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[Abstract] Increasing cost and shrinking availability of marine insurance have resulted in serious problems for broad sectors of the nation's commercial fishing fleet. Sharp reductions in the availability of Protection and Indemnity coverage have idled vessels nationwide regardless of individual safety records. The causes of the current problem are varied and numerous, with significant roles played by the fishing industry, the regulatory framework, the insurance industry, and the legal remedies involved. Ultimately, the solution will require both a reduction in the frequency of fishermen's injuries and modifications to the present compensation system, reducing insurance costs while securing equitable compensation for the injured party.

This study utilizes the most current information available on actual injuries and compensation paid to victims to analyze the insurance problem from a safety point of view and to model the impacts of possible solutions. The cause, frequency, severity, and costs of over 400 injuries were analyzed to determine where initial safety measures might produce the greatest benefits in terms of reducing injuries and insurance costs. The extent to which improvements in operational safety, design safety, protective clothing, maintenance, licensing andinspection, health screening, and the like might reduce the frequency and severity of various injuries is evaluated and recommendations are made with respect to the most promising approaches to the problem. The potential impacts of proposed government safety regulations are modeled in a cost-benefit analysis and compared to the potential savings provided by safety measures proposed in this paper.

Part 1: INTRODUCTION

Among all the varied industries in the United States, the commercial fishing industry has the dubious distinction of being the most hazardous. Occupational fatality rates in this industry are seven times greater than the national average, and twice the rate of the coal mining industry securely lodged in second place.(1) Further, catastrophic vessel losses are out-pacing losses in ocean and coastal cargo shipping by margins of between five and seven to one.(2)

The severity of the crisis is evident from the attention the issue has received in Washington, D.C. and around the nation. Five congressional sub-committee field hearings have been held since 1984 in fishing centers around the country soliciting comments from the members of the fishing industry, the insurance industry, government, and academic communities from coast to coast. In mid-April 1986, a joint meeting of congressional sub-committees for the Merchant Marine; the Coast Guard and Navigation; and Fisheries, Wildlife Conservation, and the Environment, took testimony from twenty-five witnesses in the Capitol in response to recent developments in proposed legislation.

Today, there are five bills pending in Congress aimed at resolving the question of insurance costs and availability for the fishing industry. The primary focus of four of the bills is to address the ways that injured fishermen are compensated after an accident, hoping to provide underwriters with a higher degree

of predictability. The basic approach is to encourage the re-entry of insurance companies into the market by limiting the liability of vessel owners. Two bills (H.R. 277 and H.R. 3156), grant limits outright while two others (H.R. 4415 and H.R. 4407), offer limits on a quid pro quo basis requiring vessel owners to provide basic communication and survival equipment on all commercial fishing vessels. A fifth (H.R. 4465), simply seeks the equipment requirements as a matter of principal, under the belief that fewer fatalities should translate to lower premiums. Only H.R. 4407, introduced by Congressman Jones of North Carolina, addresses the basic need for improved safety and training aboard commercial fishing vessels.

This paper will consider the potential for reducing injuries aboard fishing vessels, reviewing a number of factors which impact on safety and the potential for cost savings under the proposed equipment regulations. Further, after exploring the causes of injuries suffered aboard the U.S. commercial fishing fleet between 1980 and 1984, several simple safety initiatives are suggested and the potential savings are considered.

PART 2: WHY IS FISHING SO HAZARDOUS ?

In discussing the safety issue and its role in the current P & I insurance crisis, it is important to recognize that no one is singularly at fault. There are many factors which have precipitated the problem and the following is a summary of the

major components of the safety portion of the crisis. It will become clear that all those currently affected by the problem have played a part in creating it.

Safety Regulations

The fishing industry has shown a remarkable ability to remain largely outside government regulations with the exception of those which attempt to control their harvesting efforts. In an industry in which 95% of the vessels are less than 50 gross tons (3), only fishing vessels greater than 200 gross tons and processing vessels greater than 5000 gross tons are subject to U.S.C.G. inspections and minimal construction standards.(4) The rest are classified as uninspected vessels under Subchapter C, Title 46, C.F.R.. Pursuant to the Motor Boat Act of 1940 and the Federal Boating Safety Act of 1971, no construction or material standards are specified and equipment requirements are are limited to life jackets for each person on board, fire extinguishers, backfire flame arrestors on engine intakes, and ventilation specifications for tanks and engine space. There are no requirements for any additional safety or survival equipment.(5)

While operators of harbor launches are required to document six months of full time experience and demonstrate proficiency in vessel operations, rules of the road, fire protection, first aid, and pollution regulations in order to obtain a licence to carry up to six persons in near shore, protected waters (6), no licenses or training programs are required for fishing vessel

operators or crew members operating under far more challenging and dangerous conditions.(7) The authority of the Occupational Safety and Health Administration (OSHA), responsible for considerable safety improvements in land based industries, does not extend beyond the pier head.(8) It is perhaps ironic that the effectiveness of the industry's lobbying to avoid regulation is largely to blame for the marginally safe conditions responsible for many injuries and resulting insurance dilemma.

Fishery Regulations

The passage of the Fisheries Conservation and Management Act of 1976 extended a 200 mile Fisheries Conservation Zone (FCZ) from the coastline of the United States. At about thesame time, the Third United Nations Conference on the Law of the Sea was developing a consensus which would permit the exclusion of foreign fishing activities in such a zone only if the coastal state has the fishing capacity to harvest fishery resources at the level of the Optimum Sustainable Yield (OSY). The domestic capacity of the U.S. fleet in the mid-70's was insufficient to satisfy this criteria and a building spree ensued with the federal government providing construction loan guarantees and tax incentives to encourage the industry to expand. Ultimately, the overfishing by foreign interests was largely displaced by overfishing conducted with domestic vessels. As time went on, domestic failure to diversify and build new markets for under-utilized species led to the re-entry

of foreign fleets, resulting in far too many vessels competing for increasingly depleted stocks. Today, an overcapitalized, excess capacity fleet is fishing on reduced stocks for fish to sell in markets only now beginning to show signs of slow expansion. At the same time, foreign and domestic competition, diminished resources, and extremely limited seasonal openings, in some fisheries measured in hours or days rather than weeks, force the industry to operate in weather conditions well beyond marginally safe, and for longer periods of time.

Working under intense competition, carrying considerable debt on new vessels, operating under extreme weather conditions, and without government licensing or safety regulations, it is little wonder that the industry finds itself in yet another bind. The insurance crisis has left many owners without the coverage their lien holders require in order to fish, keeping many vessels tied to the docks and forcing others to fish in stormy conditions in order to meet their payments. Many appear unable to justify the investment of time and money needed to maintain their vessels in safe operating condition.

Insurance Industry practices

The marine insurance market represents a fraction of the general insurance industry, with fishing vessel insurance a mere 5% of that fraction.(9) This fairly small piece of the action has not justified specialized risk analyses complex enough to address the varied nature of the nations fishing industry. Hence, premiums have typically been set by a seat of

the pants approach rather than based upon accurate actuarial data or consideration of the safety efforts or loss records of individual operators. The fishing industry is typically viewed as a whole, with rates in the Florida scallop fishery reflecting the loss records of the Alaskan king crab fishery, thereby failing to provide vessel owners with incentives for the improvement of safety aboard their vessels. At the same time, poor handling of legitimate claims by insurance underwriters and adjusters has driven many a potential settlement into the court room for a larger settlement.

During the late 1970's and early 1980's, high interest rates and the potential for earning high returns on invested premium dollars generated strong competition among underwriters in general and marine underwriters in particular. The unregulated marine insurance industry was hungry for dollars to invest and eagerly accepted premiums without paying sufficient attention to the operations they were insuring or the cash surplus they need to maintain to remain credible. This "cash flow" underwriting went along fine until the interest rates fell coincident with problems in the fishing industry as the it ran into a series of stock collapses, suffered a number of major losses, and submitted substantial claims. Insurance companies began withdrawing from the markets or folding up outright, leaving the fishing industry with no option but to pay the substantially increased rates demanded by those few companies remaining in the market.

Hull vs P & I

The fishing industry has always been a dangerous one, and vessel owners usually carry two kinds of insurance coverage. The Hull policy covers the vessel and her gear, while the Protection and Indemnity (P & I) policy reimburses the vessel owner for liabilities brought about by the vessel and not covered by the Hull policy, including injury or death of crewmembers. For a variety of reasons, both types of coverage have become extremely expensive over the past few years if they can be acquired at all. Since Hull insurance is based on the value of the goods insured or services needed to repair them, claims made upon this policy, while not minor, are fairly predictable. P & I claims on the other hand have experienced a steady escalation, in part due to the nature of the legal remedies available to injured seamen under U.S. Admiralty Law.(1Ø)

THE REMEDY SYSTEM

Known as the "Blessed Trinity" by injured seamen and their attorneys, there are three independent causes of action: 1) maintenance and cure, which provide medical expenses for seamen injured in the service of the vessel until the injured party reaches maximum cure, as well as a subsistence allowance during the recovery period, currently ranging from $8 to $35 per day; 2) unseaworthiness, which allows recovery against the vessel if the injury is due to an "unseaworthy" condition aboard the boat, and holds vessel owners to a very high standard of responsibility to provide a vessel "reasonably suitable for her

intended service" , a standard established in Mitchell v. Trawler Racer, 362 U.S. 539, 80 S.Ct 926 (1960), against which it is extremely difficult for the defendant vessel owner to prevail; and 3) Jones Act negligence, which provides for the recovery of damages and a jury trial combining all three independent remedies, if the injured crewman can convince the jury of negligence on the part of the vessel owner as a proximate cause of the injury.(11) General tort law practices currently ignore the role of contributary fault in making awards despite considerable evidence of fault on the part of the victim. In keeping with the general liability problems currently facing the broader U.S. justice system, jury awards and settlements made to avoid jury awards have produced wildly unpredictable claims ranging from those for minimal medical expenses to overwhelming sums including large punitive damages, with the contingency fee system giving plaintiff's attorneys up to one half of the award. It is largely this lack of predictability of P & I claims which has driven the underwriters out of the fishing vessel insurance market.(12)

PART 3: CHARACTERIZATION OF INJURIES

In a recently completed study funded by the U.S. National Marine Fisheries Service (NMFS), and conducted by Professor Dennis Nixon and the author for the National Council on Fishing Vessel Safety and Insurance (NCFVSI), an effort was made to objectively evaluate the magnitude of the current fishing vessel

insurance problem.(13) A nationwide, systematic, stratified sample of closed insurance claims files was collected, documenting commercial fishermen's personal injuries. The number of cases in the sample from each region was based on that region's contribution to the total national catch value each year. The database provides information on the characteristics, cause, and duration of disability resulting from injuries recorded in more than 400 cases over the 5 year period 1980 - 1984, as well as the insurance compensation paid to the victims and their attorneys. The study found the average victim to be 33 years old with one dependent, earning approximately $23,000 working aboard a vessel approximately one hundred feet long. The average disability lasted fourteen weeks and cost vessel owners and their insurance companies approximately $31,000 in settlement awards; just over one quarter of which went to pay the plaintiff's attorney's fees.

The NCFVSI study investigated the present compensation system and proposed an alternative to the that scheme which was projected to result in savings of approximately 21%. Additional information collected in that study provided the basis for the current paper by allowing a detailed review of various injury classes and their proximate causes.

The present analysis focuses on those injuries which are most frequent and costly, thereby identifying which injuries, if avoided, would provide the most savings in both suffering on the part of the fisherman and expenses on the part of the vessel owner and his insurance company. Further analysis of the causes

of these injuries provides insights into the systematic safety problems present in today's fishing fleet. Finally, a review of the total database, placing each injury within one of the cause categories identified among the most frequent and costly injuries provides an idea of the value of potential savings lurking aboard the commercial fishing fleet.

Injuries recorded within the NCFVSI database were characterized by the body parts affected, the nature of the injury,(e.g. laceration; fracture), as well as the severity and duration of the resulting disability,(e.g. temporary total; permanent partial). The present analysis grouped similar injury sites (e.g. hand and wrist) when injury to these parts would likely occur under similar circumstances as evidenced within the database itself. TABLE 1 lists the injury sites, the frequency of injuries there as a percent of the total sample, and the percentage of the total settlement costs for each site.

Injury sites present among the top 50 % in frequency and settlement costs were analyzed to determine the causes of these most significant injuries. This information is presented in TABLE 2. The specific cause categories were defined as follows:

SLIP & FALL injuries involve those due to loss of footing aboard the vessel or ashore. Not included are falls resulting from being struck by gear, etc. Falls **OVERBOARD** or while **BOARDING** are considered subsets of this category although analyzed separately. **OVERBOARD** cases involve falling overboard exclusive of **BOARDING** cases which include moving between the vessel and another or docking facilities. **GEAR HANDLING**

TABLE 1.

RELATIVE FREQUENCY AND COST OF AFFECTED AREAS

INJURY SITE	FREQ	% FREQ	% COSTS	TOTAL AWARDS
BACK	94	22.1%	26.2%	$3,446,035
FINGERS	56	13.1%	14.9%	$1,957,200
KNEE/L.LEG	38	9.2%	6.1%	$802,780
HAND/WRIST	37	8.7%	3.0%	$393,250
FOOT/ANKLE	31	7.3%	15.1%	$1,981,890
ELBOW/FOREARM	22	5.2%	1.6%	$206,440
INTERNAL	22	5.2%	5.4%	$715,850
HEAD	18	4.2%	1.2%	$152,250
RIBS	17	4.0%	8.2%	$1,079,000
SHOULDER/U.ARM	16	3.8%	0.8%	$109,300
HIP/U.LEG	15	3.5%	0.3%	$45,800
FATALITIES	13	3.1%	5.8%	$769,800
FACE/MOUTH	12	2.8%	0.6%	$82,000
PELVIS/GROIN	11	2.6%	5.1%	$667,800
EYES	8	1.9%	0.5%	$71,500
NECK	7	1.6%	0.5%	$70,300
TOES	4	0.9%	1.2%	$158,900
PARALYSIS	3	0.7%	3.4%	$452,000
EARS	1	0.2%	.0%	$4,700
TOTALS	426			$13,166,795

injuries involve the operation and manipulation of the vessel's equipment used for catching fish, etc., and propelling the vessel. **WINCH** accidents are a subset of gear handling although they are analyzed separately. Gear used for sorting, packing, or processing the catch are covered by **CATCH HANDLING. STORES HANDLING** covered movement of vessel's equipment or supplies not directly associated with fishing,i.e.: food or engine supplies. **GEAR FAILURE** cases were restricted to instances where equipment breaks or fails to operate and leads to injury. **VESSEL LOSSES** are self explanatory, as are cases listed as **OTHER.**

Back injuries are by far the most common source of problems for commercial fishermen, followed by finger injuries, injuries to the knee and lower leg, hand and wrist injuries and then foot and ankle problems. Together, these injuries account for 60% of all injuries, and 65% of all settlement costs.

BACK

Sprains, bruises, pinched nerves and pulled muscles provide 70% of back injuries with another 29% involving fractures or surgery. These injuries result from slip and fall incidents in 44% of the cases, with gear handling and catch handling accounting for 21% and 15% respectively.

FINGER

Thirty four percent of all finger injuries involve accidental amputation, 29% are fractured or crushed, and

lacerations and infections accounting for another 25 % of injuries to any or several digits. Seventy-three percent of all finger injuries were due to gear handling and winch operations, with catch handling involved in another 12%.

KNEE AND LOWER LEG

Most injuries in this area are dislocations and bruises (64%), with another 31% involving fractures and crushing incidents. Forty-six percent of these injuries are due to slip and fall events, with gear handling and gear failures accounting for another 21% and 8% respectively.

HAND AND WRIST

Fractures and dislocations account for 43% and 30% of these injuries respectively, with lacerations and infections resulting from another 23%. Thirty-three percent of these injuries are due to gear handling practices, with gear failures causing another 23%. Catch handling and slip and fall accidents cause another 13% each.

FOOT AND ANKLE

Fifty-nine percent of these injuries involve crush or fracture accidents, while 25% are dislocations or bruises and nearly 10 % involve burns. Gear handling problems cause 38% of foot and ankle injuries, primarily due to falling equipment, while slip and fall incidents cause another 34%. Catch handling and boarding accidents each provide 9% of additional opportunities for this type of injury.

PERMANENT INJURIES

The sum of all fatalities and disabilities more than one year in duration accounts for a mere 15% of all injuries in the study. However, these account for 60% of the total settlement costs. These are primarily crush and fracture injuries including knee and back requiring surgery (41%), followed by major sprains and dislocations (15%), with head injuries and amputations accounting for eight percent each. Fatalities are primarily due to drowning or hypothermia (62%), with crush and fractures involved in another 15%.

Gear handling including winch operations, and slip and fall accidents contribute almost equally to these injuries, at 27% and 26% respectively. Gear failures are involved in 10% of these cases. Boarding, man-overboard, and vessel losses combine for another 16% of all permanent injuries; although these three causes account for 58% of all fatal accidents!. Gear handling including winches, and "Other" causes are each responsible for 17% of the fatal accidents with the remaining 8% due to slip and fall events.

PART 4: EVALUATING THE SAFETY ISSUE

Cases contained within cause categories GEAR HANDLING, SLIP AND FALL, CATCH HANDLING, and GEAR FAILURE, account for 86% of the sample cases. Each was reviewed to determine what practical measures might reduce the likelihood of similar accidents in the future. Specific recommendations were then placed within one of

the following potential remedy classes: Operational safety, design safety, protective gear, general maintenance, boarding gear, handling procedures for heavy equipment, licensing or inspection of vessels, and general health screening of the crew to assure preventative health care and avoid unnecessary risks. These concepts are discussed in greater detail below, describing specific measures and the potential benefits from each.

OPERATIONAL SAFETY

Remedies within this category include basic procedural measures depending primarily upon a review of each vessels operations while loading, unloading, fishing and underway. The operation of a fishing vessel is a complex affair, and to be conducted safely, the process must be assessed as a somewhat flexible series of coordinated tasks. Communication amongst crewmembers carrying out these tasks is critical, and simple seamanlike procedures including axioms like "one hand for the ship", combined with a commitment on the part of the captain and crew to think safety first, (or at least second!) can greatly improve safety and reduce injuries. Coordination of procedures such as shooting nets and pots, hauling back, catch sorting, door or dredge stowage, winch operations, and the like can provide valuable safety benefits simply by considering where various crewmembers stand during specific operations and tasks. With gear handling procedures and problems representing the cause of more than 32% of all injuries, it seems that these procedures need desperately to be reviewed and restructured if risks are to

be reduced, and insurance availability and affordability improved. Changes within the fishing industry has altered the way new crewmen become fishermen and eventually captains, and the need for structured training is painfully evident as one reads the grim details of accidents due to the victim's or their fellow crewmember's inexperience. Changes for safety on the basis of operational changes represent minimal capital expenditures and great potential benefits for everyone concerned.

DESIGN SAFETY

This category involves a broad variety of technological opportunities available to the fishing industry. Issues range from using properly sized and engineered hardware and running rigging for the job at hand, to modifications of the operational components of the entire fishing process. Possibilities include designing the work stations of the crew to minimize back strain by raising the sorting area to waist level; installing hatches with safety stops to reduce risk of fractured or amputated fingers as the vessel rolls; routing hydraulic and other plumbing lines so as to eliminate tripping hazards; ensuring that all protruding corners on bulkheads, shelves, etc., are rounded and, if necessary, padded. One idea perhaps too radical to implement all at once would be to install and maintain EFFECTIVE NON-SKID SURFACES throughout all fishing vessels. This can be accomplished in the form sandy paint as an absolute minimum or through several more sophisticated and expensive

approaches. With slip and fall injuries representing over 27% of all cases and costs, causing over 25% of all permanent injuries, it is unbelievable that this problem persists in 1986.

Another issue to be addressed in this category of remedies concerns another major source of expensive back injuries; the fact that crewmen regularly injure their backs moving catch and bait boxes weighing far more than can be safely handled on a steady non-skid surface, let alone a rolling and yawing slippery fish boat deck. As the concept of improved quality by boxing at sea catches hold, fishermen should be encouraged to employ containers incapable of carrying the devastating loads fishermen are currently breaking their backs and hearts over. A step in that direction has been taken by the New York and New Jersey Port Authority's Fishport, which has decided on the exclusive use of fifty pound capacity boxes for both boxed at sea and repackaged product.(14) In the interest of safety and product quality, Swedish law forbids the use of fish boxes exceeding 45 kilograms gross weight capacity.(15)

Vessel layouts should be analyzed and modified to minimize the frequency at which crewmembers are able to place themselves in compromising positions vis a vis winch cables, by-catch, trawl doors, etc. While this category contains some capital intensive approaches, there remain many low cost opportunities to design safety into the way a vessel is laid out and equipped to fish.

Finally, injuries involving the handling of bycatch, due to the weight, sharpness or toxicity of the species involved could

often be minimized and catches of desired species enhanced by the use of selective harvesting techniques including within-trawl separator devices. The fact that bycatch is causing problems beyond those obvious to the fisherman should further encourage development of this technology.

PROTECTIVE GEAR

Shore side industries have been experiencing steady gains in injury avoidance through the use of protective clothing and specialized work outfits. The fishing industry seems unable to get beyond the advantages of foul weather gear. Despite generations of slippery decks, heavy gear swinging overhead, and the surrounding presence of Davy Jones locker, remarkably few American fishing vessels carry let alone employ such revolutionary gear as hard hats, or wearable, workable lifejackets.

There is little or no evidence of efforts to develop effective high traction foot wear to prevent the debilitating slip and fall injury. In an industry employing between 100,000 and 200,000 people,(16) most of whom face similar footing problems, it is remarkable that this area remains almost completely unexplored.

Similarly, more than a third of fishermen's finger injuries result in amputation, with less substantial cuts accounting for another 25%. The use of stainless steel mesh gloves by crewmen cleaning fish, shucking scallops or heading shrimp could sharply reduce the incidence of many such injuries.

Yet despite the availability of such products on the market, the fishing industry has failed to capitalize on their safety potential, largely for lack of clear financial incentives from insurance companies or regulatory mandates from government.

GENERAL MAINTENANCE OF VESSEL AND GEAR

Largely due to the financial squeeze felt by many vessel owners resulting from reduced resource availability, spiraling operating costs, and extremely competitive markets, an attitude of "if it ain't broke yet, don't fix it...", prevails for everything from bilge pumps to winch cables and engines. Worn parts are not replaced, hydraulic leaks persist, overhauls are postponed, and so on. A recent informal survey showed that while 90% of a selected fleet carried liferafts, one third of those were improperly mounted or inaccessible, and another third were well overdue for annual inspections. Flares, if carried, were often several years out of date.(17) Additional negative incentives have developed due to the handling of insurance claims; the number of fishing vessel engine and winch overhauls paid for by insurance settlements has encouraged operators to wait until it breaks and have the insurance pay for it. Poor risk management and claims analysis on the part of the insurance companies is in part responsible for poor maintenance of many fishing vessels, as no rate incentives exist for safe operators, while poorly maintained vessels simply increase costs for everyone, and are in effect subsidized by their fellow fishermen. The result is that everyone pays more, especially the injury victims.

HANDLING PROCEDURES FOR TRAWL DOORS, DREDGES, AND POTS

While this category is clearly related to both operational and design safety, the frequency with which these heavy components of the fishing gear are responsible for grievous injuries deserves special attention. Major problems surround the deployment and recovery of these critical components and it seems likely that time invested considering new approaches to the procedures and perhaps the design of these devices should prove well spent. Many injuries result from the inability of the crew to effectively and safely capture and control these components as they emerge from the sea, and many fingers, toes, arms, and legs are severely injured as they are caught between the vessel's gunwale and the errant gear. It seems that a society which can pluck satellites from orbit with a crane might be able to devise a way to safely recover fishing gear from the sea. Perhaps a solution as simple as placing handrails inboard of the impact zone might leave the crew with enough fingers to attach tag lines to the gear to aid in its control. Placement of fixed racks outboard of the gunwales where the doors could be caught without ever coming aboard could be combined with rigging modifications to simplify and partially automate the capture of doors, dredges, or pots, minimizing the frequency of injuries. The possibility of designing gears which are less dependent upon sheer mass to provide necessary spreading and tracking forces might allow the use of more manageable equipment.

BOARDING GEAR

Fishing vessels regularly load and unload at piers and wharfs maintained in surprisingly dangerous condition. Few if any are equipped for safe boarding or disembarkation, yet despite the fact that boarding accidents are among the top three causes of fatalities, jumps from dock to deck continue to break bones, while those individuals who miss the deck frequently fail to surface alive. Vessel owners must pressure pier operators to provide safe gangways or carry them on board. Many injuries result when two or more vessels come alongside while at sea, again due to the lack of safe boarding equipment or procedures aboard fishing vessels. The tuna clippers suffer an inordinate injury rate associated with the speed boats and net skiffs they launch and (sometimes) recover when setting their seines and considerable improvement could be made here.

LICENSING OR INSPECTION OF VESSELS AND CREWS

A measure the fishing industry will continue to sharply protest, a fair number of the problems due to operational safety and design safety, and general maintenance would likely be avoided if minimum standards were mandated for crew experience, vessel design, construction, and maintenance. Skippers unable to fish without passing an annual or biennial inspection would be induced to maintain their vessels and gear in safer condition. Inspections need not be conducted or enforced by government agencies but could be instituted by underwriters, cooperatives, or mutual insurance pools. The point is that if

the skipper can not afford to go fishing without maintaining and operating a safe and seaworthy vessel, he will be more likely to consider taking steps to correct such deficiencies in a timely manner. Without financial or regulatory discrimination between safe and irresponsible operators, the current problems will not be solved.

GENERAL HEALTH SCREENING

Worthy of inclusion in any inspection or crew training program is a basic health screening for prospective and current crewmembers. Designed to assure preventative health care and assess the presence of serious physical problems such as hernias, back problems, and heart disease, such programs would go far to inform the operator of the actual capacities and potential health risks of the people hired to go fishing. There is no reason that an employer or underwriter should remain unaware of serious physical defects among employees which must perform most of their duties in the rigorous, and remote environment of the fishing grounds.

RELATING THE SAMPLE TO THE ENTIRE FLEET:

The NCFVSI sample contains 426 cases, and includes 13 fatalities over the five year study period. U.S. Coast Guard data indicates that an average of 100 commercial fishermen died each year in fisheries related accidents during the ten year period ending in 1984.(18) Assuming that our sample is representive of injuries across the board, this would suggest

that it contains approximately 2.6% of the total population of fishermen injured each year. Taken one step further, that population can be estimated to be approximately 3,277 injured fishermen annually, nationwide, with settlement costs averaging just over $100,000,000 each year.

Considering cases due to the top four causes of injury as listed above, and the total settlement values in each cause class, the value of potential reductions in such injuries due to safety measures can be calculated. (see Table 2). In many cases several safety measures, alone or in concert, would likely serve to prevent a similar injury in the future. The values listed under the label 100% indicates the potential value of all measures within a remedy category if they were implemented independently and 100% effective. As a result, summing the totals in Table 2 produces a figure considerably greater than the estimated total value of all injuries, since injuries with several possible solutions would be counted repeatedly. When evaluating the measures as an integrated system, it was assumed that each separate safety measure would address at least 20% of injuries due to a given cause. As a result, the total value of 20% effectiveness on the part of each of the primary safety measures shown in Table 2 is estimated to be approximately $32,000,000. Potential savings of $4.8 million dollars annually from just the five specific safety steps shown in Table 3 represents nearly 5% of the total annual losses.

TABLE 2.

Potential savings from implimentation of safety measures.

SAFETY MEASURE	EFFECTIVE VALUE	
	20%	100%
OPERATIONAL SAFETY	$15,500,000	$77,300,000
DESIGN SAFETY	$13,666,000	$68,300,000
PROTECTIVE GEAR	$ 1,400,000	$ 6,900,000
MAINTENANCE	$ 1,650,000	$ 8,200,000

TOTAL POTENTIAL IMPACT OF SAFETY MEASURES ASSUMING 20% EFFECTIVENESS: $32,000,000

PART 5. EVALUATING IMPACTS OF SAFETY AND SURVIVAL EQUIPMENT REQUIRED UNDER PROPOSED LEGISLATION

Survival and communications equipment prescribed in H.R. 4415, H.R. 4407, and in H.R. 4465 are intended to reduce the losses from potentially deadly mishaps at sea and include the following measures: 1). VHF radio communications equipment to provide basic communications capability between vessels and shorebased personnel who can assist fishermen in avoiding accidents or dealing with problems before they escalate into tragedies. Vessels operating beyond the range of these radios would also be required to carry more powerful Single Side-band radios to provide similar capability to these offshore vessels. 2). Emergency Position Indicating Radio Beacons (E.P.I.R.B.s), which broadcast a homing signal on radio frequencies monitored by aircraft, satellites, vessels at sea, and land based rescue personnel. The main effect of universal distribution of these devices among commercial fishing vessels would be to reduce the delay in initiating search and rescue efforts should a vessel encounter sudden difficulties and fail to send a distress signal over conventional radios. In addition, the directionality of

the signal sharply reduces search time in the event of inadequate information provided by frightened seamen aboard sinking or burning vessels. E.P.I.R.B.s are independent of vessel power supplies and can save valuable time when rescue or assistance crews are trying to determine the whereabouts of a vessel in need of pumps or medical aid. Indeed, the time saved in locating a vessel in need of assistance will often eliminate the need to search for survivors in liferafts, turning a rescue effort into an escort mission. 3). Liferafts or lifeboats sufficient for all aboard. Surprisingly enough, despite the fact that few fishermen can swim, many vessels operate without any alternative means of survival in the event of a fire, capsize, or sinking! By requiring functional liferafts, as well as annual maintenance checks, fishermen will be compelled to provide themselves with a fighting chance when disaster strikes. 4). Survival suits which provide protection from the killing effect of hypothermia by conserving bodyheat otherwise so quickly drained away from persons immersed in ocean waters. Healthy humans can last only minutes in cold water; perhaps a few hours in tropical seas. Despite being available for over a decade, many vessels in cold water areas still sail without these critical and proven lifesavers; many others fail to follow annual cleaning and maintenance schedules.(19) 5). The fifth component of the safety requirements involve up to date visual distress signals including flares and smoke markers which serve to aid potential rescue vessels in pinpointing the location of disabled vessels or their survivors and require replacement every three years.

The nature of the equipment listed above reflects the need to provide an additional margin of safety to victims and potential victims of the perils of working at sea. They each add a critical increment of time so important in the unforgiving ocean environment. In providing this margin they add a cost to the operation of the vessel which cannot be ignored. In addition, these new costs will be reflected in consumer prices unless their impact quickly results in reduced insurance premiums for the complying vessel owner.

COSTS OF LIVES LOST IN VESSEL LOSS SITUATIONS

It is possible to estimate the nationwide costs of injuries due to events which might be addressed by the survival equipment prescribed in the proposed bills by using information provided by the NCFVSI and U.S.C.G. databases, in combination with information provided in congressional sub-committee hearings and published fisheries statistics (20).

Average settlement awards for fatality cases were calculated from the NCFVSI database. The mean value of $275,000 represents medical costs and the lost earnings of the average injured fisherman described in the NCFVSI report,(21) assuming a working life to age 62, and an annuity based on an interest rate of 8%. This value is a composite of awards negotiated directly with the decedents survivors, those settled after a suit was filed, and those which were granted following a court decision. As such they should reasonably reflect societies assessment of the economic worth of the average of these individuals at the time of their deaths.

Using U.S. Coast Guard records showing an average of 100 fishing vessel incident fatalities each year,(22) the national average annual fatality costs total $27,500,000. Neither the National Council's database nor that of the Coast Guard documents the total number or degree of less serious injuries resulting from vessel losses.(23) Therefore, without guessing at such a figure, the model is conservatively biased in estimating the costs of injuries suffered in accidents involving vessel losses with $27,500,000 representing a minimum figure.

VALUE OF LOST VESSELS

United States Coast Guard statistics show approximately 250 commercial fishing vessels were lost annually over the period 1974 - 1984.(24) Using a hypothetical vessel over 5 tons valued at $150,000, such losses would account for $37,500,000 annually.

VALUE OF SEARCH AND RESCUE SERVICES RENDERED

The United States Coast Guard budget for Search and Rescue operations for fiscal year 1984 totaled $415 million dollars. (25) Of this amount, fishing vessels accounted for 9% of the 57,431 S.A.R. cases the Coast Guard responded to for a total of 5,171 cases.(26) Twenty eight percent of the total 242,077 hours spent responding to distress calls involved search efforts.(27) Since the Coast Guard figures lack greater detail, this model requires several additional assumptions, each of which conservatively biases the results: first, all cases are

assumed to utilize the same average amount of search and rescue effort and expense. While fishing vessels tend to operate year round in less favorable weather conditions and farther offshore than most pleasure boats, and likely involve greater search and rescue effort, information needed to quantify these differences is lacking. Second, it is assumed that an equal proportion of search time is required by the fishing sector as by other sectors. Once again, it is likely that search efforts for fishing vessels in bad weather, far from land absorb considerably more resources than small runabouts with engine trouble in protected bays and coves. Rather than separate the costs of overhead by assuming these to be fixed costs to society regardless of demand, it is argued that the austere Coast Guard budget has resulted in decreased administrative efficiency and excessive personnel and equipment workloads. Reductions in Search and Rescue demands or expenses can thus be observed as proportional reductions in the total operational budget of this sector of the U.S.C.G. and thus as benefits to society at large.

Given these assumptions, the commercial fishing sector consumes a minimum of $37,350,000 of the total S.A.R. budget, at least $10,458,000 of which involves hours spent searching for the distressed vessel. Further assuming constant 1984 dollars and similar annual costs through the planning period, this represents one set of societal costs to be offset by the proposed equipment regulations.

Another unaccounted for cost involves the exposure of Coast Guard personnel and equipment to injury or loss. U.S.C.G.

TABLE 3.

Potential annual savings from specific remedies

at 20% effectiveness.

NONSKID SURFACES:	$ 2,900,000
LIFEJACKETS:	$ 1,000,000
MESH GLOVES:	$ 500,000
CONTAINER SIZE REDUCTION	$ 200,000
HARDHATS	$ 100,000
Savings from these measures:	$ 4,800,000

TABLE 4.

AVERAGE PRICES FOR EQUIPMENT NECESSARY UNDER PROPOSED LEGISLATION

GEAR	PURCHASE PRICE	ANNUAL MAINTENANCE COSTS
VHF RADIO	$ 600	$ 25*
LIFERAFT (4 MAN)	$3450	$155
EXPOSURE SUITS (4)	$1060	$ 40
E.P.I.R.B	$ 375	$ 0
SIGNAL FLARES	$ 30	$ 0
SSB RADIO	$3450	$ 25*

* = Biannual costs

figures do not allocate these casualties to their individual programs (28) and therefore cannot be included in the model, introducing another conservative bias into the evaluation of societal costs for fishing vessel search and rescue operations.

CALCULATION OF AVERAGE ANNUAL EQUIVALENT CASH FLOWS FOR VESSELS OPERATED IN COMPLIANCE WITH PROPOSED REGULATIONS

The average current prices available to fishermen for the required gear were collected by Susan Ware, and presented in the testimony of Professor Dennis Nixon to the joint congressional hearing on 17 April, 1986 in Washington D.C.. These costs, and installation and maintenance charges are presented in Table 4.(29) With the exception of the signal flares which must be replaced every third year, all the equipment has an estimated useful life of ten years when manufacturers maintenance recommendations are followed.(30) The annual equivalent cash outflows were calculated using a ten year planning period for three different patterns of vessel outfitting schedules.

In order to model the costs of these equipment purchases, and to reflect the degree to which the fleet currently carries and maintains such gear, a number of assumptions were made. First, a typical vessel manned with a crew of four was used in the model, based on the following rationale. The nation's full time commercial fishing fleet is largely composed of vessels employing three to five crewmembers, while those using crews in excess of 8 crewmen are a fairly small minority. Many smaller vessels operate with a crew of two in small scale

nearshore fisheries which would likely be exempt from at least some of the proposed requirements. In addition, since NMFS statistics on the number of commercial fishing vessels distinguish between vessels above 5 net tons from those smaller vessels.(31) The five ton cutoff point provides a reasonable division between, for example, 20' quahog skiffs for whom liferafts might excessive, and 35' lobster boats operating further from shore and more appropriately charged with providing the prescribed gear. For the purposes of this analysis, vessels greater than 5 net tons will be considered the nation's commercial fishing fleet.

Second, the fleet was partitioned into three groups depending upon the amount and condition of their current stock of the required equipment: those which would begin the cycle with all new purchases in year one followed by nine years of maintenance costs; those which are already equipped with the needed gear but are in need of scheduled upkeep and maintenance and are assumed to be on average, in the middle of the cycle, and planning to replace all products in year five; and finally, those who have already purchased the gear and begin the cycle as if at year two, that is, they already have made the capital investment and will not have to make major capital outlays again until year ten. Third, it is assumed that approximately one half of the nation's fleet operates beyond 25 miles from shore and will need the more expensive SSB radios in addition to the other gear. The timing of SSB costs were modeled following the same patterns as the other gear but apply only to 50% of the fleet.

COSTS INCURRED TO ENSURE COMPLIANCE WITH REGULATIONS

Considerable discussion at the joint congressional hearing on 17 April 1986 focused on who would pay for the enforcement of any mandatory measures aimed at addressing the issue of minimal equipment standards. The U.S.C.G. is already under severe financial limitations in performing its current charges, and is pushing for voluntary compliance with similar guidelines they have developed. The fishing industry is interested in addressing the issue only in so far as it will reduce costs rather than increase their burden. Insurance companies are reluctant to develop the expertise needed to determine the adequacy of certain measures although they would likely be happy to pass along the costs of experienced surveyors to handle the inspections. They have also been reluctant to predict any reduction in premium costs in response to improved safety provisions. It appears that the insurance companies will win out in the end and periodic inspections at the vessel owner's expense will likely become standard. The general trend is towards this kind of arrangement and it is difficult to assess the incremental cost of inspecting this safety gear during general vessel assessments which are likely to become a normal operating expense. Since much of the gear in need of inspection is processed through certification style service arrangements, the cost of providing the inspector with appropriate certificates has been included in the maintenance expenses and additional costs are expected to be negligible.

MODELING THE ANNUAL COSTS TO THE FISHING FLEET

The cash flows associated with each of the three purchasing schedules and associated present value calculations are presented in Table 5. The net present value of each gear type and quantity needed aboard the model vessel was calculated in real 1984 dollars using deflated discount rates of 5% and 10%. The resulting totals for each schedule were summed and an annual equivalent cash flow was calculated for each by applying the annuity formula to this amount at the respective 5% and 10% discount rates. The three resulting annual equivalent cash flows were then combined and averaged. This average represents the average annual cost for the typical vessel to be outfitted in accordance with the regulations. Multiplied by the estimated number of vessels in the fleet we have a preliminary total annual cost of compliance. The cost cycles of Single Side-band radios were calculated in a similar fashion and one half the annual equivalent cash flow was multiplied by the number of vessels in the fleet, thus reflecting the cost of equipping one half of the fleet with these powerful radios. (See Table 5)

Combining the preliminary annual costs with the costs of SSB radios for 1/2 the fleet, we have the total annual equivalent cash outflow necessary to comply with the proposed regulations as shown in Table 6.

EQUIPMENT COSTS vs. THE VALUE OF POTENTIAL SAVINGS: A COMPARISON

The total average annual equivalent cash outflows necessary to equip the U.S. commercial fishing fleet using discount rates

TABLE 5

COSTS IN 1984 DOLLARS FOR VESSEL WITH 4 CREWMEMBERS
USING THREE DIFFERENT PURCHASING SCHEDULES

CASE 1: VESSEL REPLACING OR PURCHASING ALL GEAR IN YEAR 1

YEAR	VHF	LIFERAFT	EXP.SUITS	EPIRB	FLARES	
1	$600	$3,450	$1,060	$375	$30	
2	$0	$155	$40	$0	$0	
3	$25	$155	$40	$0	$0	
4	$0	$155	$40	$0	$30	
5	$25	$155	$40	$0	$0	
6	$0	$155	$40	$0	$0	
7	$25	$155	$40	$0	$30	
8	$0	$155	$40	$0	$0	
9	$25	$155	$40	$0	$0	
10	$0	$155	$40	$0	$30	
NET PRESENT VALUES						TOT. NPV
AT 5%:	$648	$4,335	$1,280	$357	$93	$6,712
	5%		ANN.CASH FLOW EQUIV.			$869
AT 10%:	$603	$3,948	$1,173	$341	$75	$6,140
	10%		ANN.CASH FLOW EQUIV.			$795

CASE 2: GEAR CURRENTLY IN NEED OF SERVICE ONLY, REPLACE IN YEAR 5

YEAR	VHF	LIFERAFT*	EXP.SUITS	EPIRB*	FLARES	
1	$25	$310	$40	$45	$30	
2	$0	$155	$40	$0	$0	
3	$25	$155	$40	$0	$0	
4	$0	$155	$40	$0	$30	
5	$600	$3,450	$1,060	$375	$0	
6	$0	$155	$40	$0	$0	
7	$25	$155	$40	$0	$30	
8	$0	$155	$40	$0	$0	
9	$25	$155	$40	$0	$0	
10	$0	$155	$40	$0	$30	
NET PRESENT VALUES						TOT. NPV
AT 5%:	$549	$3,926	$1,108	$337	$93	$6,013
	5%		ANN.CASH FLOW EQUIV.			$779
AT 10%:	$437	$3,139	$879	$274	$75	$4,804
	10%		ANN.CASH FLOW EQUIV.			$782

* first year costs upgrade raft mounting and EPIRB battery

TABLE 5 (continued)

CASE 3: VESSEL WITH ALL GEAR ONE YEAR OLD, REPLACE YEAR 10

YEAR	VHF	LIFERAFT	EXP.SUITS	EPIRB	FLARES	
1	$0	$155	$40	$0	0	
2	$25	$155	$40	$0	$30	
3	$0	$155	$40	$0	$0	
4	$25	$155	$40	$0	$0	
5	$0	$155	$40	$0	$30	
6	$25	$155	$40	$0	$0	
7	$0	$155	$40	$0	$0	
8	$25	$155	$40	$0	$30	
9	$0	$155	$40	$0	$0	
10	$600	$3,450	$1,060	$375	$0	
NET PRESENT VALUES						TOT. NPV
AT 5%:	$447	$3,220	$935	$230	$71	$4,903
	5%	ANN.CASH FLOW EQUIV.				$635
AT 10%:	$295	$2,223	$639	$145	$57	$3,359
	10%	ANN.CASH FLOW EQUIV.				$547

COMPOSITE OF SSB SCHEDULES:

SINGLE SIDEBAND RADIO FOR FLEET > 25 MILES OFFSHORE (1/2 OF FLEET)

YEAR	CASE1	CASE2	CASE3	
1	3450	0	25	
2	0	25	0	
3	25	0	25	
4	0	25	0	
5	25	0	3450	
6	0	25	0	
7	25	0	25	
8	0	25	0	
9	25	0	25	
10	0	3450	0	
NET PRESENT VALUES				
5% TOTALS	$3,361	$2,197	$2,782	
AECF BY CASE	$435	$284	$360	$1,080
AVG ANN.EQUIV.CASH FLOW(SSB) (5%)				$360
AT 10%:				
	$3,194	$1,394	$2,207	
	$520	$227	$359	$1,106
AVG ANN.EQUIV.CASH FLOW(SSB) (10%)				$369

of 5% and 10% are between $22,914,600 and $18,842,300 respectively. A conservative estimate of societal costs currently incurred without these equipment regulations breaks down as follows: vessels lost = $37,500,000; U.S.C.G. Search and Rescue costs = $37,350,000; resulting fatalities = $27,500,000. Total annual current costs to society are conservatively calculated at $102,350,000. Annual reductions in S.A.R. costs, vessel losses, and fatalities on the order of 18% to 23% will be necessary in order to offset the costs of purchasing and maintaining the needed equipment. These calculations are presented in Table 7.

DISCUSSION AND CONCLUSIONS:

The basic characteristics of the equipment required in the proposed bills are not at all unreasonable. Indeed, many would argue it is unreasonable for a vessel to leave port without such basic survival gear aboard. No one disputes the fact that E.P.I.R.B.s, survival suits, radios, life rafts, and flares are proven life saving devices. The questions revolve around principles of independence on the part of fishermen, their general resentment for government intervention, and the basic questions of costs.

The model used in the analysis of current social costs under the current situation is conservatively biased by several factors. The economic value of fisherman's lives lost in accidents does not reflect impacts on surviving family members

TABLE 7
CALCULATION OF SOCIAL COSTS AND BENEFITS

THE 1984 U.S.C.G. SEARCH AND RESCUE BUDGET = $415 MILLION.
28% OF U.S.C.G. S.A.R EFFORT = SEARCH TIME
FISHING VESSEL DISTRESS CALLS ACCOUNTED FOR 9% OF S.A.R. EFFORT
ASSUMING THAT FISHING VESSELS RECEIVE AT LEAST THE SAME PROPORTION OF SEARCH TIME AS OTHER VESSEL CLASSES, WE CALCULATE THE COST OF ALL RESPONSES TO FISHING VESSELS AS WELL AS THAT PORTION OF SEARCH TIME USED IN RESPONSE TO FISHING VESSELS.
TOTAL COSTS = $415,000,000
9% OF $415,000,000 = $37,350,000
28% OF $37,350,000 = $10,458,000
EVERY 1% REDUCTION OF F.V. S.A.R. COSTS = $373,500
EVERY 1% REDUCTION OF F.V. SEARCH COSTS = $104,580

AVERAGE VESSELS LOST PER YEAR = 250
AVERAGE VALUE PER VESSEL = $150,000
AVERAGE ANNUAL TOTAL VESSEL LOSSES = $37,500,000
AVERAGE ANNUAL NUMBER OF FATALITIES ABOARD FISHING VESSELS = 100
AVERAGE SETTLEMENT FOR DEATHS ABOARD FISHING VESSELS =$275,000
AVERAGE ANNUAL COST OF FISHING VESSEL FATALITIES = $27,500,000

MUST REDUCE VESSEL LOSSES, FATALITIES, AND SAR BY 18.5 - 22.5% TO BREAK EVEN

5%		10%	
$6,187,500	22.5%FATALITIES	$5,087,500	18.5%FATALITIES
$8,403,750	22.5%SAR	$6,909,750	18.5%SAR
$8,437,500	22.5% VESSEL LOSS	$6,937,500	18.5% VESSEL LOSS
$23,028,750	TOTAL SAVINGS	$18,934,750	TOTAL SAVINGS
$22,914,600	TOTAL COSTS	$22,914,600	TOTAL COSTS
($114,150)	BENEFIT	($92,450)	BENEFIT

beyond lost income and medical expenses. Since available information was insufficient to estimate the costs of non-fatal injuries suffered during vessel losses, these costs remain unaccounted for, as were the costs of injuries to personnel involved in search and rescue operations. The assumed value of $150,000 for each of 250 vessels lost annually may also represent an underestimate of true costs to society, adding further conservative bias. The underestimation of these social costs is responsible for the estimated 18 to 23 percent loss reduction necessary to offset the fleet's equipment costs. If these social costs could be more accurately accounted for, less dramatic savings would be necessary to "justify" the added equipment costs. Thus, the 18 to 23 percent value represents the maximum savings required, while the combined biases described above might be as high as 8 to 10 percent of the estimated total social costs. In that case, savings of between 10 and 15 percent would be enough to economically offset the costs of properly equipping the fleet.

The evaluation of safety measures in Part 4 above suggests that **every percentage point reduction in injuries represents** an average of approximately **one million dollars** worth of avoided insurance claims nationwide. That figure combined with the fact that no training is currently required for fishermen, from captain to cabinboy, suggests a great deal of potential for improving the safety of American fisheries. The fact that minimal effort has gone into safety considerations as the U.S.

fleet has out-grown its catching capacity suggests that a shift from catch efficiency to reduction of costs as a primary focus would be appropriate. The inclusion of safety principles in the design and operation of conventional gear as well as efforts to develop less dangerous fishing techniques can play a major role in reducing such costs with benefits well beyond the lives and limbs saved. Adding modified versions of the protective clothing so effective in land based heavy industry to the wardrobe of the commercial fisherman will go far to reduce losses.

While it was not possible to accurately assess the costs of systematic implimentation of the recommended safety measures in the same way the proposed survival equipment requirements were modeled, it is clear that even small reductions in injury rates represent major savings in so dangerous a business. Many problems can be avoided by improvements in the operational safety of vessels involving minimal costs, and considerable opportunity exists for the development of new products which reduce injury potentials. What is needed is incentives which encourage or force the fisherman to make safety a high priority.

A major concern expressed at the April 17 Congressional hearing was that the expense of establishing and enforcing mandatory safety and training programs would be too much for the finsing industry to afford. Further, it was argued, the creation or expansion of another bureaucratic nightmare of regulations was not needed or appropriate. Despite the

miserable record of both the fishing industry and the insurance industry in establishing or enforcing voluntary safety standards over the past decade or more, officials of the fishing industry and the Coast Guard argued that there was neither capacity nor need for Coast Guard enforcement of mandatory regulations. While several fishermens' organizations have begun to develop safety programs with the help of Sea Grant Colleges and the Coast Guard, universal implimentation will still require financial incentives on the part of the insurance industry, the Internal Revenue Service, or fisheries management agencies. A clear opportunity exists for beneficial cooperation between all the affected groups to turn the situation around without major government involvement or expense. The question which persists is why have these same parties failed to solve the problem on their own already?

A system of structured, mandatory crew training programs run by private businesses, fishermens' cooperatives, or public education facilities may provide the best mechanism for improving safety, regardless of whether implimented and enforced by the government or the insurance industry. In addition, the establishment of vessel construction and design standards is desperately needed. The efforts of the U.S. Coast Guard Fishing Vessel Task Group not withstanding, it should be mandated that safety considerations take priority over catch efficiency in the operation and design of fishing vessels, since a large part of the problem is due to the over-capacity of the U.S. fleet in the first place. Additionally, fisheries management in this country

desperately needs to directly address the issue of over-capacity in ways which do not intensify the safety risks which are basic to this industry.

While it is inevitable that some vessels will be lost despite all efforts, the potential margin of time provided by functioning communication gear and E.P.I.R.B.s will doubtless result in considerably fewer losses. Many current losses could be avoided simply by reducing the time involved in locating and reaching troubled vessels before problems become overwhelming. The ocean environment is so unforgiving that minutes without necessary protection in the form of liferafts or exposure suits can be deadly. In cases such as one occurring this past week off Block Island, R.I., time margins can be so short that location issues become secondary to basic survival and the lack of adequate equipment can prove fatal. In this particular case, a lobster boat sprung a plank less than a two miles offshore and quickly sank, leaving its two crewmen clinging to lifejackets in forty degree waters. Coast Guard rescue boats responding to radio calls were on the scene in less than ten minutes, yet without exposure suits or a life raft, one crewmember died of hypothermia, while the other remained hospitalized in serious condition.(32)

Clearly there is a need to improve the safety record of the U.S. fishing fleet. The potential savings needed to justify the expense of taking this very first step are well within reach. The critical factor of who will pay will have to be determined

by market forces either in the form of reduced insurance premiums or increased consumer prices. The prime beneficiaries of the proposed regulations will be the more than one hundred fishermen who will otherwise die this year thinking it will only happen to "the other guy", and the Search and Rescue crews who risk their lives pulling bodies out of the sea.

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