around the site. The intense areas of precipitation and the intense areas of wind may not coincide.

We, in the NWS, will be able to detect more potential trouble zones and warn people sooner. By going back and forth between the different NEXRAD displays, we can find out a whole lot of new information that was not available on the old radars.

We expect up to eight NEXRAD sites to be built in Alaska, which will include Anchorage, Middleton Island, and St. Paul. There will be one in Southeast Alaska, another one on the west coast, and several in the interior. They will provide more observational information over data-sparse areas.

There are very few regular reporting sites in Prince William Sound. We get observations from Valdez, Whittier, Cordova, and Seal Island. Occasionally we get some ships in the Sound. We are just starting to get more regular observations from the oil tanker escorts.

We hope to place a NEXRAD radar site on Middleton Island, which is located in the Gulf of Alaska south of Prince William Sound (about 70 miles south of Cordova). The NEXRAD radar will give detailed coverage up to 125 miles from the site, then give less detailed but extended coverage up 250 miles. A NEXRAD radar on Middleton Island will provide almost complete coverage over Prince William Sound.

CONCLUSION

The National Weather Service expects to continue to provide the best service it can. We are always trying to improve our forecasts. The more information we can get, the better we can forecast. ASOS, NEXRAD, and GOES NEXT are all part of the future.

Forecasting is not an exact science. When it comes down to the final deadline, we have to make a forecast. We have analyzed all the information we can, and we must issue the forecast. The last thing we do is take a look out the window and give it our best guess. □

USCG VOLUNTARY DOCKSIDE EXAMINATIONS

By LCDR Glenn C. Sicks, USCG, and ASO Emmet F. Heidemann

Mr. Gary L. Bledsoe: Our next presentation has two presenters, LCDR Glenn C. Sicks and ASO Emmet F. Heidemann. Their presentation is entitled *U.S. Coast Guard Voluntary Dockside Exams*. LCDR Glenn C. Sicks is the Fishing Vessel Safety coordinator for the 17th Coast Guard District, which encompasses all of Alaska. During his 5 years in this position, he has helped develop and advertise regulations implementing the Commercial Fishing Industry Vessel Safety Act of 1988. He represents the Coast Guard as a board member of the Alaska Marine Safety Education Association. Prior to this assignment, he was Chief of the Investigations Department at the Marine Safety Office in Honolulu, Hawaii. During his 24-year Coast Guard career, he has also served as a Deck Officer on a high endurance cutter, as Deputy Group Commander in Memphis, Tennessee, and as a Marine Inspector and Investigating Officer throughout the 14th Coast Guard District. He holds a Bachelor of Science degree in geology from Northern Illinois University and a Master of Science degree in oceanography from the University of Hawaii. Our other presenter is ASO Emmet F. Heidemann, who began commercial fishing almost 40 years ago in 1953 for shrimp out of Brownsville, Texas. For a 5-year period, from 1958 to 1963, he fished for lobster in Bermudian waters. Since 1970, Emmet has fished in Alaska for salmon and halibut in Prince William Sound, Bristol Bay, Cook Inlet, and Southeast Alaska. In January of this year, he joined the U.S. Coast Guard Auxiliary. LCDR Glenn Sicks:

We are going to try not to make this a Mutt and Jeff show, but, as I was sitting there, Emmet, and I were thinking: Where were you when I needed you as we were developing these regulations? You know, it is not always fun getting up in front of a bunch of fishermen and trying to explain what they are going to have to comply with sometime in the near future. In 1987 and 1988, I talked to groups of fishermen as small as one or two people — something like Leslie's (Hughes) initial stability classes. Then, in 1989 and 1990, when the Notice of Proposed Rulemaking came out, there was standing room only in almost every presentation I gave, and they were not the happiest bunch of campers around. So I am very happy to have Emmet here representing the Coast Guard Auxiliary and helping us.

I see that the majority of the audience are the same people who were here yesterday and heard a lot of what I had to say. I will try not to repeat myself any more than necessary and also try not to steal your presentation, Emmet.

I think this is worth repeating. These are the items that are primarily responsible for saving fishermen's lives. The EPIRB is an excellent electronic means to call for help; a good VHF or single-side band radio certainly serves much the same purpose. Immersion suits are necessary so that you can be alive when we get there after receiving your emergency call. Life rafts are necessary, in addition to immersion suits, if you are going to be without your boat for any period of time. Of course, training; if you do not know how to use your equipment, it is no good to you at all. At the bottom of the triangle are

some of the prevention means — especially having a stable and fire-safe boat, but you can add to that list almost endlessly.

VOLUNTARY DOCKSIDE EXAMINATIONS

What I am going to try to do is to cover basically the WHO, WHAT, WHEN, WHERE, and a little bit of the WHY of the Coast Guard's Voluntary Dockside Examination Program. The "WHO" incorporates the commercial fishing industry — Emmet is a good example of what a commercial fisherman looks like, and you can picture — if I come on board a 60-year-old fisherman's boat and say that I am there to do an examination for the U.S. Coast Guard, he will have a different attitude than if Emmet walks up in his Coast Guard Auxiliary uniform and discusses the program from the perspective of a fellow commercial fisherman. In that way, I can see a great role for the Auxiliary and particularly those with the experience that Emmet has.

The "WHAT" is the Voluntary Dockside Examination Program. It is a new program that was just started this year. It is something the fishermen have asked for a long time. They said, "Please tell us while we're at the dock what we need, instead of out in Cold Bay where we have to air freight it in at great expense and hassle to our fishing operations."

The "WHEN" is when you want an examination conducted. We ask that you schedule it with one of our Marine Safety Offices or Detachments. Please do a self-check before you ask for it and be ready when the examiner gets there.

The "WHERE" would be wherever your boat is. You can ask for an examination anywhere, but the problem is we do not have enough examiners to cover the entire State of Alaska, much less the rest of the country. The ideal situation is to be in a port where there is either a Marine Safety Office or a Marine Safety Detachment. If that is not possible, and particularly if you get together a group of vessels in your area, we will go to you.

It is very difficult if you have one boat in Cold Bay, and another boat in Sand Point. We just don't have the resources and the dollars to get every boat in every port.

For the "WHY" — there are a lot of good reasons. It is safer for everyone to do an examination at the dock. There is a lot less interference with the commercial fishing operation itself, and it is a way for everyone to be confident that the vessel is in compliance. That is not only from our perspective as far as civil penalties action goes; many boat owners also want to know before the boat leaves the dock that they are in compliance.

Under the Commercial Fishing Industry Vessel Safety Act, the Coast Guard has a new authority that allows us to terminate voyages when a vessel has an especially hazardous condition. It is definitely economical to have an examination to ensure that you are in compliance and that no hazardous conditions exist.

They said, "Please tell us while we're at the dock what we need, instead of out in Cold Bay where we have to air freight it in at great expense and hassle to our fishing operations."

This program is very similar to what the Coast Guard Auxiliary has done for many years, for instance the Courtesy Marine Examination Program for recreational boats. For the

last few years, until this summer, the Auxiliary has done Courtesy Marine Examinations in Bristol Bay for commercial fishing boats, and the response has been outstanding. That is one reason we, in the active-duty Coast Guard, asked them to come back again this year and work with us on this new program.

We have some new dedicated civilian billets and also MSO Anchorage has a dedicated lieutenant billet, now filled by LT Mark Hill. In Alaska there are now six persons just promoting fishing vessel safety for the Coast Guard. They should be able to respond to a request for a dockside examination in a timely manner and get you the information you need.

In my job, I have two main customers. I have got the Coast Guard boarding officers and the fishermen. Under the title of boarding officer, I am also including the fishing vessel examiners who do these voluntary dockside examinations. These are the groups that I try to furnish with information so that they can effectively interact with each other.

We are not acting as enforcement officers when we are doing the voluntary dockside examinations. There is no transfer of information from a dockside examiner to the enforcement boarding officers that you will meet at sea during a boarding.

We do not target vessels when we find things during a dockside examination that are not in compliance with regulations. Some fishermen will probably find that hard to believe, but we do our best to prevent it from happening.

We field tested the Dockside Examination Program up in Bristol Bay this summer. We examined over 400 boats and issued decals to over 260 boats during a three-week period using up to 10 people at one period. This was done in Naknek, King Salmon, and Dillingham.

The overall feedback that I got was that it was a much better approach then sending up a team of 10 boarding officers and a small boat to run out to the Johnson Hill line trying to board boats in the middle of their fishing operations. If you have ever fished the Johnson Hill line, you know that is not the thing to do. So, Emmet, I would like you to give a perspective of what you saw up in Bristol Bay.

EXAMINATIONS AT BRISTOL BAY

Emmet F. Heidemann: One thing I would like to comment on regarding this Voluntary Dockside Examination Program: it is strictly a volunteer program. When the examiner walks up to your boat, he might be wearing the Coast Guard uniform or wearing a Coast Guard Auxiliary uniform or be a Coast Guard reservist, but it is strictly for owners and operators who volunteer to have their boats examined.

That owner of the vessel or the person in charge of the vessel can say, "I don't have time for an examination, I don't want an examination or I don't like you, and there are no records kept." There are no hard feelings. If he has had a past bad experience with the Coast Guard and he takes it out on you, you say, "Well, I am sorry about that, Sir. Maybe we can make an appointment to get you an examination whenever it fits in your schedule."

There are no hard feelings. We are strictly there to give a service, and service is what the Commander is striving for. The people who he had on his team in Bristol Bay were not the average member. They were specially trained by him and his staff, and when he got there on the ground, they were off and running in a pro-

fessional manner. They knew the material and they were experts.

If they did not know an answer to a question — no one knows everything — there was no faking it; if they did not know the answer, they found out, and they said, "I will come right back to your boat tomorrow at a certain time."

They then got with the Commander, the books were brought out, and the answer was given right out of the manual. It was no dog-and-pony show. It was facts, and people appreciate dealing with facts.

If there is something that the fishermen did not understand, like how a piece of equipment was supposed to be mounted, the Coast Guard person had the ability and the knowledge to say this is how it is mounted, this is how it works, this is how you activate it and this is your preventive maintenance.

The fishermen appreciated that background and that depth of information. Not only was he there to record data that the vessels were examined, but he was also there to aid the fishermen and to take care of his equipment.

A VIDEO

LCDR Glenn C. Sicks: I appreciate the kind words, Emmet. What I would like to do now is to continue the video that I started yesterday. We ended up yesterday with the overall new regulations under the Commercial Fishing Industry Vessel Safety Act, and if I have been able to queue it up right, we should start into a mock dock-side examination here.

[Video playing]

There is a little bit of real life there, too. I particularly want to thank Lawton Paddock, who helped make that tape. You can imagine an average fisherman's reaction to a call from the Coast Guard that says, "Hey, can I come down to your boat and film you as though I'm doing a dockside exam," and "Do you mind if I come right now?"

We had an opening in the weather, we had the camera crew ready, and there was very little preliminary time to get ready to actually make this a professional video. There are a couple of equipment deficiencies, and if you have a sharp eye, you probably noticed that the EPIRB was not installed properly, and that the life raft probably should have been secured a little better. The tape was not made to make this boat look like it was a perfect boat or to identify every discrepancy. It is a real situation. It was done in about the same time frame that we would have if we went down for the first check on a dockside examination.

A CHECKLIST

One of the tools that we use during a dockside examination is this new checklist booklet that we modified for the 17th District because we found our 16-page checklist to be a little too comprehensive. This is the page that will be left with the vessel; a copy of it is taken back to the office to document that a dockside examination was conducted. If a decal was issued, it will be documented by a number on this form. If deficiencies are found and a decal is not issued, they will be listed on this form. By referring to this form, the owner and the operator of the vessel will know what they have to complete to get a decal.

Also, if an examiner is not available to come back to the vessel for a re-examination, the owner or operator of the vessel can show this summary sheet to the at-sea boarding officer, and they will know what deficiencies

existed that prevented issuance of a decal. The operator can then simplify the boarding officer's safety equipment check by presenting evidence of correction for these deficiencies. This form, together with evidence that the deficiencies have been corrected, should be considered by the boarding officer in the same light as a decal and reduce the time necessary to check the remainder of the safety equipment.

That summary sheet also records under what conditions the vessel was examined. As I went over yesterday, the "All Vessel" classification has only a few additions to safety equipment over previous regulations. If the vessel is operating outside the boundary line and it is a documented boat, of course, there are many more requirements.

There is an item-by-item checklist in this booklet for both the all vessel classification and for the documented boats going outside the boundary line. This is also left with the operator and should be retained on the boat.

EXAMINER TRAINING

Emmet mentioned our training program that we conducted before we put the dockside examiners in the field last summer. For them, we have a job aid that follows the checklist item-by-item, and it gives additional details about each requirement.

There will be areas and times when dockside examinations will not be available when fishermen want them. For example, dockside examinations usually will not be available in the remote ports around Alaska, and there will not be enough of them to conduct many examinations just before halibut season or any opening. Fishermen should not expect an immediate response if they wait until just before an opening to request an examination.

SELF-EXAMINATION

There is an alternative, however. Fishermen can use this pamphlet to self-check their boat. They can also use the checklist that we provide to self-check it.

If they are not able to get a complete dockside examination from the Coast Guard, their conscientious self-check, using these forms, will also be considered by the at-sea boarding officers, similar to how they would consider a decal issued by an examiner. The verification spot-check may be a little bit more intensive, however, but once they are convinced that it was a conscientious self-check, it should give fishermen about the same results.

If any of you have tried to learn or understand the new regulations, you realize that they are complicated. Boarding officers, as well as fishermen at sea, have the additional stress factor of trying to remember all of this. They can not carry a library of regulations with them.

At the dock, we can ask questions, look at our references, ensure that we know what we are talking about, and cover the issue properly. There is a lot less hassle for everybody. Our aim is to prevent, or at least minimize, interference with the actual fishing operations.

As the video pointed out, getting a decal and completing a dockside examination will not prevent a boarding. That needs to be emphasized again. We board vessels for many reasons other than safety equipment checks; in this area it is primarily for fishery enforcement.

We are going to come aboard regardless. Having a decal or doing a conscientious self-check of the boat will minimize the time it takes to check safety equipment. It allows everyone to evaluate the overall compliance of the vessel and it mini-

mizes the possibility of a voyage termination. As I mentioned earlier, this is good cheap insurance for the owner. Emmet, what can you add to that?

GOOD BUSINESS

Emmet F. Heidemann: I would like to add on the "WHY." I think it is important for a commercial fisherman to have this voluntary dockside examination to make sure that he is not overlooking anything, that he is not overlooking any obscure law or procedure, and that we are all marching to the same music.

We think about commercial fishing, at least I do, as a business. The reason people commercial fish is to make money. The reason why this dockside program is beneficial is because it helps to keep the man in business. When the examiner goes on board the vessel, he will not only leave sheets of paper for the examination, but he will also leave a little bit of himself in that examination.

I think it is important for a commercial fisherman to have this voluntary dockside examination to make sure that he is not overlooking anything, that he is not overlooking any obscure law or procedure, and that we are all marching to the same music.

He will give them information from his experience; when he sees the survival equipment, he will make recommendations. All that the book requires is that you have so many maintained survival suits on board for your crew. There are other things to a survival suit like how to take care of it. Is it folded properly? Is it stored in the right area?

Examiners can offer suggestions that will save the fishermen money. When they start saving money, they appreciate your expertise and help with the "bottom line."

For example, take flares; you can store them properly in a dry place, and they will last to at least, and maybe beyond, their expiration date. You can store them improperly, and they will not even last the short period of time of their certification.

Take survival suits as another example. When you talk about a crew on a vessel, the owner of the vessel should have some authority and rights to expect his crewmembers to act in the same professional manner as he maintains his vessel. A vessel owner can, and some do, require that the crew provide their own equipment, like, for example, survival suits and rain gear, and that it meets a certain standard.

Some people on their vessels only allow bright-colored rain gear. If a guy comes on board to work, and he has a black set of rain gear or a green set that would match the water or would be hard to find at night, the owner can say, "Buddy, if you want the job, this is what you are going to need." You are going to need a bright red or a bright orange or a bright green rain gear so that if you do fall overboard, we can have a pretty good chance of finding you.

Some skippers are also requiring that EPIRBs be carried with survival suits. The owner has options, and he can require a standard that exceeds these dockside examination minimums. These decal requirements are only minimum standards, just plain minimums.

To be in business and to stay in business as a commercial fisherman, you have to be one step ahead of the

latest lawsuits that are going on, protect yourself from liability, and if you know what is ahead and what has been going on in the past, you can make a better business decision. That is what the fisherman receives when he gets a dockside examination; he gets a lot more than a check of what is covered by the regulations. He gets information and background.

CONCLUSION

LCDR Glenn C. Sicks: We have already completed 850-plus examinations in Alaska, 511 decals have been issued, and we are going to improve on that record by qualifying more examiners for next year. We encourage everyone of you who are not commercial fishermen to help pass the word that the program is available. Those of you who are commercial fishermen, please call. □

QUESTIONS

Jim Herbert: A couple of questions for a couple of people. Emmet, you have been involved in dealing with some of the people in Bristol Bay, and I think from your experience you find that probably 25 percent of the people are not very enthusiastic at all about doing anything that somebody tells them to do. They are the ones most difficult to convince that it is worthwhile to have equipment; they are the ones that run the other way when they see the Coast Guard coming, etc., etc.

Emmet F. Heidemann: Yes, Mr. Herbert. The method I always use — to get their attention, either through a smile, a hand wave, a "how's fishing?" or talk about their boat. But get right down to the business of talking about making more money and when you can tell a man you can make more money by being safe, so he can fish longer and he might be able to take home more money at the end of the year, they will listen to you. In the course of the examination, you go through the steps and you tell them what to expect and how to reorganize his paperwork, his documentation, all his other forms and signs that he has to post, so that it is less of a hassle for him when he's boarded. Give him a plan of action so that he can get back to fishing when he is actually boarded on the water. But also tell him how to take care of his equipment and how to get more service life out of his equipment and try to give him a plan for documenting his training. Most fishermen conduct training, but few people document it. When he gives the new crewmember the safety orientation, document it somewhere so that when he is called or boarded at a later time, he can show that, yes, I did give the safety briefing and it was conducted on day so-and-so and this is the man's signature or initials that he received it. Prove to the boarding party that you did conduct the training. Also, when you conduct the monthly drills or when severe weather conditions start up, conduct the briefing to your crew and make a note in your log that you did provide the training to the crew. It is just my "CYA" in the commercial fishing business as a vessel owner, you have to protect yourself and to train your crew and document your training.

Jim Herbert: Another question. This would probably be for Glenn regarding dock-side exams. I have heard it said this year that people prefer to deal with the Coast Guard because they are the entity that is in control of the marine environment and all that. Say, in the port of Homer, there is sort of a distrust

of the Coast Guard Auxiliary, no offense, Emmet, because they are the ones that deal with the recreational boaters and they do not have a good understanding about the fishing vessels. So, regarding people issuing decals, I think there's a bit of suspicion, distrust of others than the folks from MSD's and MSOs.

LCDR Glenn Sicks: I could not agree more with that, Jim. When we did the program up in Bristol Bay, we had two "auxilarists" and three reservists working with us. The conclusion we reached was that someone who does not do this full-time could participate in the Dockside Examination Program only if they are trained one-on-one with the Marine Safety Officers. They will have to be as qualified as the regular-duty Coast Guard and have open communication with the MSOs for answers they do not have. The "auxilarists", like Emmet and others, have concurred with that plan; they do not want "auxiliarists" out in the field who are not experienced and who cannot give the correct information the first time. We are going to incorporate others beyond the regular Coast Guard, but it is going to take time to get people qualified. We can increase our number of examiners, but it's much better for our side if we can have the person out there with the right information, the first time, rather than having to backtrack and correct the information after the fisherman has passed it on to all of his buddies.

Jim Herbert: Yeah, I second that last comment, because that's my question or comment to everyone at large. Anyone who deals with the public should try real hard to get the right information across the first time. Because, by golly, I have had it happen in my experience. Call five different people in the Coast Guard, get five different answers, and not know exactly what to do. Still get in trouble when the boarding guy comes aboard. Thanks.

LCDR Glenn Sicks: I would like to comment a little bit more on that thought, Jim. We do have an 800 number (800-478-7369) in my office, and at least as far as violation reports against a commercial fishing vessel operating in Alaska goes, my office is the bottom line before it goes on to the Hearing Officer. If you are ever boarded, or you know of someone who has been boarded, and they disagree with the Boarding Officer's interpretation, first, you do not want to get into a battle with the Boarding Officer at sea. It is the wrong place to argue your point.

Please do contact my office. Let us know that you have a question or a comment or, if you have complied with the requirement of the Boarding Officer so that you are no longer in violation, let us know that as quickly as possible after the boarding. We can then take that information into consideration before making a penalty recommendation. We can also confirm that you have the right information. It is sometimes as difficult getting the right word to fishermen as it is to our own Boarding Officers so that they are all speaking the same language.

Dr. Tim Ungs: Tim Ungs, NIOSH. I have been with NIOSH only a few months; I am a greenhorn with the organization. Prior to NIOSH, I had 13 years with the Coast Guard, 11 of them as a flight surgeon at air stations in the North Pacific, and over those years, I have dealt with multiples of fisher-

men in distress at sea predominantly through radio, but also in person. Two things — one is a help — to provide a little more comment to Jim's question and then two, a broader solving question.

It is a difficult issue often with mariners in distress, because that's why the Coast Guard exists in part, to help mariners, including fishermen, and they are very dedicated people. On the other hand there are a lot of issues involved and very difficult decision-making. There is no doubt that when a call for help is received, and I am focusing on medically-related or health-related issues, that there is a need — the question is, who to react to? It really gets down to people gathering information the best they can and it is almost always extremely limited, and then making a decision. My part was only advisory to the operation people who make the final decision, but I spent many restless nights and turning stomachs because of the decisions. How do you respond to these people who are in distress? You try to weigh out the problems the men and women present and the risk involved.

In Alaska there were three fatalities involved in Coast Guard air crews in 1980, so there are definite risks. It is very difficult and any good surgeon who does appendectomies will tell you they never bat 100 percent because if they do, they are not a good surgeon. There is some conservativeness, there are risks and balances, so that is basically what's involved and sometimes the perception is that the Coast Guard is like a flying ambulance system which it is not. It has a lot of concerns — they are dedicated, they are there to help, but it is a balance process and it is imperfect, which in part leads to my second statement — the problem-solving thing.

My observation over the years is that — having dealt with an awful lot of people with injuries and a certain amount of mortalities, that there are an awful lot more injuries than there are fatalities and so much of this is preventable. There are just myriads of examples where it seems like what happened to someone was readily preventable. There was pain and suffering for the individual and very often economic costs for the vessel because they have to stop fishing and detour to port. The vessel owner is under a lot of pressure because they are there to make a livelihood and they have an injured individual. I think there are multiple interests that are involved. The health and well-being of whoever the individual is as well as the economic interest that could be enhanced by some preventiveness.

I am not proposing any rules or regulations, but I know that there is a lot of opportunity for fishing vessels in particular to have additional safety requirements for personal survival and for reducing injuries. Constantly, over the years, having people falling into the holds of their vessels, people getting caught in winches, people getting knife wounds, and hooks and objects in the eye, and it seems like that there are some ways that these things could be prevented without a lot of costs. But, in return, it will reduce injuries and may also, I am sure it would, reduce costs for the vessel. Perhaps there should be some thought that the Coast Guard might eventually span into other safety aspects. You know, are they storing their gasoline drums to close to this? Do people have the right kind of guards on certain equipment? Maybe it is NIOSH's work to look at this. Maybe it is OSHA's. I don't know all of the regulatory responsibilities, but I think the fishing industry can definitely benefit by some problem-solving to reduce occupational injuries that occur. I

do not know how this would come about. I think there is a definite need. Maybe somebody has some suggestions on how that would occur.

Mr. Emmet Heidemann: I would like to address that question. The Voluntary Dockside Examination Program makes an attempt, and that is a good place to start. Not only do they check for the individual items, but general housekeeping. You can just about sizeup a vessel when you go aboard, and see how he goes along through the examination, see what kind of shape his gear is in, and see what kind of operation he runs.

You can not enforce common sense, but you can suggest common sense as an examiner. I think most of the examiners touch on that subject of trying to make the commercial fishermen's operation safer, in addition to the voluntary examination. It is a starting place and I think in maybe 5 to 10 years, we should see the results. We are not going to see the results in one year.

Dr. Ray Jarris: I have been sitting through the session enjoying very much of what everyone said and could echo many things over and over that have been said that are so true in my mind. Just to give you a little background, I am with Maritime Health Services. I am one of the doctors that you mentioned. I personally handled 1,000 calls from fishing vessels with injuries and illness. We do this as a business. There is not a lot of money in it, but I am continuing to do it because I have learned to really like the fishermen I work with and have developed some very, very important relationships.

We have currently over 150 vessels that ply the waters of the North Pacific that I work with. I have two other physicians that give me breaks when I am trying to sleep. I think we have had a significant impact. There have been some cases where people may not have made it to shore, where I think they should have made it. Some fingers that have been salvaged and some wounds that have not gotten infected, perhaps, that might have otherwise. What we also do in addition to providing the medical advice is we train. Leslie Hughes mentioned this. We have a 40-hour course where we train people in more than first aid, but perhaps still not enough for what the boat often needs when they are far out to sea.

There are questions that I have developed that I would like to put out for consideration, maybe not having them answered right away. I think we need to ask if the level of basic CPR and first aid training is really adequate for what these vessels encounter. When you are 30 hours away from St. Paul or St. Lawrence, or in Russia, where many of our vessels are, I am afraid that people are not adequately trained unless they can start an IV and administer a shot and a suture. Even a paramedic often relies on a physician's advice, through myself or the Coast Guard.

The next thing you mentioned was the medical chest. I met with the Coast Guard in Seattle to explore the type of medical chests. Everything from first-aid kits up to a $10,000 supply for a crew of 200 for a year. Some guidance would be helpful. I have the experience now and there are other people that have similar experience that might be able to offer some input. I understand the Coast Guard does not desire to issue regulations, but perhaps information would be helpful in helping people to select medications and amounts.

A vessel owner or a captain can present their papers to a pharmacist and say I need this supply of medication that includes 10 ampules of 10 milligrams

of morphine. I used mine up, they gave me two months ago. I need 100 tabs of phenobarbital and 100 of valium. There's no medical oversite in this. No physician is looking at what the supply house is providing. Every order that comes out of my firm, I personally or one of my colleagues who is a physician, reviews and we have turned downed a number of requests for refills. I know of one case informally through a contact in the Coast Guard where they know the papers are only being kept by an individual so he can buy narcotics for his personal use and for spending money. I am very concerned about that. I would like to think about how we can decrease the chances that we are being a supplier of narcotics to a very dangerous industry.

I am afraid that I could probably talk for a very long time. I really have a lot of affection for the people I have been working with, and I appreciate the time to speak. If you could address those issues, I would be listening.

LCDR Glenn Sicks: Thank you for the compliments, Doctor. The one issue that I would like to comment on is the adequacy of the first-aid kit. The regulations were purposely made to be very vague in order to make it possible for a crew and a vessel owner to decide what is appropriate for their particular vessel. It has caused frustration for us, the same as for yourself. What is "adequate?" Our Boarding Officers all have different levels of experience, and it is very difficult for them to make that decision at sea. The guidance that I give them is that any boat that has only a can of band-aids and aspirin does not have an adequate kit. It has got to be more than that, but then it depends on the area of operation, the number of people on board, and their training.

One truism I have found is that the more people who are trained in first aid, the bigger the first aid kit will be. Training becomes very important that way.

There is a middle ground between not spelling out what is "adequate" in the regulations and changing the regulations to be very descriptive, like requiring a Coast Guard-approved first aid kit or whatever. That detail is sometimes provided in our Navigation Vessel Inspection Circulars where we publish policy guidance that interprets the regulations. That would be an excellent place to put the information that you say you have as far as standards, and I would appreciate copies.

Bob Nelson: My name is Bob Nelson and I have a question for LCDR Sicks. You mentioned, when you conducted your dockside inspection, that your report stays in your department and it does not go to the other branches of the Coast Guard. I guess the question is, what happens if you see something that is life threatening or something that's an immediate danger to the crew members. What do you do with that report?

LCDR Glenn Sicks: That is a real tough one. If the dockside examiner goes aboard and sees a particularly hazardous life-threatening situation, what does he do about it? He has to not coerce, but induce or persuade the operator to correct that before leaving. He should stress the advantages that if the vessel does leave and if he is boarded, he would be sent back to the dock until the hazardous condition is corrected anyway.

Even though the problem is not communicated directly from a dockside examiner to the boarding team, the probability of being boarded is still pretty high in Alaskan waters, and that vessel's voyage would be terminated. It is to his economic advantage to correct it before he leaves the dock. We have wrestled with exactly the same thing.

Like last week, with a boat in Dutch Harbor during the dockside examination, things were known to be very wrong; it is a hard decision, but I think we could compromise the whole dockside examination program if we refer any information to our boarding teams for enforcement action. We can, however, strongly encourage correction. There are many ways to get somebody's attention. If you have a bad company, one that worries only about the bottom line, they are going to hire a bad skipper — the one who will least interfere with their bottom line.

A bad skipper then will run a bad boat. There is almost always that connection. Guess who he will hire? It will probably be the high school kid who just arrived from Hawaii wearing his zories. The kid does not know any better than to accept an offered job. It is a program that leads to disaster, and it is a problem that builds upon itself.

SEARCH AND RESCUE

CDR Roger A. Whorton, USCG

Mr. Gary L. Bledsoe: Our next presenter is Commander Roger Whorton, USCG, whose presentation is entitled *Search and Rescue*. CDR Whorton is the Operations Officer at Coast Guard Air Station Kodiak, Alaska, where he manages six C-130 Hercules cargo planes, four Sikorsky H-3 helicopters, and four H-65 Dolphin helicopters. He is responsible for the Coast Guard's aviation assets flying on missions of Search and Rescue, Law Enforcement, Aids to Navigation, and Logistics throughout Alaska and its neighboring waters. He has been in Kodiak for three years. Prior to his present assignment, CDR Whorton was stationed at Coast Guard Headquarters, Washington, D.C., where he was in charge of the Coast Guard's Fixed Wing Aviation Safety Program. He has served at Coast Guard Air Stations in Clearwater, Florida, and Elizabeth City, North Carolina. Prior to entering the Coast Guard in 1977, he was a pilot in the Marine Corps. A C-130 pilot, he has over 7,000 hours of flight time. CDR Whorton graduated from the University of Northern Iowa in 1968 with a degree in social science. In 1991 he completed work on an MS degree in safety management from Indiana University. He is a native of Iowa, has been married for 26 years, and has three grown children. CDR Roger Whorton:

It is a pleasure to be here to talk with you about a favorite subject of mine, search and rescue (SAR). I have been involved with SAR in the Coast Guard for over 15 years. I would like to start by telling you a true story that might explain why SAR is a favorite subject and why it is a job that can be very rewarding.

About three weeks ago, on 22 September, 1992, at 8:10 in the morning, we received word at the Operations Center at Coast Guard Air Station Kodiak that an EPIRB had been detected by the SAR satellite at a position about 80 miles south of St. Paul Island in the Bering Sea, which is a position that is about 600 miles away from the Coast Guard Air Station at Kodiak.

We had a C-130 conducting a law enforcement mission in that direction, so we directed the crew to fly to the position of the EPIRB. At that time, we had no other indication of distress. While the C-130 was en route, we learned from the communication station at Kodiak that they had heard a short Mayday at 7:13 a.m. on the high-frequency radio, but they were not sure where it had come from or from whom it had come.

At 11:05, the C-130 crew arrived on scene and started searching. At 11:30, they found a life raft and debris in the water. Twenty minutes later, they spotted two persons in the water in survival suits. In the meantime, the Operations Center had coordinated a launch of a Kodiak H-65 off the Coast Guard Cutter Rush, which was located approximately 120 miles away.

The helicopter arrived on scene at 12:21 and within 20 minutes, all five crew members off the sunken fishing vessel *Majestic* were picked up out of the water and were en route to St. Paul. All five crew members quickly recovered from hypothermia. The last man found by the helicopter had been in the water a little over five hours. He said that he thought he was a goner, and in the newspaper he

was quoted as saying that he said the last of his prayers and had just given himself up to the Lord. The next thing he heard was the noise of the helicopter.

Unfortunately, the SAR business often does not always have such a happy ending, but it does not take too many cases like the *F/V Majestic* to make us glad to be in the search-and-rescue game. SAR is about saving lives and saving property.

I am going to give a very quick overview of the SAR organization in the United States, tell you about some of the SAR resources, and then take you through instances of an actual SAR case. Lastly, we will talk about SAR in the fishing industry and, hopefully, how we can save more lives.

SEARCH AND RESCUE ORGANIZATION

The bible for all SAR activities in the United States is the National Search and Rescue Plan. The plan designates SAR coordinators' responsibility for all SAR activities in a particular area.

The Commandant of the Coast Guard is the SAR coordinator responsible for all activities in the maritime region. In Alaska, this responsibility has been delegated to the 17th District Commander, RADM Rufe. The SAR coordinators have established rescue coordinator centers (RCCs) to coordinate SAR activities in a particular area of responsibility.

For instance, in Alaska, for the maritime region, RCC-Juneau is the controlling center. SAR coordinators can occasionally establish sub-centers. My home in Kodiak formerly was a rescue sub-center. Right now, the only sub-center in existence is RCC-San Juan/Puerto Rico under the Miami RCC.

The SAR Mission Coordinator is the activity designated by the SAR coordinator to actually manage a specific SAR case. The SAR Mission Coordinator is usually the RCC for the area, but sometimes this responsibility is delegated. For instance, our Operations Center at Air Station Kodiak was designated SAR Mission Coordinator on over half of the 400 SAR cases we are involved with each year.

Finally, the last level of management is the On-Scene Commander or OSC. This is also called the incidence commander by some organizations. This could be a ship, an aircraft, or a person responsible for actually using the on-scene resources to prosecute the SAR case. The OSC has full operational authority of the SAR Mission Coordinator. Large aircraft and medium- and high-endurance cutters make the best OSC.

SAR COORDINATOR DUTIES

Next, we are going to talk about the duties of the SAR coordinator. He is the one who establishes the RCC to coordinate the SAR resources within their sub-region. He establishes an area SAR plan. This includes all the various SAR assets available in the region. Most of the assets are federal, but there are many state and local SAR organizations as well. For instance, in Alaska, we have the Alaska State Troopers who are very involved in SAR. We have organizations like the Kodiak Island Search and Rescue Association, which also helps out with SAR.

The SAR coordinator also coordinates and establishes SAR agreements. He is responsible for conducting the SAR, for the SAR Mission Coordinator, and for directing the SAR rescue units until the assistance is no longer needed.

On the West Coast of the United States, we have RCC-Long Beach, RCC-Honolulu, RCC-Seattle, and then Victoria for the Canadians and RCC-Juneau for the maritime Alaska area.

A typical RCC is really an operation with lots of phones, access to HF radios, FM radios, computers, and duty officers who actually prosecute the various SAR cases. The RCCs' responsibilities include functioning as the SAR Mission Coordinator and coordinating SAR cases. As the SAR Missions Coordinators, the RCC controllers are the managers of the SAR and have communications with all assets on scene.

The controllers know the areas, the hazards, and the SAR capabilities of the SAR rescue units. They have the charts, the maps, and all the reference materials to actually prosecute the case. They also have access to the AMAVR, which is the Automated Mutual Assistance Vessel Rescue system that tells where all the ships are that have reported to this service, so that they might be used in an emergency.

Often, these RCCs are also receiver sites for the COSMOS and SAR satellite systems where the RCCs are actually alerted by the satellite when a satellite picks up a 406 EPIRB or a 121.5 EPIRB. The RCCs are usually the ones who actually launch the aircraft or the boats toward the area of distress.

MISSION COORDINATOR DUTIES

Next, we will cover the SAR Mission Coordinator (SMC). He is the one who actually handles coordinating a certain SAR case. The SMC is responsible for the prosecution of a specific SAR mission. He evaluates the information that comes into the SAR system to determine what needs to be done. He classifies the severity of the incident, he conducts the precoms, which are the preliminary communication checks, and the excoms, which are the extended communication checks, to find out if the situation can be handled just by phone calls or radio calls. Oftentimes it can be.

The SMC alerts and dispatches the SAR rescue unit, he develops a search plan, and designates the OSC. He evaluates unsuccessful searches and presents findings to the SMC, especially when we do not find somebody we should have found or when we fly right over someone. This is always something that you look at. We try to learn from what happened before.

The duties of the OSC are these: establish communications with the SMC, which is usually the RCC, but not always, and the SAR rescue unit; assume operational control and coordination of the SAR rescue unit; execute the SMC's SAR action plan and modify it according to the situation and the changing on-scene conditions; and receive and evaluate sighting reports and submit "sitreps" to the SMC at regular intervals. Usually this is about every four hours.

SAR UNIT DUTIES

SAR units are responsible for prosecuting the SAR case assigned. They establish and maintain the communications with the OSC and the SAR Mission Coordinator. They advised the OSC and the SMC of on-scene weather, of sightings, endurance, and the status of their equipment. Of course, they assist distress craft and/or rescue survivors.

SAR assists the 17 Districts in Alaska that are going to respond to an SAR situation or an SAR case. The biggest two, probably, are the two air stations — Air Station Sitka, located in Southeast Alaska, and Air

Station Kodiak, located in the Gulf of Alaska. Besides those, we have boat stations. We have four cutters at the base at Kodiak and several of them throughout the Gulf of Alaska and Southeast Alaska. These stations out here are the LORAN stations, and they normally do not get involved with SAR.

As far as the SAR units go, they include a 378-foot cutter with an H-65 helicopter on the back. They range to much smaller vessels all the way down to 16-footers.

Aviation assets include the H-65 Dolphin helicopter to the long-range C-130 aircraft and also the H-3 helicopter, which has really been the workhorse SAR aviation resource in Alaska for the past 20 years. This aircraft is being phased out in Alaska right now. The air station at Sitka already has three new H-60 Jay Hawk aircrafts, and Air Station Kodiak is going to get the first one later on this month. In about 2 weeks we should be getting our first one. We will eventually get four all together. We should go operational with the H-60 Jay Hawk by April of 1993.

A SAR CASE

Now, I would like to talk you through an actual SAR case and show you the five SAR incident stages that we have.

Awareness

On May 8, 1991, at 23:36 hours, almost midnight, the communication station at Kodiak received a distress call on Channel 16. The fishing vessel *Dora-H* reported it was sinking approximately 150 miles south of Kodiak. This was the awareness stage — we knew we had a problem.

Initial Action

The next phase was the initial action. The first thing the duty officer did when he heard this was to alert the crews that would probably be flying on it. In this case it was an H-3 crew and a C-130 crew that were on stand-by. In other words, they were ready to launch within 30 minutes. So we alerted these crews.

Planning

They started their planning, which is the third phase. You leap into this phase right away in a lot of cases.

In this case, the crews that were going to fly, the H-3 crew, thought about the various searches they could use. They thought about how they could use the radar and their night vision goggles. They thought about how much fuel they would have to have, and immediately they refueled the H-3 aircraft to its full fuel component. They thought about the extra pumps they could carry on board to dewater the vessel, the *Dora-H*, if it could be saved.

> It was one of those nights that was pretty dicey, and you have to consider whether it is actually safe to send the SAR unit out.

At the same time, the operation duty officer and the operations officer were planning, they were thinking about relief aircraft, the possibility that they may need another crew later in the night. Also, they think about the dangers involved and whether the aircraft should actually be launched.

The weather that night was really bad. Visibility was about 1 mile with rain showers, and the wind was out of the south at 45 knots, gusting to 55 knots. The seas were 20 feet, running up to 35 feet. There was also severe turbulence for the aircraft.

It was one of those nights that was pretty dicey, and you have to consider whether it is actually safe to send the SAR unit out. Always, in the back of my mind, is the fact that at Kodiak, in the 1980's, we actually had three fatal aircraft crashes occur. This is something that you always have to consider.

Actual Operations

The next phase of the SAR incident stage is the actual operations. In this case, the H-3 aircraft did launch. The C-130 was launched as well to fly what we call "cover" to go ahead and try to find the vessel for the H-3 crew, maintain a communication platform for them, and just to be there in case anything would happen to the H-3 helicopter.

The helicopter arrived at the position at 02:30 in the morning. They saw with their night vision goggles a very strange glow in the water. It was the position where the *Dora-H* had sunk, and the battery had not yet failed on the vessel. The lights where still on in the vessel and the crew was able to see this in the dark with the night vision goggles, which illuminate any source of light.

The next thing they found was a life raft floating. They were not sure that people were in it, but they thought there might be. They had a rescue swimmer on board the helicopter who is a young man or woman.

They are trained to go into the water, swim to people in distress and put them into a rescue basket, and actually get them back up and into the helicopter. These young people are highly trained. They are in superb physical condition, they have the best equipment possible, they wear a dry suit, they wear a face mask, but in this case, the waves were up to 35 feet and the wind was gusting up to 55 knots.

The aircraft commander will never order one of these rescue swimmers into the water. It is always voluntary. He or she has to be willing to go. In this case, the 22-year-old petty officer, ASM-3 Gary Streebe, did not hesitate. He said he wanted to go down, so they put down the hoist, and he went down and into the water.

As he landed on the water, he was getting out of the equipment that he had on at the end of the hoist cable when the wave that he was on fell out from under him. Remember these are 35-foot seas, and he fell off the cable that he was on. He fell quite a distance into the water, and into the dark.

His mask and snorkel were knocked off. He could have signaled to the helicopter crew to be brought back up for another mask, for a spare mask that he had in the helicopter, but he decided to swim for the raft instead, and try to make the rescue.

It was not easy. It took him about 45 exhaustive minutes of swimming and working with the people — the four people who were in the raft. But he managed to get all four into the rescue basket and on board the helicopter.

It was not easy for the crew of the helicopter, either, as they fought to keep their position in the black of night, the wind, and the turbulence. It was so rough that the co-pilot got ill out of his window during the hoisting, but he still provided the important backup needed by the aircraft commander flying the helicopter.

MISSION CONCLUSION

The last phase is mission conclusion. In this case, the crew flew back to Kodiak. They had to stop at Sitkanik Island which has a

remote cache of fuel that we have just for situations like this. They refueled, and at 4:40 in the morning, they landed back at Kodiak and dropped off the crewmen to waiting ambulances. They were fine.

For this particular mission, the crew received the Naval Helicopters Association Air Crew of the Year Award for the entire nation. This means for all the U.S. military helicopter crews that flew on every type of mission during 1991. This included combat missions in Operation Desert Storm. Their rescue mission was deemed to be the most demanding and skillfully prosecuted. We are very proud of our crew at Kodiak. Another Kodiak H-3 crew, incidentally, won this same award the year before.

THE FISHING INDUSTRY

You have all heard the statistics: fishing, particularly in cold Alaskan waters, is the most dangerous occupation that there is. Each year in Kodiak on Memorial Day, we have a commemorative service for fishermen who go out and do not come back.

As Corky McCorkle told us the other day, it is a very moving occasion and seeing the families brings home the danger involved in fishing in Alaska. Last year, 19 fishermen from Kodiak did not return, and if you go back to 1988, the figure that year was 42 people. That is an awful lot of fishermen not to return from a small community like Kodiak.

We have many SAR assets in Alaska, but one of the big problems that Jerry Dzugan pointed out yesterday is just the sheer size of our operational area. The state is huge, and the distances involved can mean that it can take up to 8 hours to get a helicopter on the scene of a fishing vessel in the Bering Sea.

Incidentally, a scene that Glenn Sicks showed was a vessel that was in the ice in St. Paul Island. I happened to fly in that case as a C-130 pilot, and it took the crew 6 hours to get out that far to make that rescue. Luckily, they were able to pluck those five people out of the water shortly after that shot was shown.

Another hazard that we have in Alaska is the environment. The cold water, the icing, the high winds, and the mountainous seas all make it difficult to prosecute SAR and to be a fisherman in Alaska.

Regarding preventative safeguards to avoid disaster, I think LCDR Glenn Sicks has really hit on it. He calls it the bottom line of his triangle, the EPIRBs and radio, the survival suits, and the life rafts. When you have this with a well-trained crew, you are going to have a crew that is probably going to be able to survive. One other thing about the EPIRBs that I would just like to say, the 406 EPIRB really is a much better signal, the SAR satellites can pick it up, they can pinpoint much better where the location of distress is.

We encourage everybody, and we hope you encourage everybody who buys one of those EPIRBs, to register it. It is amazing all of the people who will spend $2,000 and not send in a little card that should go with it so that we will know who it is that is in trouble when the SAR satellite picks up the signal. It makes our job so much easier, and it would help us to get the SAR assets on scene a lot quicker if people would take the time to do that. Personally, I think it should be mandatory. I am not sure why it is not mandatory.

The Coast Guard is here to support the public, particularly in Alaska. That means the men and women who fish. SAR is our most important

job — we will drop any other mission we are on to save lives or property.

Are we always successful? Unfortunately, not. As Spike Walker's moving tale last night showed with the crew of the fishing vessel *St. Patrick*, sometimes we will fly right over people in the water, and we will not see them. This occasionally happens.

Our crews are well-trained and highly motivated. The Coast Guard each year saves over 5,000 lives. We have the best possible technology for SAR in the radars, the night vision goggles, and the directional finding equipment, but we are not always going to be successful. SAR will never be the total solution for mishaps in fishing.

To reduce losses and save lives, we have to start before a problem turns into an SAR case. We have to start on the docks and in the classroom with education and training that will lead to cooperative compliance with the fishing vessel regulations. The efforts of safety advocates like Peggy Barry, Coast Guardsmen like Glenn Sicks, fishermen like Jim Herbert, and many others have resulted in significant progress over the past 5 years. We still lose about 30 people a year in fishing incidents in Alaska alone. Only when safety and training are as much a part of the fishing industry as nets and crab pots, only then will the fatality rates decrease. We hope this happens soon. □

FIRST AID AND EMERGENCY MEDICAL SERVICES

By Mr. George E. Angus

Mr. Gary L. Bledsoe: Our last presenter for this session is Mr. George E. Angus, whose presentation is entitled *First Aid and Emergency Medical Services*. George Angus has been a Mobile Intensive Care Paramedic since 1982. During that time he has worked in several pre-hospital areas including Los Angeles City Fire Department, University of California, Trans Alaska Pipeline, and Humana Air Ambulance. He has been involved in training for the duration and currently functions as the training coordinator for Southern Region Emergency Medical Services Council in Anchorage. He is the chairman of the State of Alaska EMS Training Committee and has been published in several trade journals. He currently resides in Anchorage. Mr. George Angus:

I am going to take just a couple of minutes and talk to you about one of the most difficult situations that you may encounter out on the sea, and that is dealing with some type of medical emergency that may happen. Through education and training and conferences such as this and injury prevention, we can do a couple of things.

We can increase the awareness of the potential for these types of emergencies. We can decrease the number of preventable injuries. I think everything we have seen so far in the past few days has shown us how important safety and education can be.

However, there are always going to be unintentional injuries and illness as long as people are at sea. Why is that? Why are we always going to have things happen?

First of all, it is the nature of the beast? Right? People are out there, they are doing dangerous work, they are working in dangerous conditions, and things are going to happen. The other reason is people are people, none of us is perfect, and injuries will happen out there.

There are some factors that will happen, and we need to deal with when looking at any kind of a medical emergency. One of the first factors is the type of illness or injury. That is one of the things that you are going to have to consider. Is it an amputation, a broken arm, or somebody cut, or is there someone with chest pain or having seizures. What is the problem? That is the first thing.

The second thing that we are going to look at is the severity of the illness or injury. You are going to have to take into consideration, for example in an amputation, is it a fingertip, a foot, or an arm? Is it a broken arm, is it a relatively minor break with just some swelling, or is it a bad break with bleeding and perhaps loss of circulation, which means that you are going to have to get them to medical attention a little quicker?

Obviously, you are going to have to be aware of the weather and sea conditions. Is it foggy or stormy, or are there calm seas or high seas?

Distance is another factor. How far away from any kind of help are you? Are you hundreds of miles? Are you close enough to get back to port if you need to?

The number of injured crew is important as well. If you have a block that breaks loose and knocks

out three of your five crewmen, that is going to change this emergency.

Another factor is, are there any medically trained people on the crew? I would certainly hope that there are. I understand that regulations effective next year will make it mandatory for at least one crewmember to be CPR- and first-aid trained. I would like to hope that people are complying with that even now. If someone has got some medical training, they can look at an injury or illness and then decide how serious it is and how quickly you need to get the injured person to medical attention.

Medical supplies that are available on the boat are another factor. The amount of supplies, the type of supplies, and the condition of the supplies are included in this factor. Is it a first-aid kit that has been stowed in a bunker for the past 7 or 8 years and not been looked at? Is it in deteriorating condition?

This means that we can classify the different types of injuries and illness into a couple of different categories. The first one is probably going to be the easiest. That is a minor injury, and it is something that can to be handled by a medically trained crewmember or someone else on the crew. We are talking about very minor injuries, minor cuts, abrasions, minor illnesses, headaches, those kinds of things.

There are other types of minor injuries that may not be life threatening, but the person may need more medical attention than they are able to get on the vessel. These people need to get to port one way or another.

The major injuries are life-threatening. If you do not get the medical attention fairly soon, the injured person may not survive. Are you able to make it back to port? Are you close enough to do that?

Another major problem is when you are unable to make it to port. Perhaps the weather is poor, or you are 300 or 400 miles away. Those are the different types of classifications.

If you happen to be near the port, and you have a major medical emergency, contact the harbormaster and let him know that you have a problem. The harbormaster can activate the emergency medical services in that community and have them there when you arrive back at dockside.

I know that some of the larger fishing vessels with larger companies have radios that they use to talk back and forth to a base station on the shore. That would be one way to communicate and get the emergency medical services involved.

If you are not near the port, probably the most important resource to you is the Coast Guard Rescue Coordination Center. These folks are the ones who are going to be able to coordinate and get a rescue vehicle out there for you based upon weather conditions, where you are, and the type of injury.

Depending on the location, the Air National Guard does do some type of rescue procedures as well. They can come out and assist if needed. They have medically trained personnel on board.

Perhaps any other vessels that are in the area could be of help, especially if you do not have a medically trained person on board. Perhaps another vessel has someone with medical training who can give some advice over the radio.

Some of the specialty services that may be needed include the dive rescue teams. There are a number of dive rescue teams throughout the state. There are some hyperbaric facilities in case you are dealing with a diving incident. There are also

some larger fishing companies that contract with physicians to provide medical advice over the radio to their people on board the vessel.

Finally, one of the most important phone numbers and addresses for you folks to have is for the Alaska Marine Safety Education Association. I can not stress how important it is that at least some of the crew members on board have some type of medical training. These people are the experts in giving that training.

In summary, there are a number of factors that affect a medical emergency at sea. The best that you can possibly do regarding these emergencies is to be prepared beforehand, have some people who have some training, have good medical supplies, know the areas that you are in as far as what type of contact numbers you need, and how to access any emergency medical services that you may need. □

SESSION 9: DIRECTIONS FOR THE YEAR 2000

Moderator: Max R. Miller, M.S.
Captain, United States Coast Guard

Captain Max Miller, a native of Bakersfield, California, graduated from the California Maritime Academy with a Bachelor of Science degree in Marine Engineering. He was commissioned in the Coast Guard in 1971 and spent the first 4 years of his career as a marine inspector and casualty investigator at the Marine Safety Office in Los Angeles/Long Beach, California. Captain Miller left the Coast Guard for 4 years in 1974, during which time he worked as an engineer for the fire department in California. He returned to the Coast Guard in 1977 and was assigned to the Marine Inspection Office (MIO) in Houston, Texas. He served as the assistant senior marine inspector and was involved with the Marine Board of Inquiry investigation when the oil tanker Chevron Hawaii exploded in 1978. Upon detachment in 1980 from MIO Houston, Captain Miller entered the Naval Postgraduate School in Monterey, California, and earned a Master's Degree in Mechanical Engineering in 1982. From 1982 to 1985 he put this knowledge to work in New Orleans, Louisiana, at the Eighth Coast Guard District where he was the Chief of the Electrical Section and Mobile Offshore Drilling Unit Section of the Merchant Marine Technical Branch. From there, Captain Miller was assigned to Coast Guard Headquarters, Washington, D.C., where he served as Chief of the Port Security Branch. While there, he worked on the passenger ship safety measure adopted by the International Maritime Organization, aimed at increasing passenger safety on board cruise ships. Captain Miller made his way back to the sunny Gulf of Mexico in 1988, where he served 2 years as the Chief of Port Operations at Marine Safety Office (MSO) New Orleans. In 1990, Captain Miller became the Executive Officer at MSO New Orleans and it is from there that MSO Anchorage welcomes him.

QUOTES FROM THIS SESSION

"There have to be better ways to engineer safer vessels, to give better weather reporting, to get better communications, and to train better the masters of these vessels."
— John P. Middaugh, M.D.

"Very gratifying to hear from Tony Ford and others that the industry sees that it is in their economic interest as well as their moral duty to do the best they can to improve safety in the industry."
— Roger T. Rufe, Jr., M.P.A.

"There is little to be done with the company who only wants bodies for a few days or weeks to do the dirty work and will pay anyone who stands up for such working conditions."
— Carl M. Hild, M.S.

"Our priority at NIOSH is to focus on primary prevention, knowing that secondary and tertiary prevention are needed as "safety nets" in the system."
— Melvin L. Myers, M.P.A.

OCCUPATIONAL INJURY — ALASKA PERSPECTIVE

By Dr. John P. Middaugh

CAPT Max R. Miller, USCG: Our first presenter is Dr. John P. Middaugh, whose presentation is entitled the *Occupational Injury — Alaska Perspective.* John P. Middaugh, M.D., is the State Epidemiologist for Alaska and the Chief of the Section of Epidemiology. Dr. Middaugh received his Bachelor of Arts degree from the College of Wooster and his medical degree from the University of Wisconsin Medical School. Dr. Middaugh's first tour in Alaska was as an EIS officer with the Centers for Disease Control from 1975 to 1978. He left Alaska for 1 year to become the Senior Resident of Internal Medicine at Case Western Reserve University Hospital. In 1979 he returned to Alaska and became the Medical Director of the Anchorage Neighborhood Health Center, and the following year he took over his current duties. Dr. Middaugh is a member of several professional organizations, a recipient of several honors and awards, and author of numerous publications. Dr. John Middaugh:

I am most impressed with the commitment made by the National Institute for Occupational Safety and Health (NIOSH) to improve worker safety in Alaska. I am pleased to be able to participate in this very important conference to explore the serious problems of occupational injury in the fishing industry in Alaskan waters.

While I hope to make a small contribution to our understanding, you can be certain I have been an attentive student during the 3 days. I have been asked to provide an Alaskan perspective to our growing knowledge of injury prevention.

Tremendous and extraordinary changes have taken place in Alaska and in the Arctic in the past 40 years. Now, in 1992, the overall health of Alaskans has never been better. Over the past four decades, we have seen an almost miraculous reduction in life-threatening infections and communicable diseases.

The infant mortality rate has dropped to an all-time low. Death rates have fallen to an all-time low. The life expectancy of an Alaskan born in 1992 has never been higher.

The catastrophic epidemics of infectious diseases, especially tuberculosis, that ravaged Alaskans during the 1930's to 1950's largely have been eliminated by public health programs. These programs did not appear by accident. They grew from a carefully crafted health policy. But we must now ask if the health policy, institutions, and programs that were developed in the 1950's to deal with health problems due to infectious diseases are adequate to respond to the public health problems we face today and will face in future decades.

In spite of the great improvements in health status, severe problems remain. The health status of Alaska's indigenous people is much worse than non-Natives.

Although we have eliminated most epidemic infectious diseases, we now face an epidemic of injuries. Injuries are the leading killers in Alaska. The devastating impact of injuries in Alaska has not been newly recognized.

Dr. Jack C. Haldeman, in 1951, during the formal installation of the Alaskan Division of the American Association for the Advancement of

Science (AAAS), presented at the Second Alaska Science Conference, a paper entitled "Violent and Accidental Death as a Health Problem in Alaska." Dr. Haldeman presented his paper "...to call attention to a major health problem of Alaska that has received far too little consideration in view of its importance — namely deaths from violent and accidental causes." Dr. Haldeman described the need to acquire detailed knowledge of the exact circumstances of accidents in order to develop effective control programs.

Unfortunately, he found that there were not adequate data to provide information for program planning emphasis. Dr. Haldeman noted the need for "...cooperative planning and working together of the number of governmental and voluntary agencies and of private citizens as well....an organized approach in which all the resources at our command are brought to bear on the prevention of specific types of accidents, alcoholism, suicides, and homicides, could appreciably reduce the mortality which these causes are responsible."

In 1992, 41 years later, intentional and unintentional injuries continue to be the leading cause of death and years of potential life lost (YPLL) in Alaska, accounting for 29 percent of all deaths and 53 percent of all YPLL. The leading causes of death due to injuries are motor vehicles, drowning, suicide, alcohol and illegal drugs, aircraft, homicide, and fire.

Alaska's youthful population, in part, accounts for the high proportion of fatalities and morbidity associated with intentional and unintentional injuries. However, detailed studies reveal that age- and race-specific attack rates for various types of injuries are significantly higher in Alaska than in the other 49 states. Of central importance to this conference, Alaska has the highest rate of fatal injuries among workers in the United States.

Recent studies by NIOSH have documented that Alaska is the highest risk state in the United States for traumatic worker deaths. From 1980 to 1988, 33 worker deaths occurred per 100,000 workers employed in Alaska, four times the rate for the United States (7.2 per 100,000).

In 1991, 79 workers died on the job in Alaska. Thirty-five were employed in the commercial fishing industry. Within the fishing industry, rates were highest in the crab industry, followed by halibut and salmon fishing. Aviation was the industry with the second highest number of work-related deaths with 9 fatalities among workers in the air transportation industry, and 15 additional fatalities in workers from other industries who were killed in aircraft crashes. Logging and transportation were the next highest-risk industries.

If we can identify the risk factors associated with injuries, then control measures can be implemented with great success. Most injuries can be prevented.

Alaska's epidemic of injuries is even more distressing because it is potentially preventable. Injuries are not accidents. Accidents are random and unpredictable events and, therefore, they are by definition unpreventable events. Injuries are not randomly distributed and often they are predictable. If we can identify the risk factors associated with injuries, then control measures can be implemented with great success. Most injuries can be prevented.

Unfortunately, injury control receives scant attention compared to infectious diseases and other hazards.

Research and our public health control measures are unfocused, lack continuity, and are under-supported. For example, in one recent year the federal government provided 33 major research grants for five infectious diseases — cholera, diphtheria, polio, rubella, and rabies — for which in the entire United States there were 9 deaths and 17 total cases. In contrast, that same year in the Untied States there were 33,000 persons who were shot to death and more than 198,000 individuals who were shot and injured, but there were no federal research grants awarded to deal with firearms.

To achieve safety and health at the workplace, we must learn how to prioritize our public health efforts. All studies show that we constantly overreact to trivial risks and ignore much more substantial threats to our health and safety.

Without a clear health policy that focuses on controlling injuries, it is all too likely that we will respond to our health problems with "Ready, Fire, Aim." Examples abound:

- In responding to the oil spill in Alaska, we spent $18.2 million to rescue 222 otters; less than half are thought to have survived.
- We Alaskans spent $30 million to remove crysotile asbestos from a state office building in Juneau, although scientific studies show this to be unnecessary and very probably harmful.
- Alaskans spent more than $6 million to remove lead ore from the town of Skagway, although studies proved the ore to be relatively inert and not to contribute to the body burden of lead of community residents.
- The Department of Energy is planning to spend $3 million in 1993 to remove dirt from Cape Thompson due to a radiation scare even though scientific evidence proves that the dirt is harmless.
- The Environmental Protection Agency mandated a state oxyfuel program that may have caused illness in as many as 25,000 Alaskans but provided little, if any, health benefit from carbon monoxide reduction.

Alaskans have a rich and colorful history — and a long tradition of applying occupational health principles (even though done inadvertently). One of the first and most impressive mass occupational screening programs in Alaska was implemented during the Klondike gold rush of 1898.

The Canadian Mounted Police camped at the top of the Chilkoot Pass. Only those would-be miners who could stockpile 1,200 pounds of supplies at the summit were permitted to go on to Lake Bennett and the Klondike gold fields near Dawson. In contrast to the murders, occupational fatalities, injuries, disease, and crime in Soapy Smith's Skagway, the Klondike saw few deaths and almost no crime or disease. The men and women who reached the summit at the top of the Chilkoot Pass "screened" themselves. Only the fittest were able to undertake the hazardous journey beyond Lake Bennett, through the notorious five-finger rapids, and on to Dawson where they confronted harsh working conditions while extracting gold from the frozen ground.

Now Alaska faces a difficult challenge to respond to the existing epidemic of occupational injuries, especially those in fishers.

We must critically examine our assumptions about injuries so that we will become aware of our ability to prevent them.

1. We need to acquire appropriate data.

2. We need to understand and apply injury control principles.
3. We need to overcome social, political, and economic barriers that stand in the way of implementing effective control measures.

Using today's powerful tools of epidemiology, and working in close partnership with fishers, industry, and government, we can make a difference. For example, Alaska has the highest rates of injuries to those who fly in the United States. Aviation in Alaska is an integral part of life. One of 50 Alaskans is a pilot.

Unfortunately, Alaska's aviation safety record is disheartening. Although Alaska has only 7 percent of commercial air taxi operators in the United States, more than 48 percent of the air taxi crashes in the nation occur in Alaska each year. During the years 1988 to 1990, 551 aviation crashes occurred in Alaska involving 1,184 people. Sixty-seven crashes involved at least one fatality; 118 individuals were killed.

During the *Exxon Valdez* oil spill clean-up from 1989 through 1991, all aviation operations were centralized. More than 50,000 flight hours and 4 million miles were flown during the operations. No fatal crashes occurred, and only a small number of crashes were documented. Detailed analysis of the oil spill aviation operations is underway to identify key factors responsible for this excellent safety record.

Recent studies documented the dangers to halibut fishers who were forced to fish a limited opening period that was set without regard to weather. Now as a result of management changes, this important fishery should be safer because fishers can choose to fish when weather conditions are milder.

> How can we use existing knowledge and engineering technology to prevent sinkings, capsizings, and rollovers?

Alaska now depends on federal grants to support injury prevention activities. Hopefully, in the future, the State will recognize the value of injury prevention, become committed to safety and injury control, and fund injury prevention programs.

I have great admiration for those fishers who ply the high seas. I can not imagine the conditions endured by fishers that we have heard about this week and that are described in Spike Walker's book.

I have extraordinary appreciation for the skills of the U.S. Coast Guard search-and-rescue professionals who risk their lives to save others. As a total ignoramus about ships, ship safety, and ship stability, I cannot understand why someone would hire an inexperienced 26-year-old to manage a 162-foot vessel and put a crew in his hands. I do not understand why holes were open on the side of the vessel during a major storm. I do not understand how, when the stability of fishing vessels is so bad after converting them from one purpose to another, we still let them ply the seas.

I would like to see us go beyond our refinement of safety rescue, which is so very important, and to focus on primary prevention. How can we use existing knowledge and engineering technology to prevent sinkings, capsizings, and rollovers? There have to be better ways to engineer safer vessels, to give better weather reporting, to get better communications, and to train better the masters of these vessels.

My hope is that the Alaska Division of Public Health and the health community can help in this effort. Principles of injury prevention and the science of epidemiology can be effectively applied to reduce Alaska's occupational injury and fatality rate. Better public health is better business. More important, we need to protect our greatest sustainable resource — our people. □

REGIONAL PERSPECTIVE

By Rear Admiral Roger T. Rufe, Jr., USCG

CAPT Max R. Miller, USCG: Our next presenter is RADM Roger T. Rufe. His presentation is entitled *Regional Perspective*. RADM Rufe is Commander of the 17th Coast Guard District, Commander of Maritime Defense, Zone Sector Alaska, and Commander or U.S. Navy Forces, Alaska. During his career, he has served aboard seven Coast Guard cutters, five as the Commanding Officer. Ashore, he has served as operations officer for the Greater Antilles Sections in San Juan, Puerto Rico; Assistant Chief of Environmental Response Division, Coast Guard Headquarters; and Chief of the Congressional Affairs Staff in Washington, D.C. During his assignment to the Environmental Response Division, he was a U.S. representative to the Maritime Environmental Protection Community of the International Maritime Organization in London and led the U.S. delegation that negotiated an oil spill contingency plan agreement for the Caribbean Island nations. With that, I will introduce RADM Roger Rufe:

I see we still have the hard core here. I know it is getting late in this 3 days of presentations, so I will try not to use all my time. You have certainly heard from plenty of people in Coast Guard blue over the past several days, most of them more knowledgeable than I. I think they have given you a good perspective on what the Coast Guard brings to the fishing vessel safety equation.

I would like to hit a few highlights and talk about the regional perspective just for a few minutes.

My strong concern for fishing vessel safety began even before I began my Coast Guard career. I am from a fishing community on the south shore of Long Island and knew a lot of fishermen as I was growing up.

I still have one brother who is a full-time commercial fisherman on the East Coast and has been doing it for some 25 years. So I know what the economics are in the fishing industry. I also understand personally the safety concerns in the industry.

I have also sat through 24 hours of agony waiting to hear from a brother and a sister who were lost at sea. They were eventually found by the U.S. Coast Guard, but I know how agonizing that can be for those whose families go to sea. All too often during my Coast Guard career, I have had to make that phone call to someone — a fisherman or a recreational boater's family-to say that we had either found a body or we had to suspend searching after an extended period.

I would like to see fewer of those phone calls in the future. So I am committed during my time here in Alaska to make an impact, in cooperation with others, on improving the safety of the fishing industry in the Alaska.

We in the Coast Guard must maintain a regional perspective in our fishing vessel safety efforts. Many of the fishing vessels that come to fish in Alaska are not home ported in the 17th Coast Guard District. They come from elsewhere in the Pacific, mostly from Seattle.

Those boats are often inspected by Coast Guardsmen who do not fall under my jurisdiction. It is important that we coordinate what we are doing here in Alaska with what is done

elsewhere in the Coast Guard. I know we have not always been perfect at that.

Like everyone else, we have gone through some growing pains in learning these complex safety regulations. I have had some complaints that vessels that have passed an inspection with flying colors in Seattle, come to Alaska and are boarded up here and some discrepancies are found. That should not happen. I am committed to work with my compatriots down south to make sure we are all operating with the same guidelines and are singing from the same sheet of music.

The other perspective that is regional in nature is that the enforcement that we do here in Alaska is done from Coast Guard cutters that typically come from elsewhere in the Coast Guard. When they come here and are at sea on the fishing grounds, they are working for me. However, they come from Honolulu, from San Francisco, from Seattle. We need to provide training to these crews to ensure that the enforcement program is consistent. I am committed to trying to do a better job with that, and I think we will.

I would also like to mention some cases recently that bring into focus the need for us to be very active and committed to safety. You have heard a lot about the fishing vessel *Majestic* the last couple of days. We all point with pride to that case as a good example of how these new regulations can work effectively. I am certainly happy that this case turned out that way.

From the time we received the initial partial Mayday from the *Majestic* until the rescue center in Juneau got the first alert on the EPIRB signal from the satellite, only 22 minutes elapsed. That shows how quickly the system can work when it is working properly and was certainly a key to those folks being rescued safely.

Not all of the news is good. As Glenn Sicks pointed out in one of his presentations, the statistics show that the number of lives we will lose this year in Alaska and the number of boats lost will probably be about the same as we have experienced historically the last 2 or 3 years. We need to improve on that.

Let me talk about two cases that preceded the *Majestic* by just 2 weeks. The fishing vessel *Sea Breeze* was a 47-foot halibut boat out of Yakutat, fishing on the Gulf of Alaska, during the October halibut opening. The vessel went down with three persons on board. We understand it only had a manually-operated EPIRB. We were first alerted by an overdue report, 2 days after the distress.

During the same halibut opening, the 41-foot fishing vessel *Mary May,* with two people aboard, was operating out of Sitka, in Sitka Sound, not far off shore. Once again, our first alert to a possible distress was an overdue report by the next-of-kin that the vessel had not returned from the fishing grounds.

In both of these cases, we conducted extensive searches. In one case, we found a body and a life raft, in the other case, we did not find anything until a body surfaced several weeks later.

In these two cases a total of five men were lost. As in the case of the *Majestic,* had there been an EPIRB activated the chances are good that we could have effected a rescue.

There are some indications in one of those cases that a Mayday was heard and not reported. When we put out a broadcast 2 or 3 days later, asking for information on either of these boats, a fishing vessel answered

by saying, "Gee, yeah, I thought I heard a May Day two days ago."

That obviously is not in keeping with the traditions of the sea. We normally look after our own.

We certainly need to stress that there is an obligation on the part of fishermen to help fishermen.

We have not been able to ascertain why the report was not made, but perhaps the person thought, well, I am in the middle of fishing for halibut, and if I report this, the Coast Guard is going to ask me to go over and see if I can help out. I do not know that is the case, but I think that we need to emphasize the obligations of all of us. We all have a part in this safety program.

Shared responsibility! We heard a little bit about that yesterday, from both industry and the government.

I will say in the presence of Peggy Barry, that it was through her singular efforts, her courageous and dedicated efforts, that the Coast Guard and the industry was brought into this increased effort in fishing vessel safety. Had it not been for her efforts, we probably would have been two or three years behind. We are now all in it together, and it is great to see the combined effort that I have seen here the last couple of days.

NIOSH has done a tremendous job in bringing this whole thing together. It is clear that government and industry are both committed to improving the safety record of the fishing industry. It was very gratifying to hear from Tony Ford and others that the industry sees that it is in their economic interest, as well as their moral duty. to do the best they can to improve safety in the industry.

In terms of the industry's responsibility, obviously it begins at the dock, long before the vessel ever leaves the pier. We have got to insure that seaworthy vessels are going to sea, that they are properly equipped, the crews are trained, and they are realistically going to be able operate in the conditions that they will encounter at sea.

The fishermen themselves bear a great responsibility, both the masters and the crewmembers. Obviously, the master must ensure that his boat is properly outfitted, that he has the required survival equipment aboard, that his crew is properly trained, and that he sets the right tone — that safety is number one. It is incumbent upon the crew members to ensure that they educate themselves on the dangers, and that when they go aboard a vessel it is properly outfitted and they receive the proper training.

It is good to see the fisheries associations and the operators of the major fishing fleets putting together dedicated safety-training programs. I think that is going to have a positive impact on safety in the industry.

I will say in the presence of Peggy Barry, that it was through her singular efforts, her courageous and dedicated efforts, that the Coast Guard and the industry was brought into this increased effort in fishing vessel safety.

The Coast Guard's responsibility is to actively enforce the safety regulations at sea. I know that some fishermen, the independent, crusty types like my brother, often do not like to hear that. We have not always had the customer focus that we need to have. That is changing in the Coast Guard.

I think we are doing a much better job of making the industry safer and, at the same time, doing it in the least intrusive way that we can. We do not want to interfere with fishermen's making a living. We

want to make sure they are safe, but we can do that in a way that ensures that they can be profitable. It is in all of our interest to ensure that fishing remains a profitable industry in this country.

We are doing better. This past summer, we boarded 769 fishing vessels in Alaskan waters. We had about six high-endurance cutters on patrol, five medium-endurance cutters, and five patrol boats, patrolling in the Bering Sea and the Gulf of Alaska, just this summer alone.

What we found is that compliance is very good. Following their patrols, our cutters are reporting a much reduced number of violations and that they are often finding our fishing vessel safety check-off lists aboard the vessels they board.

The operators are using them and often express their appreciation for the guidance they have been given during the course of voluntary dock-side examinations. I am hopeful that as the word gets out, the dock side-examination will become more accepted by fishermen and that it will become a very effective program.

The dock-side examination program can really have an impact. The enforcement efforts are important, but if we can make the folks safe, and ensure their safety before they go to sea, I think our enforcement efforts will be much less intense than they have had to be in the past.

I recently received a very gratifying letter from a fishing vessel skipper, one of a few I have received. His vessel was boarded by the Coast Guard cutter *Anacapa*, our 110-foot patrol boat out of Petersburg, and they did find some violations. They cited the master for the violations they found on the vessel, but in so doing the boarding officer provided some much needed instruction to the operator.

I received a letter from the master several days after the boarding took place. The master said the boarding team had acted much differently than he had experienced in boardings he had undergone in the past. He felt that they were there to try to help them. They were there to try to make him and his vessel safer. He came away from the boarding with a much better feeling about the Coast Guard. I am using that example when I talk to all my people. I hope to get those letters on a regular basis in the future.

I know that most fishermen do not want to pick up a pen and write me a letter and that is why I was particularly happy to get this one. Whether or not they write a letter, I hope that they will feel that way at the end of each of our boardings. We may not be 100-percent successful at that, but I hope that we will be able to do better with our customer outreach programs.

We are very early into this program. We do not know what the long-term benefits will be. Statistics so far are not that good. As we develop a better data base, it will help us to focus future regulatory and enforcement efforts.

We are also placing more emphasis on fishing vessel safety at the fisheries management council meetings. I am a member of the North Pacific Fishery Management Council. Of course, their primary focus is on conservation. The conservation management schemes obviously have a safety component as well. I do think that the fisheries management councils are sensitive to that. They are willing to work with us to make sure that their regulations adequately consider the safety aspects of those regulations.

We will continue to work on that and continue to work with our cus-

tomers. As I said before, our commitment is to make sure that the fishing industry is a healthy and vital one in Alaska and that it is safely operated. I think those two can work hand-in-hand and they should work together very compatibly.

In closing, I would like to say thank you to NIOSH for putting this workshop together. I hope we have more of these efforts in the future. You can count on Coast Guard participation and help as we work together for fishing vessel safety.

Finally, I would like to thank the folks who work for me. I came here to the 17th Coast Guard District with one of my primary goals to make the fishing industry a safer one. I found I had people here already committed to that in a very dynamic and aggressive way. They have been led by LCDR Glenn Sicks, ably assisted by Sue Jorgensen and Rob Lee. I want to thank them personally and publicly for their efforts. □

CIRCUMPOLAR PERSPECTIVE

By Mr. Carl M. Hild

CAPT Max R. Miller, USCG: The last speaker of this session is Mr. Carl M. Hild whose presentation is entitled the *Circumpolar Perspective.* Carl Hild has been the Executive Director of the Alaska Health Project since June 1988. Before that he was Business Manager and Program Specialist for the organization. He currently is responsible for the overall operation of the agency including grant writing, fund raising, staffing, program development, fiscal management, and community relations. He has over 15 years of experience in human service program administration and also a background of health education in rural Alaska. His Master of Science degree is in Science Management and focuses on the Health Sciences. Mr. Hild is actively involved with circumpolar health issues both nationally and internationally. He received a special recognition award for his participation in the joint American Public Health Association/ Alaska Public Health Association National Task Force to develop the *National Arctic Health Science Policy*. He is President of the American Society for Circumpolar Health and Vice-President of the International Union for Circumpolar Health. Mr. Hild has been actively involved on numerous boards and commissions particular to Alaskan health issues. Mr. Carl Hild:

When the whale fisheries of the Atlantic and Pacific began to decline in the early 19th century, the undaunted captains pointed their small vessels to the poles and searched for new grounds. They hit a bonanza when they arrived in the Arctic Ocean, the summer feeding grounds of many of the whales for which they searched and some new species one of which was dubbed the "Right" whale as it was the correct beast to hunt. It was slow and easy to kill, floated when dead, and had exceptional amounts of oil and baleen.

However, as the whalers soon came to know, all too well, the northern oceans are hard mistresses. Vessels iced and capsized, were caught and crushed in pack ice, became layered with ice on the inside from the condensed breath of the crews, and generally suffered great hardships while in the Arctic.

The ships continued to search for and kill whales until three things occurred within a few years. Oil was taken from the ground and whale oil was not so needed. Spring steel was developed and baleen lost its market share next to women's hearts.

One-third of the Yankee whaling fleet in 1 year and almost half of the entire world's whaling ships in 5 years were destroyed in the ice pack. It was no longer very economical to whale in the far north nor anywhere in the world. It was a timely break for the whales which were nearing extinction.

The seafood harvesting and processing industries are seeing the same types of economic factors. With decreased populations of harvestable food and increased demand in waters close to home ports, seafood harvesters are heading further into the ocean and to the poles to fill their vessels. This process requires more sophisticated gear, longer trips, and overall the cost per unit will increase. However, the health and safety of the workers is not likely to see a radical

change with increased investment in the harvest mechanism.

I do not believe that the seafood industry will become generally safer as our factories and mines have over the past century. The key with the land-based occupations was when they became unionized. There is no one big company from which to demand better hours, holidays, sick pay, or safety inspections. The seafood industry workers are not in a place physically nor historically to band together to demand a part of the profits of the industry be returned to improve their lives. A miner, working 365 days a year in an owner's property with a single source of mineral wealth that needed to be excavated, had a lever.

Anyone with a vessel and gear can make a year's wages in the incredibly short natural-resource-recovery season, such as the one for herring roe. If you go on strike during that hour, or if you are even slow, you are out of a year's income.

What will get the attention of any business is economics, or better yet, profit. What I perceive in other areas of the world are attempts to improve the industry by making it more economical. Then, as a by-product, workers will get better conditions. Dr. Thomas Bender of NIOSH used the phrase on Friday "total quality management." Tony Ford stated his company was making "economic decisions."

Our keynote speaker, Peggy Barry, listed three concerns: vessel stability; legislation, regulations, policy issues; and training. These are also the concerns I have identified in other countries.

VESSEL STABILITY

If a vessel is more stable, moves through the water faster, and can carry a greater load, it will mean savings in time, fuel, and cost of getting the product to market. It will also mean a better (less rolling) work platform, fewer hours harvesting and, therefore, less stress on the crew physically and mentally and fewer trips to make the money needed for maintaining a business and family.

The savings of engineering a better vessel mean a variety of other savings to the owner, captain, crew, and community. Norway is well on its way to catamaran vessels than do all the above. MARINTEK, the Norwegian Marine Technology Research Institute in Trondhiem, Norway, focuses on the construction and design of vessels. The Fishery Technology Research Institute in Tromso, Norway, deals with fishing industry data and work conditions.

Catamaran crabbers see a good application of Dr. Bruce Adee's comments that stability issues are responsible for half of all seafood harvesting fatalities. If pots could be retrieved from the center of the vessel, this could also then reduce the injuries that occur in swinging a pot on a crane over the side of a rolling vessel. Dr. Adee's comments on sponson refits seems to be another area to promote as we try to improve our fleets. I also believe that we need to look to the traditional designs that worked in the open ocean and consider outriggers for stability.

In order to know what can work, engineers are asked to design equipment based on the structural limits of the materials being used. In order to know what can work, engineers also need to know who will be using the equipment and under what conditions.

The three-legged occupational health stool of human well-being supported by the task, the tool, and the environment is a model. If the crew member has the best tool to do the task but is in the worst environ-

ment, there is still a great chance of injury. The environment cannot be completely controlled in workplace settings, especially in natural resource recovery such as seafood harvesting.

> Samuel Plimsoll painted a line on each vessel in Bristol to delineate the depth to which it could safely be loaded. Up to that time, it was an estimate made by the skipper; now there was an exact engineering solution to the question of how much load the vessel could really handle and remain seaworthy.

Norway and Finland today are making efforts to listen actively to those in the profession. It was in the early 19th century that an engineer from Bristol, England, talked to distraught survivors of numerous fishing disasters.

With one stroke of a brush he saved innumerable lives. Samuel Plimsoll painted a line on each vessel in Bristol to delineate the depth to which it could safely be loaded. Up to that time it was an estimate made by the skipper. Now there was an exact engineering solution to the question of how much load the vessel could handle and remain seaworthy.

The entire industry needs to listen to those in the trade and offer practical solutions. Jim Herbert, Hank Pennington, and Jerry Dzugan stated yesterday we need to involve those in the trade. It is the fisher who knows how the vessel or gear will be used.

The statistical review of data on Friday gave us some real targets for areas of concern. We all need to look at how individuals are injured on the job. The following is from "The Role of the ILO (International Labor Organization) in the Improvement of Safety and Working Conditions Aboard Fishing Vessels."

"In order to improve conditions of safety, it is essential to identify who is at risk. Accidents occur on board ship at the place of work rather than ashore or as a result of major casualties to the vessel itself. In the fishing fleet, deaths occur at the place of work due to accidents not related to the safety of the vessel itself. We also know that the greatest number of accidents occur to those members of the crew who work on deck. Further analysis of available information shows that the ordinary seaman or fisherman is the most likely victim of an accident."

A few paragraphs later, the report state the following:

"This confirms the findings of analyses carried out on accidents on fishing vessels of certain countries of the EEC (European Economic Community): 40 percent of accidents were due to slips and falls and 50 percent due to mechanical lifting and handling equipment. It appears that there is a strong correlation on one hand between injuries to the hands and handling equipment and, on the other hand, between feet and trunk injuries and slips and falls. The occurrence of such accidents is closely related to working conditions and the working environment in general. Slippery decks, faulty and unguarded machinery and unfavorable climatic conditions together create ideal conditions for accidents to occur."

Paula Trapp, R.N., presented data earlier in this workshop on the first look at what injuries are occurring and in which fisheries in Alaska. I believe that this evaluation is an important step to preparing individu-

als for the specific tasks of their occupation, while preparing the local community health providers for the types of injuries they are most likely to see during a coming season. This knowledge of past trends enables us to prepare for and prevent the most common types of injury.

If it could be shown that a safety-educated worker has fewer injuries and is, therefore, not lost to the work of the vessel. I believe that those people will be hired by companies that are looking to the long-term investment in the community and the craft.

Unions and trade schools around the world have stated that a trained worker is a safer worker and a more efficient worker. If a company wants the best workers on its vessels because of the new, sophisticated fish-locating equipment, new hydrodynamically designed nets and trolling gear, then they will pay a bit more for such skills. If it could be shown that a safety-educated worker has fewer injuries and is, therefore, not lost to the work of the vessel, I believe that those people will be hired by companies that are looking to the long-term investment in the community and the craft.

There is little to be done with the company who only wants bodies for a few days or weeks to do the dirty work and will pay anyone who stands up for such working conditions. Schools and universities in northern Europe have training programs that encompass the latest technology and biology, to basic seamanship and first aid. There is a "Fishery High School" at the University of Tromso, Norway, as well as a "Safety Training Center for Fishermen." There needs to be further investment in the individuals involved in seafood harvesting.

Not only is there need for education of the workers, there is a need to share information among the researchers. This FISH Workshop is a major step forward for the United States and is based in part on the new National Institute for Occupational Safety and Health office based in Alaska to investigate occupational fatalities.

Several years ago there was a meeting on "Health and Safety in Fishery" in Lofoten, Norway. In 1988, there was a meeting in Svolvaer, Norway, on "Occupational Health Problems Among Fishermen in Spitsbergen Waters." Just last month there was an international meeting in Spain, "Safety and Working Conditions Aboard Fishing Vessels."

At that meeting there were only two speakers scheduled from the United States, and only one of them presented. He was from Alaska and is at this meeting, Jerry Dzugan with the Alaska Marine Safety Education Association (AMSEA), a small non-profit group. There needs to be much more sharing of information within the field of seafood-harvesting safety and health. The upcoming Ninth International Congress on Circumpolar Health may be an excellent opportunity.

The seafood-harvesting industry needs to listen to other industries as well. At this time much information on survival in cold water, icing conditions, impact of ice on materials, and navigational aids has not come from the seafood industry, but from offshore oil and gas development.

The petroleum industry is in need of this information and is researching the dynamics of work in the northern areas. This information is transferable to seafood harvesting.

I believe that other areas of research need to be tapped to improve health and safety within the seafood industry. These may include special coatings to keep ice from forming, heat-recovery systems in industry applied in small scale on vessel design, energy high-efficient systems to reduce equipment space and provide more work area with less clutter on board.

Passive alarm systems for load, stability, and air monitoring should be improved and made less expensive. To prevent drowning, perhaps safety lines, not unlike those used by roofers, could be employed for on-deck station work.

I would encourage NIOSH to invite a seafood-harvesting expert from Norway or Iceland to participate in some extensive and intensive review of our industry.

The man-overboard rescue nets as developed in Great Britain need to see wider use. Likewise floatation gear, such as that used by Olympic kayakers, should be available for those who must be physically active but need protection if knocked into the water. Shoes and decks with super griper surfaces that will stay that way with fish slime and copious amounts of water, and yet are easy to clean, need to be investigated in all industries for application on vessels. Dr. (Alan) Steinman's example of increased survival time if an individual is round should be expanded upon. If tarps covering crab pots reduce the surface areas to volume ratio, then they not only would reduce the area upon which ice could form, but they would also act to hold heat from the vessel to reduce icing further.

NIOSH could sponsor a series of working sessions that would bring a collection of experts together to design more appropriate gear, vessels, and suggested practices. I understand that NIOSH currently has a logging expert from Finland visiting. I would encourage NIOSH to invite a seafood-harvesting expert from Norway or Iceland to participate in some extensive and intensive review of our industry.

There are several areas of concern that will need to be addressed as we go into the next century. First is the need for consistent and comparable data. The Scandinavian countries have been a wealth of information for me in the generation of this paper.

Canada and the United States are certainly involved. However, the level of literature and data collection systems for this industry seem to be lacking. Russia is largely an unknown, with a literature base that at this time, is untranslated. However, I understand that they have incredible collections of hand-logged data. There needs to be consistent collection of data, and data that is comparable to similar conditions, all in a format that can be used to make comparisons and draw statistically valid conclusions. Some data I reviewed was helpful in learning the wages of those in the seafood harvesting industry in southern and northern countries, but this was of little assistance as there was no base of exchange or standard of living for each of the countries.

As this is Sunday, I felt a quote from the *Bible* may be appropriate. Job 28:28 — "To fear the Lord that is **wisdom**, but to depart from the way of evil is **understanding**."

In the discussion over the past days it has repeatedly been said that companies will follow the regulations because they are law and there are

fines if they do not. That is wise. What has also been said is that what they really need to do is to put in place a comprehensive program that includes more than the minimums, but reflects the understanding of the true nature of safety and health on board their vessel.

Another concern that will need to be addressed is international policies on the use of the sea and how each nation chooses to deal with their waters. As our population continues to explode, we will harvest the sea more heavily. As we once nearly wiped out the whales, we can easily do so with other species.

In addition, there may be natural cycles of which we are not aware and that over-fishing one year could be much more critical than at some other time. To my knowledge, it is still unclear as to the cause of the crash of the King crab population in Alaska, but it may have been such a situation. Shorter seasons, equipment limits, permits, and other ideas have been tried and proposed with little satisfaction in managing the commons.

Some of the policies are counter-productive to safety and economy such as the 48-hour halibut season that will occur no matter what the weather and condition of the crew to work the entire time. The shorter seasons should be based on weather and scheduled for a range of days to be determined by officials 24 hours in advance.

From the information we received from Mr. (Reuben) Eaton of NOAA, it appears that a forecast could be made that would achieve this goal. It perhaps would also be prudent to schedule three 16-hour seasons over a 2-week time period versus one 48-hour period. The fatigue of crews would be lessened and, therefore, the chance of injury. From Dr. Pautzke's comments yesterday, it looks as if the approach for some of these seasons may go to individual quotas and limited entry.

Policies have been suggested that would stabilize income for seafood harvesters, provide social security as they age, and safety and health protection while they are working. The International Labor Organization (ILO) of Geneva, Switzerland, was founded in 1919 and in 1946 was the first specialized agency of the United Nations.

They have produced international policies and programs to improve working conditions, created labor standards, completed research, and provided liaison between countries. They have published guidelines on fishing industry minimum age, medical examinations, competency certificates, accommodations on vessels, vocational training, and general safety and health for skippers and crews. Much work has been done, but who knows of and follows these recommendations?

Concerns of injury point to musculoskeletal issues from heavy work and slips and falls on shifting decks. Injury issues also include stress from long hours of work in rigorous conditions, inappropriate rest periods, confined working areas, removal from family and support centers, and risk of the job in a harsh environment. Stress is also evidenced in the use of drugs in the forms of tobacco, coffee, and alcohol to make the job tolerable.

Silent and invisible injury can occur from gases such as carbon monoxide, hydrogen sulfide, and general lack of oxygen. Constant noise on vessels is being shown to damage hearing in the long-term. Circulation and dermatitis issues are noted from cold, wet protective gear, and ergonomic considerations. Again I believe we need to look at what

engineering designs can be put in place to reduce these injuries.

ILO recommendations include development of health education materials and programs. This has been done in Scandinavia and here in Alaska through AMSEA and the Alaska Vocational Technical Center in Seward. I also believe that, as with vessel design, we need to look at traditional knowledge for life upon the ocean. ILO recommends health screening every 3 years for those 18-35 years old, every other year for those 36-60, and every year thereafter. They have also suggested a general improvement of the workplace environment. As there is little that can be done about the Gulf of Alaska, we certainly can look at when and how seafood is harvested.

What has become clear from the review, which has been conducted, is that seafood harvesters are independent spirits, the cowboys on the last free range. There will be no sod busters nor sheep herders to fence in the ocean and tame this wild environment in the near future. There is fish farming that does pose a threat to some of the free-ranging vessels, but it does not seem to be as much an immediate threat here as in other countries.

There is a love-hate relationship that was mentioned by several of the presenters. Fishers cannot wait to get back home to family and then cannot wait to be back at sea.

There are many risks and many rewards to this work. It is clear that the motivating factor toward a reduction in worker injury and death is and will be economic. The health field needs data on the cost of such impact.

The ILO has generated a partial list of cost factors to consider when evaluating safety and health concerns as shown in Table I. These need to be reviewed and reflected upon at all levels of the industry, academia, and government.

SUMMARY

In summary, I see that those in this industry and those concerned about occupational safety and health need to network through existing systems and join in collaborative research efforts. There needs to be an increase in attention to engineering both vessels and gear for northern fisheries.

There needs to be a close review of policies that address the work period from harvest season time-limits to adequate periods and facilities for rest for crews. Each of these points must look to address a reduction in musculoskeletal injury and fatalities from drowning or exposure.

Before I close, I wish to offer a written acknowledgement to Dr. Nils O. Alm of Norway. Dr. Alm and I have sat on the Council for the International Union for Circumpolar Health (IUCH). When I was requested to make this presentation, I contacted Dr. Alm to learn more about the circumpolar perspective.

He has put me in contact with dozens of individuals and sent me materials that I would have been unable to locate without a visit to Scandinavia. He also provided me with insight into the way his country is being involved with the seafood industry. I believe that through the IUCH and the American Society for Circumpolar Health that we have a mechanism for sharing information and coordinating research on topics such as those discussed during this workshop.

I would like to encourage those who are interested in this field to use the existing networks of health researchers. Make use of those in the

Table I. Fishing Industry — Cost of an Injury Based on *The Role of the International Labor Office in the Improvement of Safety and Working Conditions Aboard Fishing Vessels.*

1. Cost of lost time of injured worker.

2. Cost of time lost by other crew members who stop work.

   a. To assist the injured worker.
   b. Out of curiosity.
   c. Out of sympathy.
   d. For other reasons.
   e. Cleaning up the area to prepare it for work.

3. Cost of lost time by vessel officers and shore management.

   a. Assisting the injured worker.
   b. Investigating the cause of the injury.
   c. Arranging for the worker's job to be continued by another.
   d. Selecting, training, breaking in another worker.
   e. Preparing mandatory accident reports and attending hearings before regulatory officials.

4. Cost of time spent on the case rescue and hospital staff; many workers are not adequately covered by insurance carriers.

5. Cost due to damage of equipment or other property, or due to spoilage of material and harvest.

   a. Loss of entire catch or trip due to return to port.
   b. Loss of income to the entire crew.

6. Incidental costs due to interference with fishing and processing activities, failure to fulfil orders on time, loss of bonuses, payment of forfeits and other similar causes.

7. Cost to employer under employee welfare and benefit system, if one exists, or cost to governmental health and welfare system.

8. Cost to employer of continuing wages of the injured worker in full after his return although he may not be fully productive; or cost to government to support an unemployed disabled worker.

9. Cost due to the loss of profit on the injured worker's productivity and on idle equipment.

10. Cost that occurs in consequence of the excitement or weakened morale of the remaining crew due to the accident.

11. Overhead cost per injured worker, the expense of running the vessel which continues while the injured worker is a non-producer.

This list is non-exclusive and non-exhaustive and does not include the personal costs to the worker. Safety and Health training and considerations are surely less costly. List modified by Carl M. Hild, M.S., Alaska Health Project, 1992.

other countries who have similar environmental conditions with which to deal. We have too few resources not to cooperate.

As economic considerations will drive future developments in safety and health, so will they drive the need to consolidate and cooperate in research findings and data base development. The next regular opportunity to share in the health concerns of the polar regions will be the Ninth International Congress on Circumpolar Health in Iceland, June 20-25, 1993. I understand that there will be workshops on Environmental/Occupational health issues, and that there will be practical recommendations made at each of the sessions. For more information, contact the following organization:

American Society for Circumpolar Health
P.O. Box 242822
Anchorage, AK 99524
USA

I encourage your participation in this and other international meetings. There is a great need to share the limited information that exists on the programs to reduce injury and death in the fisheries of the northern climates. There are limited dollars for programs, research, and material development. We must all work closely together if we are to be successful in achieving greater fishing industry safety and health. □

CLOSING REMARKS

By CAPT Melvin L. Myers, USPHS

CAPT Max R. Miller, USCG: The last presenter of the day and of the FISH Workshop is CAPT Melvin L. Myers of the U.S. Public Health Service, who will present a summary of the workshop. CAPT Myers has 24 years of service with the U.S. Public Health Service and is currently the Special Assistant to the Director of the National Institute for Occupational Safety and Health in Atlanta, Georgia. CAPT Myers received his Bachelor of Science degree in Agricultural Engineering from the University of Idaho and his Master of Public Administration degree from Indiana University. He has received numerous awards and has held several positions within the U.S. Public Health Service; perhaps his most important from our perspective was as the first Acting Chief of the Alaska Activity — he established the Anchorage NIOSH office. One more very important thing he did was the securing of the funding for this workshop. CAPT Melvin Myers:

Thank you, Captain Miller. I want to make some important observations that I have seen at this workshop. These observations are about the business of NIOSH, and our business is prevention.

PREVENTION

In the field of public health, we classify prevention into three categories:[1]

1. Primary prevention is when the event that poses a hazard is prevented from happening. For example, preventing a vessel from sinking.
2. Secondary prevention is when the event happens, but you prevent irreversible harm to the person, such as resuscitating a drowned person.
3. Tertiary prevention is used when a person suffers irreversible harm like an amputation. We want to assure that the person does not have complications from that amputation such as an infection or getting into an environment where that arm is needed, and he or she can no longer function safely.

Our priority at NIOSH is to focus on primary prevention, knowing that secondary and tertiary prevention are needed as "safety nets" in the system. I will focus on primary prevention a lot in my remarks.

Prevention is a system, and we approach this system in two phases.[2] The first day of the FISH Workshop was geared to the first phase, surveillance. The second and third days were geared to the second phase, control, including different kinds of interventions.

We use surveillance to help define problems. With problems defined, we move into the second phase, which is control. In the control phase, we target populations at risk, and we intervene to control.

Interventions can range from friendly to coercive.[3] A combination of intervention tactics may work best.

SURVEILLANCE

Based upon surveillance, NIOSH came to Alaska. Dr. Bender, the Director of the Division of Safety Research, spoke of the National Traumatic Occupational Fatalities (NTOF) surveillance system. The NTOF system showed that Alaska was highest in the nation in the rate of occupa-

tional fatalities among all of the states.

In 1988 I came to Alaska to make a presentation about NTOF data at the Tenth Governor's Safety and Health Conference and to explain why the rate was so high in Alaska. Like many of you in this audience on the first day of the FISH Workshop, the statistics got old and boring. Those numbers sounded like things you already knew.

I felt that way when I came here in 1988. I wanted to get in touch with what they really meant. In much the same way that Spike Walker and Mrs. Peggy Barry have brought that dimension here, I went out seeking some stories.

I found a 31-year-old fisherman. Our data showed a lot of fatalities in February at that time, and I asked him, "Why are the fatalities in February so high? What is it like out there?"

He had worked on a crabbing vessel. He said, "Seas!"

I countered, "What?" He said, "The seas get heavy in February."

I asked him "What really happens on those vessels? Have you ever seen anybody killed on a vessel?" He said he had seen three people killed. I thought, here is a 31-year-old man, who has seen three people killed — this is like combat! He then explained each fatality to me.

1. One fatality that he witnessed happened when a crab pot fell onto a worker. The worker was killed.
2. Another fatality happened when a worker fell overboard. Before the vessel could turn around and return to rescue the worker, he was gone.
3. The third fatality happened when a vessel was latched to another vessel with a net strung between the two. A fisherman was crossing from one vessel to the other on the net when the vessels smashed together and crushed the man. He was the third fatality.

Well, that put a human dimension into those statistics. But when we focused on Alaska as the state with the highest fatality rate, it was only the tip of the "iceberg." We found that we were not counting everyone. Much of the undercounting was explained by how we were doing our surveillance.

Surveillance is a two-step process. Diagnostic criteria are established first, and a reporting system is second. We used diagnostic criteria in our procurement of death certificates from which we counted fatalities in NTOF. We bought death certificates from across the country starting with 1980 data. The criteria for each certificate that we purchased were the following:

1. Anyone who is 16 years and older.
2. The fatality was caused by an injury.
3. The category on the death certificate for injury at work was marked.

Our annual average count for fatalities in Alaska for 1980–1986 was 51 per year. Last year, in our first year of effort, — the first time and place in this country where we comprehensively reported every occupational fatality — we counted 79 fatalities.

What explains the difference between the average we normally saw, 51, and 79? Most of the difference was explained by how our diagnostic criteria failed to account for presumptive death certificates. In every state in this country, the presumptive death certificate does not have on it the category, "injured at work," which was one of our criteria. We were not

capturing much of the population in aviation and in fishing because the bodies were never recovered since presumptive death certificates were issued.

That error in the system has been corrected in Alaska.[4] Networking is currently taking place among state registrars to extend this change into other states.

POPULATION AT RISK

Not only can surveillance data lead you to places like Alaska, but, through use, the focus of the data improves year after year. As we focus more, the data can guide us to different problems.

Mortality

As we looked at those 79 fatalities, we defined the problem of fatalities among fishers, which brought us to this meeting. Fishers were by far the population at highest risk. That is the next step in our prevention continuum. We use these reports from surveillance to identify the population at risk. Fishing men and women were the largest population at risk, in terms of the occupational fatalities in Alaska.

There are others affected by fishing, too. Because of the way we identify populations at risk, we leave out associated cases of fatalities. I will list a few:

1. Rescuers — The people who rescue the fishers at risk.
2. Fish-tender workers — Last year, on the Yukon River, there was a young man who died when a fish tender sank. He was from Virginia.
3. Fish spotters — This is a "war zone" in the air, where up to 30 airplanes within a mile or 2 miles can be spotting fish. Alaska has seen fatalities from fish spotting earlier in the decade. Most of them are double fatalities because two planes collide and both crash. Sometimes, like last year, only one of the two planes went down.
4. Fishing observers — On some vessels, either Federal or state agents are on board to confirm catches and by-catches.
5. Subsistence fishers — We had two subsistence fishing fatalities this year related to whaling.
6. Cargo pilots — Pilots fly cargo such as clams from their harvest site or such as fertilizer to lakes that are aquaculture sites.

Within the fishing population, our population at highest risk, we have learned at this workshop that those working in the crabbing industry are the highest population at risk of fatality. We have heard that from several people. We heard it not only from the data, but from the human standpoint.

Second highest after crabbing is halibut fishing. Both of these populations are at risk of mortality, or getting killed.

Morbidity

We are also talking about morbidity, when people get injured, but not killed. Paula Trapp reported that low-back strains and sprains were the highest morbidity problems.

The second problem was lacerations, and third was infections, which likely is associated with lacerations. Actually, we have seen through Paula Trapp's insight that number two and number three may be the same problem; infections most likely result from lacerations.

Strains and sprains of the upper and lower extremities are, respectively, numbers four and five as well. Thus, strains and sprains and lacerations are the probable morbidity problem for our population at risk, the fisher.

INTERVENTION

After identifying the population at risk in our prevention continuum, we focus on intervention to control the problem. Many interesting ideas for intervention were raised at this workshop.

The question was asked, "What makes prevention happen?" Having the right equipment available was first, and training was number two.

Later in the same presentation, it was stated that if you train a person, that person will buy equipment. Now that is fascinating!

Training not only changes how a person behaves in practicing safety and what a person knows about safety, but it leads them to making decisions to invest money. That is knowledge about motivation that we can use. People have chosen to buy safety equipment because of their training.

Vessel Stability

Another fundamental observation in terms of primary prevention is the need for vessel stability. We heard that few people attend courses on vessel stability. Determining vessel stability was reported as physically inspecting the vessel to determine its center of gravity, and then calculating the stability curves.

Dr. Richard Lemen showed that the most frequent causes of vessel-related fatalities are capsizings, founderings, and disappearings; all are vessel stability problems. If you want to focus on a problem in terms of vessel-related fatalities, maintaining vessel stability is a primary prevention route.

Spike Walker said something that was amazing last night. The vessel was stable, but the crew thought it was unstable. On board the *St. Patrick*, 9 of the 11 crew died because they incorrectly thought it was unstable.[5] Not only must a vessel be stable, the crew must know that it is stable and know when it becomes unstable.

We heard, at least three times, that fishermen and women buy electronics. Are there ways that we can put electronics into the pilot house that will monitor the stability of the vessel? Could we start designing vessels in a way so that they optimize fuel pumping around the vessel, based upon the conditions of the wind or icing or other factors?

Stability as a preventive action is one of the biggest opportunities in primary prevention that I have seen here. A lot can be done to improve vessel stability. Perhaps a first step is to convene people who have different knowledge about the problem.

I think we should focus, too, on training in terms of vessel stability. In addition, it also sounds like cost is a factor in determining vessel stability, and we need to find less expensive approaches.

Person Overboard

Another cause of fatalities and drownings, not necessarily related to vessel stability, is person overboard (POB), about which we have heard a lot. We see it in our statistics, and there is such an alarming rate with small vessels.[6] Why do people fall overboard? To understand will require research.

The secondary prevention action related to POB is very important. Wear that PFD (personal floatation device)!

Ergonomics

Carl Hild just mentioned that we need to do more ergonomics. The problems of strains and sprains and the solution of ergonomics go together. Through ergonomics, we analyze the jobs and redesign them to prevent

problems like strains and sprains, and for that matter, lacerations. The solution for this problem comes down to ergonomics.

CONCLUSION

In conclusion, there are a couple of issues I need to address. One of these is what we at the Centers for Disease Control and Prevention call the "A" word.

Injuries are Caused

The "A" word is "accident." We are encouraged to not use the "A" word. That is because the dictionary defines it typically as events that are unpredictable and that cannot be controlled, i.e., "an event occurring by chance or arising from unknown causes." We use the word injuries or other words, such as diseases, to describe problems. We believe that injuries are caused, and, because they are caused, they can be prevented by intervening to control that cause.

I have heard the word "accident" used quite a bit. In the statement "accidents will happen," there is a sense of fatalism about accidents. A vessel will go out, you might come back, or you might not; that is the way it is. Conversely, if you know the causes, then you can start controlling them. We use the word, "injury!" You will never hear — except by "accident" — the word "accident," used by anyone from NIOSH.

Workshop Results

Two results of the Workshop are noteworthy. First, the proceedings from this workshop are going to be published from a transcript. Speakers will have an opportunity to make changes in their part of the transcript.

Second, the networking that is taking place has been tremendous. People have engaged and listened to each other. I found it to be tremendous — especially the discussions after each of the sessions.

The Planning Committee

I want to give some special thanks to the planning committee. The Chair of the Planning Committee was Michael Klatt. Mike, would you stand up and let everyone see you. He has done a masterful job in pulling this workshop off. We have talked with each other quite a bit over this past year.

I will read the names of the other Planning Committee members: Jerry Dzugan, Richard Kennedy, Gunnar Knapp, Jennifer Lincoln, Jan Manwaring, Clarence Pautzke, Hank Pennington, and Paula Trapp. I thank you all.

Circumpolar Coordination

Finally — regarding Carl Hild's comments about circumpolar health — NIOSH is working with the Nordic nations in developing criteria documents, which support recommended standards to the Occupational Safety and Health Administration. We are collaborating with Finland, Sweden, and Norway on these documents. At times, we will complete a document, and it will become a document in Sweden. Other times, it will work in the other direction.

Bringing a logging expert, who is helping NIOSH here in Alaska, started through a memorandum of understanding that we have with the Finish Institute of Occupational Health. He is here now on a World Health Organization (WHO) fellowship. We may be able to follow a similar approach regarding fishing safety and health.

We also work with WHO in other ways. Dr. Lemen mentioned his meeting in Moscow. That was a meeting among many WHO collabo-

rating centers in occupational health. We are working with Russia as a collaborating center, as well. In terms of the circumpolar area, there is a lot of potential for collaboration with other nations. I value Carl Hild's advice about bringing someone from Norway to assist in improving the safety of the fishing industry.

Let us walk away with the thought that Corky McCorkle left with us, the wish of his life:

I would pray to God that just one year the bell would not toll. □

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2. See Baker, Edward L., Patricia A. Honchar, and Lawrence J. Fine. "Surveillance in Occupational Illness and Injury: Concepts and Content," *American Journal of Public Health.* Vol. 79, Supplement, December 1989, pp. 9-11.

3. See Millar, J. Donald and Melvin L. Myers. "Occupational Safety and Health: Progress Toward the 1990 Objectives for the Nation," *Public Health Reports*. Vol. 98, No. 4, July-August 1983, pp. 324-336.

4. The Alaska State Registrar decided to make that change effective in 1992 when the author and Richard Kennedy explained this problem to him at a meeting in Juneau, AK in September 1991.

5. The story of the *St. Patrick* is told in the book, Walker, Spike. *Working on the Edge — Surviving in the World's Most Dangerous Profession: King Crab Fishing on Alaska's High Seas.* New York: St. Martin's Press, 1991, pp. 251-270.

6. The fatalities reported in the National Research Council Report on *Fishing Vessel Safety* counted only vessel casualty-related fatalities, which omitted many POB fatalities.

COMMERCIAL FISHING FATALITIES — ALASKA, 1991–1992*

Based on data from the National Traumatic Occupational Fatalities surveillance system, Alaska had the highest state-specific work-related fatality rate during 1980-1989. During this period, the annual average private industry fatality rate in Alaska was 34.8 per 100,000 workers, nearly five times the annual United States (7.0 per 100,000).[1] Fatalities in the commercial fishing industry — which accounts for the second largest percentage of revenue and number of jobs in the state — are among the highest industry-specific rates in the United States.[1] Because of the high occupational fatality rates for Alaska, in 1991, CDC's National Institute for Occupational Safety and Health (NIOSH) initiated efforts in Alaska to improve surveillance and describe risk factors for serious occupational injuries associated with the fishing, logging, and air transport industries. This report uses data obtained and analyzed by NIOSH to characterize fishing industry deaths in Alaska for 1991 and 1992.

Table I. Employment and occupational fatality rates in the commercial fishing industry, by fishery—Alaska, 1991-1992.

Fishery	Annual full-time employee equivalents*	Number Fatalities	Fatality Rate†
Groundfish	4,600	8	90
Halibut	1,500	9	300
Herring	500	0	0
Salmon	7,500	14	90
Shellfish	3,000	32	530
Miscellaneous/Unknown	300	7	—§
Total	**17,400**	**70**	**200**

* Full-time employment equivalent (FTE) values estimated to nearest 50 FTEs; one FTE=2080 person-hours per year.
† Per 100,000 per year. Calculated fatality rates rounded to nearest 10.
§ Not calculated.

Surveillance data from fatality investigations by NIOSH's Alaska Activity, Division of Safety Research, were used to obtain information on fishing-related fatalities, including the cause of death, the circumstances of the incident, and the location of the vessel's operation. The data included interviews of survivors; review of death certificates; and analysis of data received from the U.S. Coast Guard (USCG), the Alaska State Troopers (AST), and local news media reports. Fatality rates were calculated for each type of fishery by estimating worker population of the fishery within which the vessel was operating at the time of the fatal event (Table I). These estimates were based on methodology developed by the Institute of Social and Economic

* From *MMWR*. Vol. 42, No. 18, May 14, 1993, pp. 350–351, 357–359.

Research, University of Alaska,[2] and revised by the Alaska Department of Labor and the Alaska Commercial Fisheries Entry Commission.[3] The number of workers at risk was estimated by multiplying the number of vessels making landings each month by the appropriate crew size associated with the respective fishery. Data on use of wearable personal flotation devices (PFDs) (i.e., survival suits, life jackets, and float coats) were obtained either from the USCG or AST reports.

During 1991—1992 in Alaska, there were 116 fatal occupational incidents resulting in 166 work-related deaths; 43 (37 percent) incidents occurred in the commercial fishing industry resulting in 70 fatalities (35 each in 1991 and 1992). Of these 70 workers, 69 (98.6 percent) were male; mean age at death was 32.7 years. The occupational fatality rate for the Alaska commercial fishing industry for 1991 and 1992 was 200 per 100,000 workers per year — 6.8 times the mean fatality rate for all private sector Alaska industry for 1991 and 1992 (30.0 per 100,000 per year),** (CDC, unpublished data, 1993).

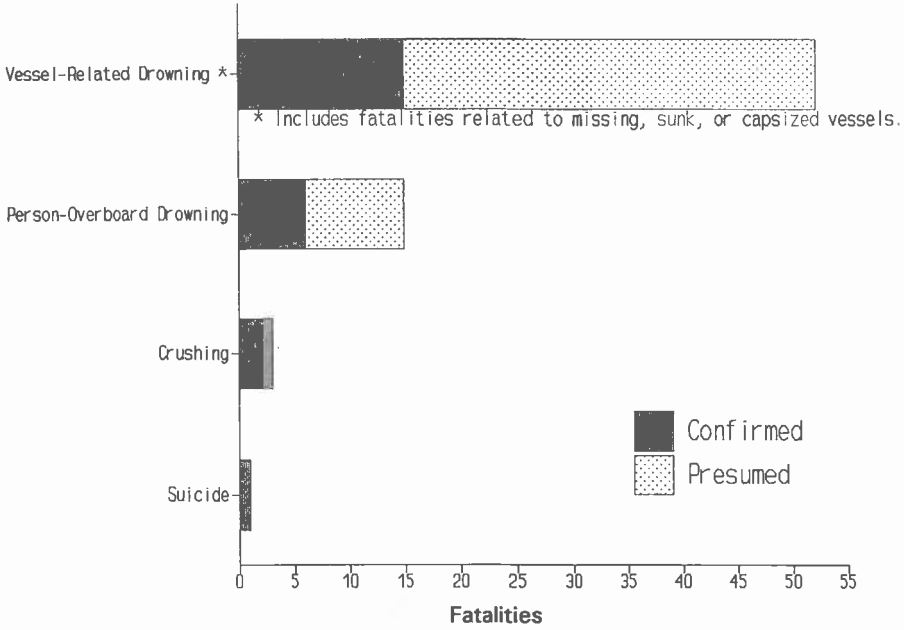


Figure 2. Commercial Fishing Fatalities by Circumstances of Death — Alaska, 1991–1992.

The cause of death for 66 (94.3 percent) workers was drowning due to hypothermia (International Classification of Diseases, Ninth Revision, external cause-of-death codes 830, 831, 832, 834, 836, 838, and 910). Three workers were crushed to death during crabbing operations, and one committed suicide aboard a working vessel (Figure 1). Of the 66 drownings, 51 (77.3 percent) were attributed to capsized, sunk, or missing (presumed lost) vessels; the

** Denominators are from employment estimates supplied by the Research and Analysis Section, Alaska Department of Labor.

remaining 15 (22.7 percent) (all single fatality events) resulted from a person-overboard drowning. Twenty-one (31.8 percent) were confirmed drownings (body recovered), and 45 (68.2 percent) presumed (no body found). Of the 43 fatal incidents, 27 (62.8 percent) were single-fatality events; the remaining 16 (37.2 percent) were multiple-fatality events, including the loss of two vessels with six persons aboard each.

Of the 70 fatalities recorded, 63 were identified as participating in one of the five major Alaska fisheries (groundfish, halibut, herring, salmon, or shellfish); two died while harvesting sea cucumbers; and information on type of fishery was not available for five fatalities. Both the number of fatalities (32) and the average annual fatality rate (530 per 100,000) were the highest for the shellfish fishery. Half (16) of these fatalities resulted from the disappearance and presumed sinking of three vessels in the Bering Sea in three separate incidents; all three vessels were fishing for king crab in the vicinity of the Pribilof Islands during winter months (February 1991, November 1991, and January 1992).

Persons who drowned or are presumed to have drowned were compared with persons who survived incidents in which at least one life was lost. Of those persons reportedly wearing a PFD, seven (58 percent) of 12 survived and thus were more likely to have survived (odds ratio=8.9; 95 percent confidence interval=1.7—49.0) than those who reportedly were not wearing a PFD, of whom six (14 percent) of 44 survived.

Seven (10 percent) of the 70 workers died while working aboard catcher-processor ("factory trawler") vessels. These vessels combine the activities and risk of fish harvesting with those of large commercial canning and food-processing machinery.

Nine workers died during "derbies" (i.e., abbreviated fishing seasons during which catch quantities are unlimited), which are scheduled in advance and held regardless of weather or sea conditions. The USCG cited foul weather and/or vessel overloading as a factor in five of these fatalities.

Reported by: Alaska Activity, Division of Safety Research, National Institute for Occupational Safety and Health, CDC.

Editorial Note

The findings in this report are consistent with previous reports of surveillance data, incident investigations, and survey information collected during 1980-1992 NIOSH;[4] CDC, unpublished data, the USCG,[5] the National Research Council,[6] and the University of Alaska.[7] These findings indicate that workers at greatest risk for fishing-related fatal injuries are those who operate aboard unstable (i.e., easily capsized) vessels and those who have insufficient training in shipboard safety, especially regarding cold-water survival techniques and the use of lifesaving equipment such as PFDs.

In this report, fatality rates were greatest for shellfishing and varied substantially by fishery, which differ in geographic location of fishing grounds, type of harvesting equipment and techniques, and time of year and duration of respective fishing season. Alaska shellfishing, which is predominantly for crab, ma be particularly hazardous because crab harvesting generally takes place during the winter months, often in conditions of cold, high winds, short daylight hours, and high seas. In addition, the basic equipment

used in crabbing is large steel cages ("pots") that weigh up to 800 pounds (empty) each and require physical strength and use of winches and other equipment for placement, retrieval, and stowage. Stacking these pots on deck can also severely compromise vessel stability, especially if accompanied by icing of the vessel structure.

Adverse weather and other environmental conditions contribute to the increased risk for injury for all commercial fishing workers in Alaska. Resource management needs have lead to a substantial reduction in the number of permitted fishing days for some species;[8] for example, in 1992 the Alaskan halibut fishing season consisted of two or three 24-hour derbies, compared with a 2-week season in 1980. Many workers labor continuously — without sleep and in foul weather — through a derby and return to port in overladen, unstable vessels. If more flexible fishing seasons were established, fishing could be done during fair weather instead of during a mandated short season regardless of weather conditions.

Environmental conditions may also contribute to the severity of work-related incidents. The USCG has classified all waters in Alaska (including bays, inlets, harbors, and rivers) as "cold" waters [$<60°F(<15.6°C)$]; in these waters, hypothermia can lead to death by drowning within minutes of immersion. Because immersion suits provide thermal protection from cold water temperature and are critical for survival during immersions in cold waters, the USCG has recommended their routine use in these environments.[9]

The findings in this report also indicate that once a person falls overboard, protection from drowning is frequently inadequate. Although the USCG does not require PFDs to be worn during all activities, USCG regulations (46 CFR Part 28) do require that each commercial fishing vessel carry at least one USCG-approved PFD of the proper size for each person on board, and that each PFD be readily accessible from both the worker's usual work station and berthing area. The use of some PFDs while performing tasks on commercial fishing vessels may actually increase worker risk because the PFDs may become snagged by nets or hooks or caught in large winches and pulleys (9).

Since 1987, the number of factory seafood-processor vessels has increased rapidly in the Alaskan seafood industry. The risk for workers aboard processor vessels is similar to those on commercial fishing vessels (e.g., prolonged and extended work hours, exposure to hazardous equipment, and danger of falling overboard or the vessel's sinking). College newspapers recently have advertised opportunities for seasonal employment aboard factory processors operating in Alaskan waters. Accordingly, students and other persons considering seasonal employment in the Alaskan seafood industry should be aware of the hazards associated with this type of work and the need to familiarize themselves with available safety equipment (including PFDs) and procedures. In addition, employers should provide such training to workers on their arrival.

Prevention-oriented research activities aimed at reducing the risk for occupational injuries in the Alaskan commercial fishing industry include the recently established NIOSH surveillance and investigative activities to identify potential risk factors. Other activities include developing, testing, and increasing acceptance of PFDs that incorporate heat-conserving properties and can be comfortably and safely worn by all fisherpersons while working on deck. Ongoing activities include data collection by the Alaska Occupational Injury

Prevention Program and the USCG and safety education programs through the USCG and nonprofit organizations (e.g., Alaska Marine Safety and Education Association, Alaska Vocational Technical Center, and the North Pacific Fishing Vessel Owners Association).

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ACRONYMS

AAAS - American Association for the Advancement of Science
ABS – American Bureau of Shipping
ADEC – Alaska Department of Environment and Conservation
ADF&G - Alaska Department of Fish and Game
AFTA – American Factory Trawer Association
AIDS – acquired immune deficiency syndrome
AK - Alaska
AKDOL -Alaska Department of Labor
AMAVR – automated mutual assistance vessel rescue
AMSEA – Alaska Marine Safety Education Association
ASM – Aviation Survivalman
ASO – Assistant Staff Officer
ASOS – Automated Surface Observation System
ASPH – Association of Schools of Public Health
ASSC - Alaska Seafood Study Commission
AST - Alaska State Trooper
AVTEC – Alaska Vocational and Technical Center
AWOS – Automated Weather Observation System
BA - Bachelor of Arts
BLS - Bureau of Labor Statistics
BS - Bachelor of Science
CA - California
CASMAIN – Main Casualty Data Base (U.S. Coast Guard)
CCF – Capital Construction Fund
CDC – Centers for Disease Control and Prevention
CDR – Commander
CFEC – Commercial Fisheries Entry Commission
CFR – Code of Federal Regulations
CPR – cardiopulmonary resuscitation
CRAY – the name for a super computer derived from the name of its designer, Seymour Cray
DHHS – Department of Health and Human Services
DHSS - Department of Health and Social Services
DOL - Department of Labor
DSR - Division of Safety Research
E-codes – injury and poisoning codes, external cause
EEC – European Economic Community
EIS – Epidemic Intelligence Service
EMS – emergency medical services
EPA – Environmental Protection Agency
EPIRB – electronic position indicating radio beacon
FAA – Federal Aviation Administration
FACE – Fatality Assessment and Control Evaluation
FAX - facsimile
FISH – Fishing Industry Safety and Health
FL - Flordia
FM – frequency modulation
FRA – Federal Railway Administration
FS – flight suit
FT - feet
FTE - full-time equivalent
F/V – fishing vessel
GOES – Geostationary Operational Environmental Satellite
GOES Next – a GOES satellite to be launched in 1994
GPS – Global Positioning System
HF – high frequency
HIPS – High-resolution Image Processing System
HIV – human immunodeficiency virus
ICD – International Classification of Diseases
IFQ – individual fishing quotas
IHS – Indian Health Service
ILO – International Labor Office or Organization
IMO – International Maritime Organization
IPHC - International Pacific Halibut Commission
IRA – individual retirement account
IRS - Internal Revenue Service
IUCH – International Union for Circumpolar Health
LCDR – Lieutenant Commander
LORAN – Long-range Radio Aid to Navigation
LT - Lieutenant
LTJG – Lieutenant Junior Grade
MA - Massachusetts
MA - Master of Arts

MARINTEK – Norwegian Marine Technology Research Institute
MBA - Master of Business Administration
MD - Medical Doctor
MFVS - Marine Fishing Vessel Safety
MIO – Marine Inspection Office
MOI - Method of Instruction
MPA - Master of Public Administration
MPH - Master of Public Health
MS - Master of Science
MSD - Marine Safety Detachment
MSO – Marine Safety Office
NC - North Carolina
NEXRAD – Next generation RADar
NIOSH – National Institute for Occupational Safety and Health
nm - nautical mile
NMFS – National Marine Fishery Service
NOAA – National Oceanic and Atmospheric Administration
NPFVOA – North Pacific Fishing Vessel Owners' Association
NPRM - Notice of Proposed Rulemaking
NTOF – National Traumatic Occupational Fatality (data base)
NTSB - National Transportation Safety Board
NVIC - Navigation Vessel Inspection Circular
NWS – National Weather Service
OSC – On Scene Commander
OSH - Occupational Safety and Health (Alaska)
OSHA – Occupational Safety and Health Administration (Federal)
OSH Act - Occupational Safety and Health Act
PE - Professional Engineer
PFD – personal flotation device
PhD - Doctor of Philosophy
POB - person overboard
P/V – processing vessel
RADM – Rear Admiral
RCC – Rescue Coordination Center
RN – Registered Nurse
RS - Registered Sanitarian
SAR – search and rescue
SCBA – self contained breathing apparatus
SIDS – sudden infant death syndrome
SMC – SAR Mission Coordinator
SNPRM - Supplemental Notice of Proposed Rulemaking
SOLAS – Saving of Life at Sea
TQM - Total Quality Management
UAA - University of Alaska Anchorage
TV - television
UCLA - University of California at Los Angeles
USCG - United States Coast Guard
USPHS – United States Public Health Service
VHF – very high frequency
WS – wet suit
YKHC – Yukon Kuskokwim Health Corporation
YPLL - years of potential life lost

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