UNITED STATES COAST GUARD

MARINE BOARD OF INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE SINKING OF THE

F/V KATMAI

IN THE AMCHITKA PASS, NORTH PACIFIC OCEAN ON OCTOBER 22, 2008, WITH MULTIPLE LOSS OF LIFE

MISLE ACTIVITY NUMBER: 3351236

U.S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W. STOP 7581
Washington, DC 20593-7581
Staff Symbol: CG-545
Phone: (202) 372-1029
FAX: (202) 372-1907

16732
APR 26 2010

SINKING OF THE F/V KATMAI IN THE AMCHITKA PASS, NORTH PACIFIC OCEAN, ON OCTOBER 22, 2008, WITH MULTIPLE LOSS OF LIFE

ACTION BY THE COMMANDANT

The record and the report of the Marine Board of Investigation convened to investigate the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments.

ACTION ON RECOMMENDATIONS

Recommendation 1: The Coast Guard should initiate an LCP to amend 46 U.S.C. 2101 (11b) to clarify which activities exempt a vessel from being considered a fish processing vessel (and which activities would not). The analysis section of the LCP would need to identify the safety concerns that exist as a result of these vessels being classified as uninspected vessels despite the elevated risks associated with these activities (in which they act like fish processing vessels). Change the definition of fish processing vessels to include "head and gut" operations on fishing vessels that carry more than 6 crewmembers. (ARCTIC ROSE ROI, Recommendation 4)

Action: We concur with the intent of the recommendation. We do not believe the definition of "fish processing vessel" in 46 U.S.C. 2101(11b) needs to be amended. We do agree that clarification and improvement is needed in identifying the actions taken by individual fishing vessels to commercially prepare fish or fish products in order to determine whether they meet the definition of a fish processing vessel; however, we believe that this can be done without amending the statutory definition. We are now using information from commercial fishing vessels, as reported in the National Marine Fisheries Service (NMFS) Product and Delivery Codes published in Table 1 to 50 CFR 679, to determine the types of preparation activities being conducted on vessels and assess whether or not they meet the definition of a fish processing vessel.

Recommendation 2: The Coast Guard should develop regulations requiring all watertight doors to be alarmed and equipped with a visual and audible system in the pilothouse to indicate the position of the door(s). (ARCTIC ROSE ROI, Recommendation 2)

Action: We partially concur with this recommendation. We note that existing requirements on inspected cargo vessels already exist for watertight doors and visual indicator lights; however, there are no such requirements for audible alarms. Taking these existing requirements into account, we are considering the issue of watertight door closure and status indicator requirements for fishing vessels as part of a fishing safety vessel rulemaking project currently underway.

Recommendation 3: The Coast Guard should develop a regulation requiring all fishing vessels to document required drills found in 46 CFR 28.270. (ARCTIC ROSE ROI, Recommendation 5)

Action: We concur with this recommendation. We are considering the inclusion of requirements regarding documentation of required drills and safety training as part of a current fishing vessel safety rulemaking project.

Recommendation 4: The Coast Guard should initiate an LCP to require masters of commercial fishing vessels 30 feet and greater to hold operators licenses for that position based on the specific route and tonnage of the vessel. This recommendation is in direct support of the USCG-2003-16158 ANPRM.

Action: We concur with the intent of this recommendation. By requiring masters of vessels to hold operator licenses, we would have the ability to set minimum training and competency levels for fishing vessel masters by setting them as requirements to obtain the license. However, past attempts to obtain the necessary statutory authority to develop operator licensing requirements for commercial fishing industry vessels less than 200 gross tons have been unsuccessful. We are considering the best ways to readdress this issue. In the interim, we are considering safety and stability training requirements for fishing vessel masters as part of a fishing vessel safety rulemaking project currently underway.

Recommendation 5: The Coast Guard should conduct a risk based analysis of fishing vessel casualties to determine the appropriate parameters under which the requirements of 46 CFR Part 28, Subpart E should apply in lieu of the current length based standard of 79 feet. New regulations should be developed to change the stability applicability standard in accordance with the recommendations from this study. At a minimum, the revised stability applicability standard should include vessels that have a dedicated fish processing space, use of pots/traps, or carry additional crew to perform any type of fish processing duties. The current proposed rulemaking (USCG-2003-16158) which expands the applicability of stability requirements for commercial fishing vessels should be completed as soon as possible.

Action: We concur with the intent of this recommendation. We agree with the general concept of expanding the applicability of the stability requirements in 46 CFR Part 28, Subpart E. This is being addressed in a current fishing vessel safety rulemaking project, and we agree with the recommendation to complete this project as soon as possible. However, we do not concur with the recommendation to conduct a risk based analysis of fishing vessel casualties. The Advanced Notice of Proposed Rulemaking (73 FR 16815) for the project discussed the results of two major fishing vessel casualty studies, and also describes how the Coast Guard conducted a comprehensive review of all previous commercial fishing industry vessel safety recommendations. In view of these studies and review, which are being used to develop proposed amendments to the commercial fishing industry vessel regulations, there would be no substantial benefit from conducting an additional risk based analysis at this time.

Recommendation 6: The Coast Guard should seek legislation that requires masters and owners of commercial fishing vessels to have stability training to minimize the potential for preventable vessel losses attributed to improper loading and operation of fishing vessels.

Action: We concur with the intent of this recommendation. We believe the masters and owners with training in vessel stability can improve the safety of commercial fishing vessels; however, we do not believe a legislative change is necessary at this time. As an alternative, we are considering the issue of stability training requirements for masters and owners of commercial fishing vessels as part of a fishing vessel safety rulemaking project currently underway.

Recommendation 7: The Coast Guard should seek legislation to require all fishing vessels be inspected periodically to verify compliance with the current requirements detailed in 46 CFR Part 28. This inspection should be performed by appropriate Coast Guard personnel or a 3rd party surveyor recognized by the Coast Guard.

Action: We concur with the intent of this recommendation. We note that legislation has already been introduced in Congress that would require dockside examinations of uninspected commercial fishing industry vessels at least once every two years to ensure compliance with the requirements of 46 USC Chapter 45 and its implementing regulations. We will keep apprised of the action on this legislation and be ready to implement it if it is eventually passed and enacted.

Recommendation 8: The Coast Guard should review and revise the requirements of 46 CFR Part 28 as soon as possible to ensure that they adequately address all commercial fishing vessel safety concerns that have been identified in previous commercial fishing vessel marine casualties.

Action: We concur with this recommendation. As part of a rulemaking project currently underway, a review of the requirements of 46 CFR Part 28 is being conducted that includes analysis of past fishing vessel casualty investigation reports and safety recommendations to identify revisions necessary to improve fishing vessel safety. A Notice of Proposed Rulemaking is in development.

Recommendation 9: The Coast Guard should change the current requirements detailed in 46 CFR 160.151-53 to require that the servicing of all Coast Guard approved liferafts be witnessed by a Coast Guard marine inspector or 3rd party inspector accepted by the OCMI. The Coast Guard should place greater emphasis and dedicated resources toward the execution of the Liferaft Inspection Program.

Action: We partially concur with this recommendation. Although we do not agree that witnessing of all approved liferaft servicing is a productive use of Coast Guard resources, we agree that a more consistent oversight posture for liferaft servicing is needed. Accordingly, we are developing risk-based guidance for such oversight, in the form of a policy letter, to assist Officers in Charge, Marine Inspection (OCMIs), in decision-making after the notification of servicing required by 46 CFR 160.151-53. This guidance will include recommendations for minimum frequency of visits by OCMIs to approved servicing facilities, and reinforce to OCMIs that the notification and oversight outlined in 46 CFR 160.151-53 apply to all rafts serviced under a facility's approval, not just rafts from inspected vessels.

Recommendation 10: The Coast Guard should require Coast Guard approved liferafts that were manufactured before 1997 to be outfitted with ballast bags of a size meeting current liferaft stability requirements provided in 46 CFR 160.051 and 160.151 and in accordance with manufacturer recommendations.

Action: We do not concur with this recommendation. We do not agree with requiring Coast Guard approved liferafts manufactured before 1997 be retrofitted with new ballast bags to meet post 1997 standards. There was no conclusive evidence that the ballast bags in this case were inadequately sized. Rather, the evidence suggests that they were, whether by design or deterioration with age, structurally inadequate for the extreme conditions encountered. Further, although there were no specific size requirements until 1997, approved liferafts have been required to be fitted with water pockets to improve stability since 1959. Therefore, any requirement to add new ballast bags would require first removing the old ones, which could in some cases damage the liferaft. As a practical matter, a number of manufacturers of older liferafts are no longer in business, in which cases there would be no one to support implementation of a retrofit requirement.

However, the regulatory requirements for post-1997 liferafts are more stringent than for older ones in terms of ballast/stability and structural integrity above the water, in that they prescribe minimum volumes for ballast appendages, and a new "wind velocity test" to evaluate the structural integrity of the canopy in extreme conditions. We believe it would be useful to disseminate that information to the industry and will do so in a "lessons learned" from this casualty, recommending that particularly for use in extreme environments, mariners should consider replacing older liferafts with ones complying with these new requirements.

Recommendation 11: The Coast Guard should determine if an age limit should be imposed on existing liferafts to ensure proper operation in all marine environments and to ensure that all liferafts are compliant with the most current safety requirements. Simply because an older liferaft passes the required periodic tests does not make the liferaft suitable for operational environments that demand greater protection and extended survivability.

Action: We do not concur with this recommendation. We disagree with imposing age limits based on two likely unintended consequences, which stem from the wide variety of equipment available, and the wide range of conditions of stowage and maintenance to which it is subjected. Such a limit could result in many perfectly good, serviceable (and expensive) liferafts being discarded simply because they had reached the arbitrarily established expiration date. However, we do believe consideration should be given to replacing older liferafts with newer one for reasons beyond age, especially for vessels that often operate in extreme environments. To address these reasons, we will publish a lessons learned document based on the results of this report, advising fishing vessel owners and operators to consider the selecting lifesaving equipment that provides greater protection and survivability if their vessels often operate in harsh and cold conditions.

Recommendation 12: The Coast Guard should determine if an age limit should be imposed on immersion suits to account for material deterioration as a result of exposure to UV sunlight, chemicals, humidity and improper storage techniques.

Action: We do not concur with this recommendation. We disagree with imposing age limits based on two likely unintended consequences, which stem from the wide variety of equipment available, and the wide range of conditions of stowage and maintenance to which it is subjected. First, such a limit would result in many perfectly good, serviceable (and expensive) immersion suits being discarded simply because they had reached the arbitrarily established expiration date. Second, it could result in immersion suits that are unserviceable being kept in service past their useful life simply because they had not reached that date. However, we do believe action can be taken by fishing vessel owners and operators to ensure that immersions suits on their vessels are fit for service, regardless of age. Of particular importance is the proper care of lifesaving equipment, especially when it is for use in extreme environments. Although it is not at present mandatory, Navigation and Vessel Inspection Circular (NVIC) 01-08, Shipboard Inspection and Testing of Immersion Suits, if conscientiously applied by vessel owners and operators, will go a long way to ensuring that immersion suits remain fit for service regardless of age. Based on the results of this report, we will publish lessons learned, referencing NVIC 01-08 highlighting the importance of periodically inspecting and testing immersion suits outside of and during CFVS exams to ensure they are fit for service.

Recommendation 13: The Coast Guard should amend 46 CFR 160.171 to include the minimum equipment recommended in NVIC 1-92 be carried on each immersion suit to facilitate locating personnel in the water.

Action: We partially concur with this recommendation. We are initiating a rulemaking project to consider amendments to our general immersion suit regulations in 46 CFR 160.171 that will address the issue of fitting immersion suits with equipment, such as lights and whistles, in an attempt to improve consistency with current International Maritime Organization requirements. We are also considering this issue strictly within the commercial fishing industry as part of a fishing vessel safety rulemaking project currently underway. However, it should be noted that not all immersion suits have the means to carry additional equipment as recommended in the Navigation and Vessel Inspection Circular (NVIC) 1-92, and that some of the recommended items are not regulated by the Coast Guard.

Recommendation 14: The Coast Guard should require all commercial fishing vessels that operate beyond the boundary line to have an emergency means to communicate such as a satellite telephone or GMDSS. (ARCTIC ROSE ROI, Recommendation 7)

Action: We concur with this recommendation. We are including this issue as part of a fishing vessel safety rulemaking project currently underway.

Recommendation 15: The Coast Guard should publish a Safety Alert that details the limitations and potential hazards of modular liferafts when used in inclement and/or cold weather environments. Consideration should be given to employing liferafts that provide the greatest

amount of protection and survivability especially for fishing vessels operating in the harsh environments often prevalent in the North Pacific and Bering Sea.

Action: We concur with the intent of this recommendation. We agree that fishermen should be reminded of the need to consider the particular environment conditions they are likely to be operating in when selecting lifesaving equipment for use on their vessels. In those instances where they will often be working in harsh and cold conditions, they should consider selecting lifesaving equipment that provides greater protection and survivability. We will use the contents of this report to publish a lessons learned to the industry discussing this topic.

Recommendation 16: The Coast Guard should publish a Safety Alert that informs fishing vessel owners to routinely inspect immersion suits on their vessels for damage and deterioration. This notice should also recommend fishing vessel owners to consider the assignment of immersion suits to individual crewmembers to ensure that crewmembers don properly sized immersion suits in the event of an emergency.

Action: We concur with the intent of this recommendation. We intend to publish a lessons learned from this investigation, referencing Navigation and Vessel Inspection Circular (NVIC) 01-08, highlighting the importance of periodically inspecting and testing immersion suits and ensuring individual crewmembers are assigned immersion suits that are properly sized.

Recommendation 17: The Coast Guard should promulgate a policy that requires all commercial fishing vessel owners to revise vessel stability information following major modification or when fishing operations are changed.

Action: We concur with the intent of this recommendation. Current regulations in 46 CFR Part 28, Subpart E, address the topic of revising stability information after modifications for vessels 79 feet in length or greater. We are currently reviewing the issue as part of a current fishing vessel safety rulemaking project. In an Advance Notice of Proposed Rulemaking (ANPR), 73 FR 16815, we discussed potential changes to these requirements, including the possibility that it could be made applicable to vessels less than 79 feet.

Recommendation 18: The Coast Guard should require liferaft manufacturers to develop checklists to ensure critical inspection items are completed during the servicing process by approved liferaft servicing facilities. This should be accomplished by using a witness other than the servicing technician to confirm critical inspection items have been conducted.

Action: We do not concur with this recommendation. Although the report concludes that the liferafts "may have" been improperly serviced, based on the facts available we believe this is unlikely. In any case, the regulations already contain comprehensive requirements for approved servicing manuals, training for certification of servicing technicians, and documentation of servicing. Most manufacturers do incorporate some kind of checklist in the forms they use to comply with the documentation requirements. In general, we have not seen any indication that these provisions are inadequate to ensure correct and thorough servicing. Inspection processes and job aids are periodically reviewed during oversight visits to servicing facilities already performed by Officers in Charge, Marine Inspection (OCMI).

Recommendation 19: The Coast Guard should develop a policy to require Coast Guard approved liferaft servicing facilities to develop and implement quality assurance programs to ensure that all aspects of the liferaft servicing process are performed in accordance with Coast Guard and manufacturer requirements.

Action: We concur with the intent of this recommendation. Although the report concludes that the liferafts "may have" been improperly serviced, based on the facts available we believe this is unlikely. The requirement to perform servicing in accordance with the regulations and manufacturer requirements is stated explicitly in every liferaft facility approval letter. Nevertheless, as discussed in our action for recommendation 9, we are taking action to promote more consistent oversight of servicing facilities by Officers in Charge, Marine Inspection (OCMIs), which will include auditing servicing facility compliance with the requirements.

Recommendation 20: The Coast Guard should develop a policy that requires all commercial fishing vessel owners to maintain crew training records.

Action: We concur with this recommendation. We are considering this issues as part of the commercial fishing vessel safety rulemaking project currently underway.

Recommendation 21: The Coast Guard should develop guidance regarding the proper maintenance of watertight doors and recommend that all commercial fishing vessel owners perform routine inspections of all watertight doors onboard their vessels.

Action: We concur with the intent of this recommendation. We intend to publish a lessons learned as a result of this investigation discussing proper maintenance and inspection of watertight doors on commercial fishing vessels. We are also considering this issue as part of the commercial fishing vessel safety rulemaking project currently underway as it relates to such topics as stability, watertight integrity, self-inspections, and pre-departure reports.

Recommendation 22: The Coast Guard should identify all fish processing vessels and fishing vessels performing head and gut operations which are operated or home ported in the Thirteenth and Seventeenth Coast Guard Districts. A risk assessment of these vessels should be performed to determine whether additional local safety interventions are necessary to mitigate risk to crewmembers participating in these fisheries.

Action: We concur with this recommendation. We are already in the process of identifying all vessels that are performing any kind of fish processing and assessing whether existing safety requirements should be imposed or whether an alternate compliance regime, similar to the Alternate Compliance and Safety Agreement (ACSA) Program, may be successfully implemented to mitigate risks to the vessels and their crewmembers.

Recommendation 23: The Coast Guard should consider deploying Coast Guard SAR assets in Adak, AK to improve SAR capabilities in D17.

Action: We concur with the intent of this recommendation. We support any pre-deployment or staging of assets that increases search and rescue response effectiveness. Our search and rescue readiness and mission response standards, published in the U.S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), provide resource planning guidance to our District and Sector Commanders, who are responsible for the siting, basing, or staging of assets. In making their resource deployment decisions, they must take into account resource constraints, environmental considerations and other factors. In light of this investigation's findings, we will forward a copy of this report to the Coast Guard's Seventeenth District Commander for review and consideration of this recommendation.

Recommendation 24: The Coast Guard should conduct an analysis of commercial fishing vessel casualties to determine the frequency of human factors including fatigue, work-related stress, drug/alcohol use, and/or working conditions as causal or contributing factors.

Action: We concur with this recommendation. We will conduct an analysis of commercial fishing vessel casualties to determine the frequency of human factors including fatigue, work-related stress, drug/alcohol use, and/or working conditions as causal or contributing factors.

Recommendation 25: The Coast Guard should increase emphasis on commercial fishing vessel casualty investigations to focus on the collection of human factors related information including fatigue, work-related stress, drug/alcohol use, and/or working conditions.

Action: We concur with the intent of this recommendation. In keeping with our marine investigations policy regarding levels of effort and giving consideration to constraints on investigation resources, we agree that efforts should be made to collect human factors related information during marine casualty investigations when such information is useful in carrying out our responsibility determine the causal factors for marine casualties.

Recommendation 26: The FPV COURAGEOUS and FPV PATRICIA LEE should receive Public Service Awards for their actions and efforts during the search and rescue operations following the sinking of the F/V KATMAI.

Action: We concur with this recommendation and note the awards have been approved by the Commander, Seventeenth Coast Guard District, and will be presented in the near future.

Recommendation 27: A copy of this report should be provided to the National Transportation Safety Board.

Recommendation 28: A copy of this report should be provided to the International Maritime Organization.

Recommendation 29: A copy of this report should be provided to families of the next-of-kin, the owner of the F/V KATMAI, and Puget Sound Inflatables.

16732

APR 26 2010

Recommendation 30: This report should be given wide dissemination throughout the commercial fishing industry vessel community including major fisheries journals, the National Council on Fishing Vessel Safety and Insurance, the North Pacific Fishing Vessel Owners' Association, The Alaska Marine Safety Education Association, The Society of Architects and Marine Engineers, The Groundfish Forum and other major fishing vessel associations in the Pacific Northwest.

Recommendation 31: Notice of this report should be provided to each Coast Guard District Fishing Vessel Safety Coordinator.

Action: We concur with recommendations 27 through 31. Copies of this report will be provided to those parties identified in the recommendations. In addition, an electronic version of the report will be made publicly available for downloading on our HOMEPORT website at http://homeport.uscg.mil/ in the Investigations section.

Recommendation 32: Recommend this investigation be closed.

Action: This investigation is closed.

Brian M. Salerno
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Marine Safety,
Security and Stewardship

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street S.W.
Washington, DC 20593-0001
Staff Symbol: CG-5452
Phone: (202) 372-1223
FAX: (202) 372-1907

16732
May 29, 2009

MEMORANDUM

From: Marine Board of Investigation

To: Commandant (CG-545)

Subj: SINKING OF THE F/V KATMAI IN THE AMCHITKA PASS, NORTH PACIFIC OCEAN, ON OCTOBER 22, 2008 WITH MULTIPLE LOSS OF LIFE

Ref: (a) Marine Board of Investigation Designation Letter, dated October 24, 2008
(b) COMDTINST 16000.10A, USCG Marine Safety Manual, Volume V

1. In accordance with reference (a), the Commandant required that a Marine Board of Investigation be convened to conduct a formal investigation into the sinking of the F/V KATMAI that occurred on October 22, 2008. The board consisted of CDR Malcolm R. McLellan (Chairman), LT [redacted] (USCG Member), and LT [redacted] (USCG Member, Recorder).

2. With the investigative assistance of the Investigations Division of Sector Anchorage, D13 Investigations and SJA Staff, and the U.S. Coast Guard Marine Safety Center, we held four public hearings and conducted numerous interviews. In accordance with reference (b) we were able to gather facts, conduct analyses, draw conclusions, and make recommendations regarding this terrible tragedy.

3. The Report of Investigation detailing the causal factors that lead to the casualty as well as proposed recommendations to prevent future similar casualties is attached as an enclosure to this Memorandum. All times listed in this Report of Investigation were translated to Zulu time (Greenwich Mean Time) to account for the multiple time zones involved in this casualty. The MISLE activity number is: 3351236.

4. The primary causal factors that led to this casualty were attributed to: (1) imprudent voyage planning given forecasted weather conditions; (2) failure to maintain watertight boundaries; (3) excessive loading of cargo in the vessel's hold; and (4) exposure to heavy winds and high seas. The cause of the flooding in the engine room remains unknown.

5. Several recommendations from this investigation focus on the inspection and stability requirements for commercial fishing vessels. Additional recommendations are included to improve the monitoring of watertight doors, licensing of fishing vessel masters, and revising 46 CFR Part 28. Numerous recommendations are also provided to enhance safety drills and lifesaving equipment requirements with a specific focus on liferafts and immersion suits. Several of the applicable recommendations were also noted in the Report of Investigation for the F/V ARCTIC ROSE casualty but have not been implemented to date.

Subj: SINKING OF THE F/V KATMAI IN THE AMCHITKA PASS, NORTH PACIFIC OCEAN, ON OCTOBER 22, 2008 WITH MULTIPLE LOSS OF LIFE

6. Upon review and approval by the Commandant, it is recommended that this investigation be closed.

[redacted]

M. R. MCLELLAN, Commander, USCG
Chairman

[redacted]

[redacted], Lieutenant, USCG
Member

[redacted]

[redacted], Lieutenant, USCG
Member and Recorder

Enclosed: F/V KATMAI Report of Investigation

TABLE OF CONTENTS

A. LIST OF ABBREVIATIONS

ACSA	-	Alternative Compliance and Safety Agreement
ADF&G	-	Alaska Department of Fish & Game
AIRSTA	-	Air Station
ANG	-	Air National Guard
ASTM	-	American Society for Testing and Materials
BSAI	-	Bering Sea / Aleutian Islands
CFR	-	Code of Federal Regulations
CFVSE	-	Commercial Fishing Vessel Safety Examination
CGC	-	Coast Guard Cutter
COMSTA	-	Communications Station
EPIRB	-	Emergency Position Indicating Radio Beacon
FCC	-	Federal Communications Commission
FOIA	-	Freedom of Information Act
FPV	-	Fish Processing Vessel
FT	-	Feet
F/V	-	Fishing Vessel
GMDSS	-	Global Maritime Distress & Safety System
GRT	-	Gross Registered Ton
HF	-	High Frequency
H&G	-	Head & Gut
IVO	-	In the Vicinity Of
LCP	-	Legislative Change Proposal
LT	-	Long Ton
MBI	-	Marine Board of Investigation
MHz	-	Mega Hertz
MISLE	-	Marine Information for Safety and Law Enforcement
MMC	-	Merchant Mariner Credential
MSC	-	Marine Safety Center
MSD	-	Marine Safety Detachment
NM	-	Nautical Mile
NMFS	-	National Marine Fisheries Service
NPFVOA	-	North Pacific Fishing Vessel Owners' Association
NPSC	-	North Pacific SAR Coordinator
NTSB	-	National Transportation Safety Board
NVIC	-	Navigation and Inspection Circular
OCMI	-	Officer in Charge of Marine Inspection
OSHA	-	Occupational Safety & Health Administration
P/S	-	Port/Starboard
PSI	-	Pound per Square Inch
RCC	-	Rescue Coordination Center
ROI	-	Report of Investigation
SAR	-	Search and Rescue
SOLAS	-	International Convention for the Safety of Life at Sea
SSB	-	Single Side Band
UMIB	-	Urgent Marine Information Broadcast
USCG	-	United States Coast Guard
VHF	-	Very High Frequency
VMS	-	Vessel Monitoring System

B. LIST OF FIGURES

C. FINDINGS OF FACT

1. EXECUTIVE SUMMARY

During the evening of October 21, 2008, the F/V KATMAI was making way towards Dutch Harbor, AK to offload approximately 120,000 lbs (53.6 LT) of Pacific Cod with the majority of the crew asleep. The vessel was transiting the Amchitka Pass located between the Rat and Andreanof Islands in the Aleutian Islands. Testimony indicated that it was raining with 25 to 35 foot seas and 55-90 knot winds. The Captain stated that the vessel had a port heel caused by the wind and seas. At approximately 0800Z (0000 local time) on October 22, the Captain realized that the vessel had lost steering and ordered the Engineer to investigate the problem. The Captain immediately attempted to notify Communications Station (COMSTA) Kodiak using the vessel's Single Side Band (SSB) radios on frequencies 4125 and 2182 with no response. The Captain then tried to report the vessel's situation on channel 16 of the vessel's VHF radio with no response. Using the vessel's SkyMate® Vessel Monitoring System (VMS), the Captain sent an email to the F/V BLUE BALLARD to report that the F/V KATMAI had lost steering.

The Engineer proceeded to the lazarette which contained the steering gear and noticed that the watertight door to the space was open and that the space was flooded. The Engineer reported the flooded lazarette to the Captain and then proceeded to the engine room to start the bilge system to dewater the lazarette. The Captain sent a second email to the F/V BLUE BALLARD stating that the lazarette was flooded. The Engineer was able to start the bilge pump and reported to the Captain that the water level in the lazarette was going down. Testimony also indicated that there were several inches of water accumulated in the processing space.

During the dewatering efforts, the Captain had the entire crew, except for the Engineer, muster on the bridge and don immersion suits. When it appeared that the flooding in the lazarette was under control the Captain had the crew remove their immersion suits. The vessel then took a starboard list and the Captain ordered a Deckhand to check the engine room. Upon arrival in the engine room, the Deckhand noticed that it was flooded 1 to 2 feet above the deck plates. The Captain again ordered the crew don immersion suits and to prepare the liferafts for abandoning ship. The flooding appeared to progress and the vessel continued listing to starboard and down by the stern. The cause for the rapid flooding of the engine room remains unknown. Approximately five minutes after the vessel listed to starboard the Captain ordered the crew to abandon ship. Prior to abandoning ship the Deck Boss noticed that the aft watertight door to the processing space was open. During a conversation between the Captain and the Engineer, a Deckhand heard that the aft deck of the F/V KATMAI was submerged and that water was entering the processing space. Testimony also indicated that the Engineer may have put the engines in forward gear immediately prior to the F/V KATMAI sinking causing the stern to sink more and increasing the starboard list. Approximately 10 minutes prior to abandoning the vessel, the Captain activated the EPIRB.

Seven crewmembers abandoned the F/V KATMAI to a liferaft that was located off the starboard bow and three of the crew abandoned the F/V KATMAI from the fishing deck on the starboard side where the second life raft was deployed. The Engineer was last seen entering the engine room and is believed to have gone down with the vessel. The F/V KATMAI sank at approximately 0845Z (0045 local), October 22. The last known position of the F/V KATMAI reported by the VMS at 0734Z (2334 local time), October 22 was 51° 58.89' N, 179° 21.54' W.

Of the 11 crew onboard, 4 were ultimately rescued, 5 deceased members were recovered, and 2 remain missing and are presumed dead.

At 0907Z (0107 local time), October 22, the North Pacific SAR Coordinator (NPSC) received a 406 MHz alert in the vicinity of Adak , AK from the EPIRB registered to the F/V KATMAI. At 0954Z (0154 local time), the F/V BLUE BALLARD reported to NPSC that the F/V KATMAI sent emails stating that the vessel had lost steering and had a flooded lazarette.

An immediate response to the alert was ordered by NPSC using C-130 and H-60 assets from USCG Air Station (AIRSTA) Kodiak. Due to immediate unavailability of USCG C-130 support, a C-130 from the Kulis Alaska Air National Guard Base in Anchorage, AK was requested and provided. The USCGC ACUSHNET was also launched to provide assistance with search and rescue efforts. Two Good Samaritan vessels, the FPV COURAGEOUS and FPV PATRICIA LEE, were also requested and agreed to assist in the search and rescue operations.

The four survivors were located at 0028Z (1628 local time), October 23 by Coast Guard helicopter CG6005 at position 51° 32.37' N, 179° 50.20 W approximately 25 miles east of Amchitka Island. Coast Guard helicopter CG6005 also recovered one deceased crewmember at 2104Z (1304 local time), October 22. The FPV COURAGEOUS located and recovered one deceased crewmember and the FPV PATRICIA LEE located and recovered three deceased crewmembers. Both Good Samaritan vessels recovered miscellaneous debris from the F/V KATMAI including one of the vessel's life rafts and EPIRB. All debris and recovered deceased were transported to Adak, AK by the FPV COURAGEOUS. All search and rescue operations were officially suspended by the Coast Guard at 1736Z (0936 local time), October 26 with two F/V KATMAI crew missing.

2. VESSEL PARTICULARS

F/V KATMAI	
Name:	KATMAI
Official Number:	918779
Service:	Fishing
Document Endorsements:	Coastwise, Fishery, Registry
Year Built:	1987
Hull Material:	Steel
Built By:	Patti Shipyard – Pensacola, FL
Gross Tonnage:	148 GRT
Net Tonnage:	101 NRT
Length Overall:	92.2 ft
Registered Length:	73.3 ft
Breadth:	26 ft
Depth:	10.1 ft

Propulsion:	Diesel reduction
Horsepower:	600
Estimated Market Value:	$ 1,500,000
Estimated Replacement Cost:	$ 5,000,000
Hailing Port:	Kodiak, AK
Inclining Test Conducted & Location:	July, 1996 – Foss Shipyard, Seattle, WA
Date of Recent Stability Report:	August 16, 1996
Load Line Certificate:	None
CFVSE Decal:	135910
Port Issued:	Seattle, WA
Inspection Office:	Sector Seattle
Date Issued:	December 7, 2007
Owner	Katmai Fisheries, Inc.
Operator	Katmai Fisheries, Inc.

3. PERSONNEL INFORMATION

Deceased	DOB	Position	Date of Hire	Next of Kin
Jake Gillman	[redacted]	Processor/ Deckhand #3	09/30/2008	[redacted]
Glenn Harper	[redacted]	Deckhand #1	06/04/2008	[redacted]
Fuli Lemusu	[redacted]	Processor #1	06/04/2008	[redacted]
Joshua Leonguerrero	[redacted]	Processor/ Deckhand #4	08/29/2008	[redacted]
Cedric Smith	[redacted]	Processor Foreman	06/04/2008	[redacted]

Missing	DOB	Position	Date of Hire	Next of Kin
[redacted]	[redacted]	Chief Engineer	08/06/2008	[redacted]
[redacted]	[redacted]	Deckhand [redacted]	09/07/2008	[redacted]

Survivors	DOB	Position	Date of Hire

[redacted]	[redacted]	Processor/Deckhand [redacted]	08/29/2008
[redacted]	[redacted]	Captain	06/04/2008
[redacted]	[redacted]	Processor/Deckhand [redacted]	08/29/2008
[redacted]	[redacted]	Deck Boss	06/04/2008

Parties in Interest	**Role**	**Counsel**
Katmai Fisheries, Inc.	Owner/Operator	[redacted], [redacted] (Holmes Weddle & Barcott)
Puget Sound Inflatables	Liferaft Servicing Facility	[redacted] (Cox, Wootton, Griffin, Hansen & Poulos, LLP)

F/V KATMAI prior to the incident

4. VESSEL DESCRIPTION

a. General

The F/V KATMAI was an all steel single deck, raised forward, twin screw typical combination fishing vessel with a raked stem, hard chine hull and square stern which operated primarily in the North Pacific Ocean and Bering Sea. The vessel operated as a Head and Gut (H&G) processor meaning the catch was beheaded and gutted in preparation for freezing and packaging in the processing space.

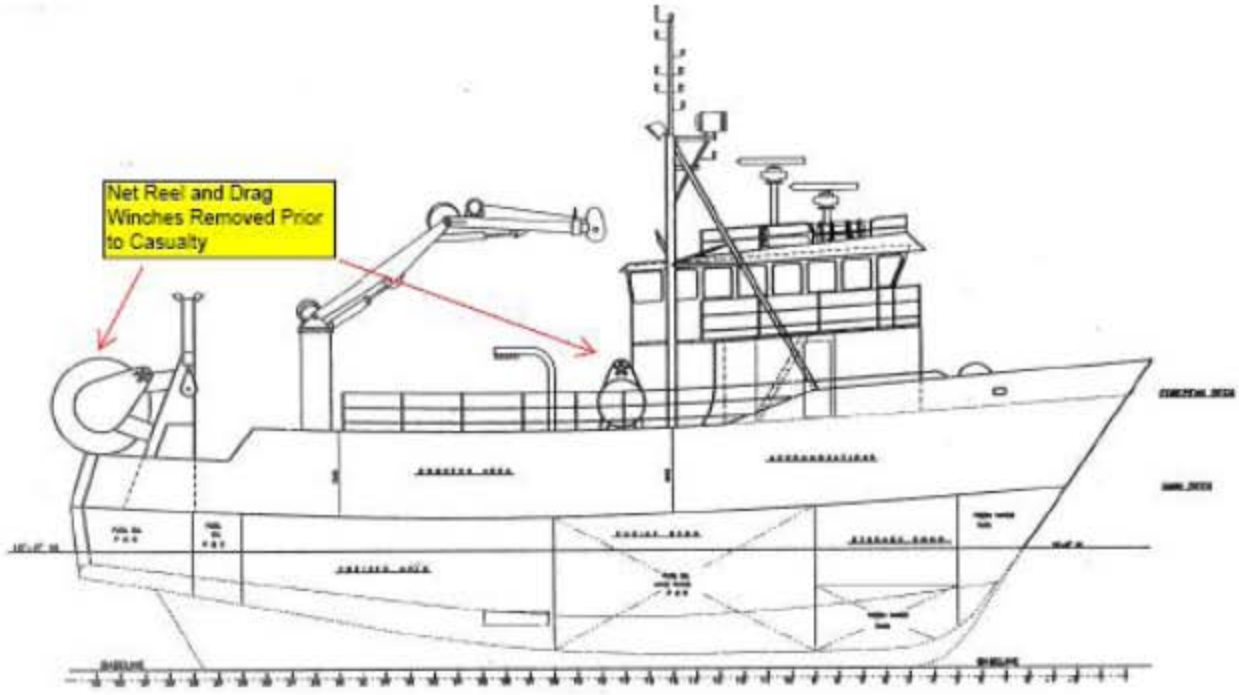


Figure 1: Profile Drawing of F/V KATMAI

b. <u>Hold Level</u>

The Hold Level of the F/V KATMAI consisted of multiple compartments as shown in Figures 2 & 3.

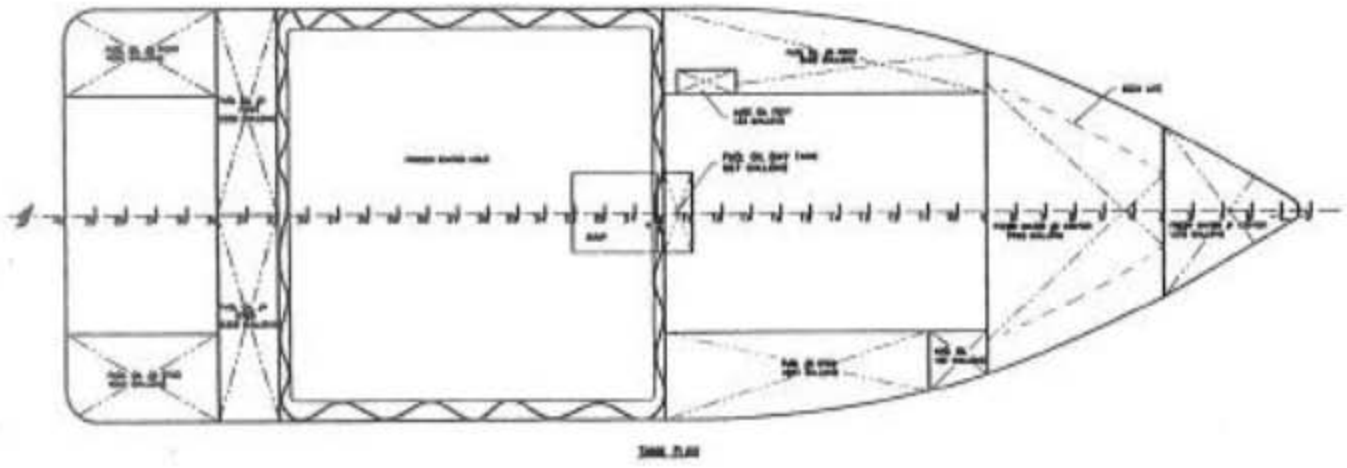
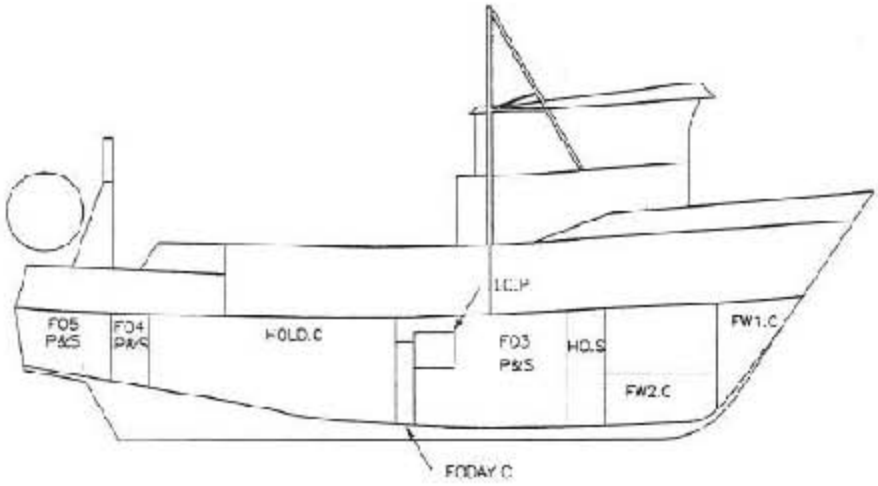


Figure 2: Hold & Tank Drawing of F/V KATMAI



TANK LEGEND

Figure 3: Tank Locations on F/V KATMAI

1) Forepeak

This tank was used for fresh water with a capacity of 1,378 gallons. The #1 Fresh Water Tank was empty at the time of the casualty.

2) Stores

This space was used as dry storage and a work area. See Appendix 4 for the equipment contained in this space. The #2 Fresh Water Tank was located below the stores space with a capacity of 2,703 gallons. The #2 Fresh Water Tank was full at the time of the casualty.

3) Engine Room

The engine room space contained all of the F/V KATMAI's primary propulsion and electrical machinery. See Appendix 4 for the equipment contained in the Engine Room. Outboard of the engine room were four wing tanks holding fuel oil, hydraulic oil, and lube oil. The capacities of these tanks were: #3 Starboard F/O Tank – 4,624 gallons, #3 Port F/O Tank – 5,162 gallons, Port Lube Oil Tank – 133 gallons, and Starboard Hydraulic Oil Tank – 451 gallons. The fuel oil day tank was located on the centerline aft bulkhead of the engine room with a capacity of 657 gallons. Approximately 5,500 gallons of fuel in the #5 fuel tanks was transferred to the #3 saddle tanks prior to the casualty.

A review of the emails transmitted during the vessel's voyage using the SkyMate® VMS revealed that the GMC 6-71 75 KW generator was inoperable. The Captain and vessel operations manager indicated that the two remaining generators would have been sufficient to handle all electrical loads on the F/V KATMAI.

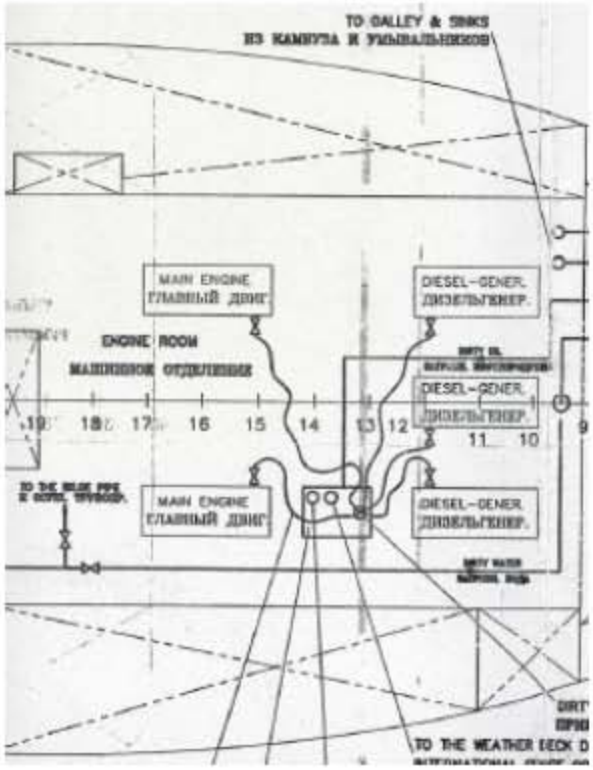


Figure 4: F/V KATMAI Engine Room

4) Cargo Hold (freezer)

Access to this space was through a hatch in the floor of the fish processing space as indicated in Figure 5. The processed fish was frozen and packaged in nylon-lined paper bags and sealed with tape. The bags were targeted to contain 45 pounds of finished product. They were stacked in the refrigerated cargo hold into separate bins as shown in Figure 6. The most current stability analysis of the F/V KATMAI was based on the cargo hold containing 60,000 lbs or 26.79 LT of frozen cargo. Testimony indicated that at the time of the casualty there was approximately 120,000 lbs or 53.57 LT of Pacific Cod in the cargo hold. The #4 P/S Fuel Tanks were located directly aft of the cargo hold and had a capacity of 2,380 gallons each. The #4 P/S Fuel Tanks were full at the time of the casualty.

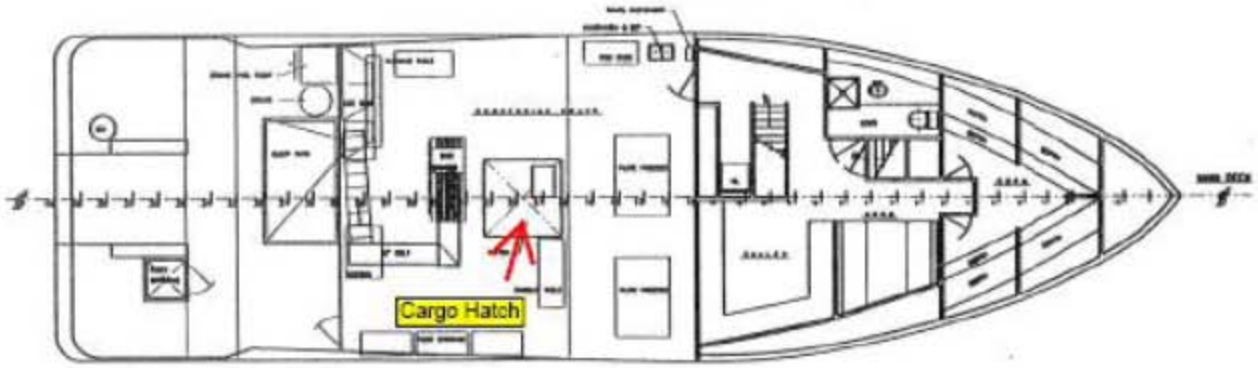


Figure 5: Main Deck of F/V KATMAI

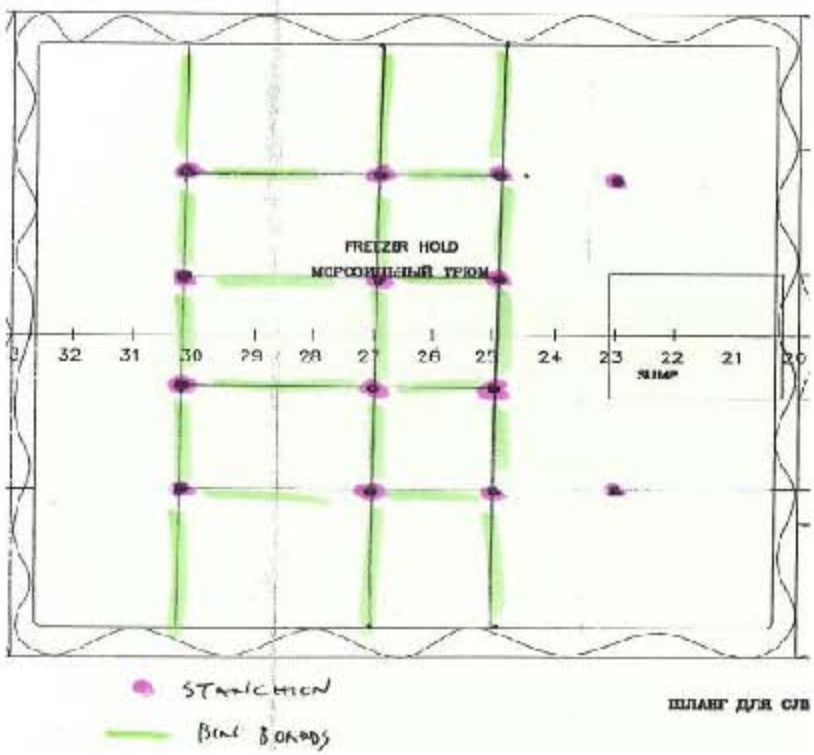


Figure 6: F/V KATMAI Cargo Hold Layout (Drawn by Vessel Operations Manager)

5) Lazarette

The lazarette was the aft most space of the vessel and contained the vessel's two hydraulic rams driving the rudders. Figure 7 provides a description of the equipment contained in the lazarette. The space was also outfitted with one 110 Volt portable submersible dewatering pump. Outboard of the lazarette were the #5 P/S Fuel Oil Tanks which had a capacity of 1,854 gallons each. The #5 P/S Fuel Oil Tanks were empty at the time of the casualty.

Testimony indicated that there may have been a 1½" – 2" drain in the forward bilge on the centerline of the lazarette that could have permitted water to drain directly into the engine room. This drain may not have worked properly or may have been plugged through a previous modification that prevented water from draining from the lazarette into the engine room. A previous engineer on the vessel also indicated that the lazarette bilge drain was tied into the engine room bilge system which would have permitted water in the lazarette bilge to be pumped out from the engine room.

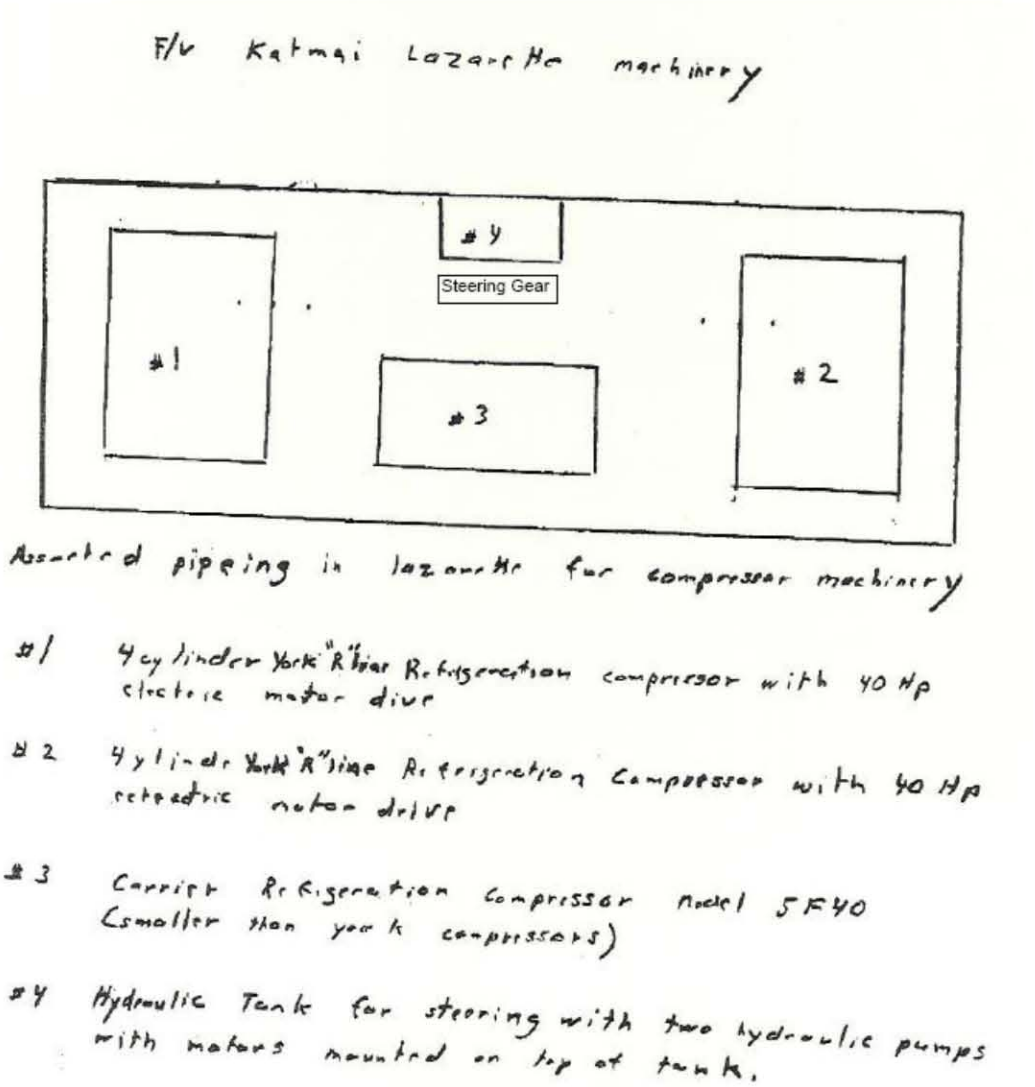


Figure 7: Layout of F/V KATMAI Lazarette (Drawn by Vessel Operations Manager)

c. Main Deck (Processing Space)

The processing space contained two Jackstone Foster plate freezers, four sump pumps, two electric motor driven condenser pumps, chiller tank, boxing table, Marcel M2000 digital scale, double stainless sinks, conveyors, sorting machine, heading machine, Larkin six fan air conditioning system and Jennair refrigerator/freezer. There were manually operated watertight doors on the port forward bulkhead and starboard aft bulkhead of the processing area that permitted access to the accommodation area and shelter deck, respectively. The Deck Boss indicated that the starboard aft watertight door may not have sealed properly and that it was open immediately preceding the sinking of the F/V KATMAI. The vessel operations manager stated that he was unaware of any problems with this door. Testimony also indicated that it was not uncommon to have 2" to 3" of water accumulate in the processing space especially during processing operations.

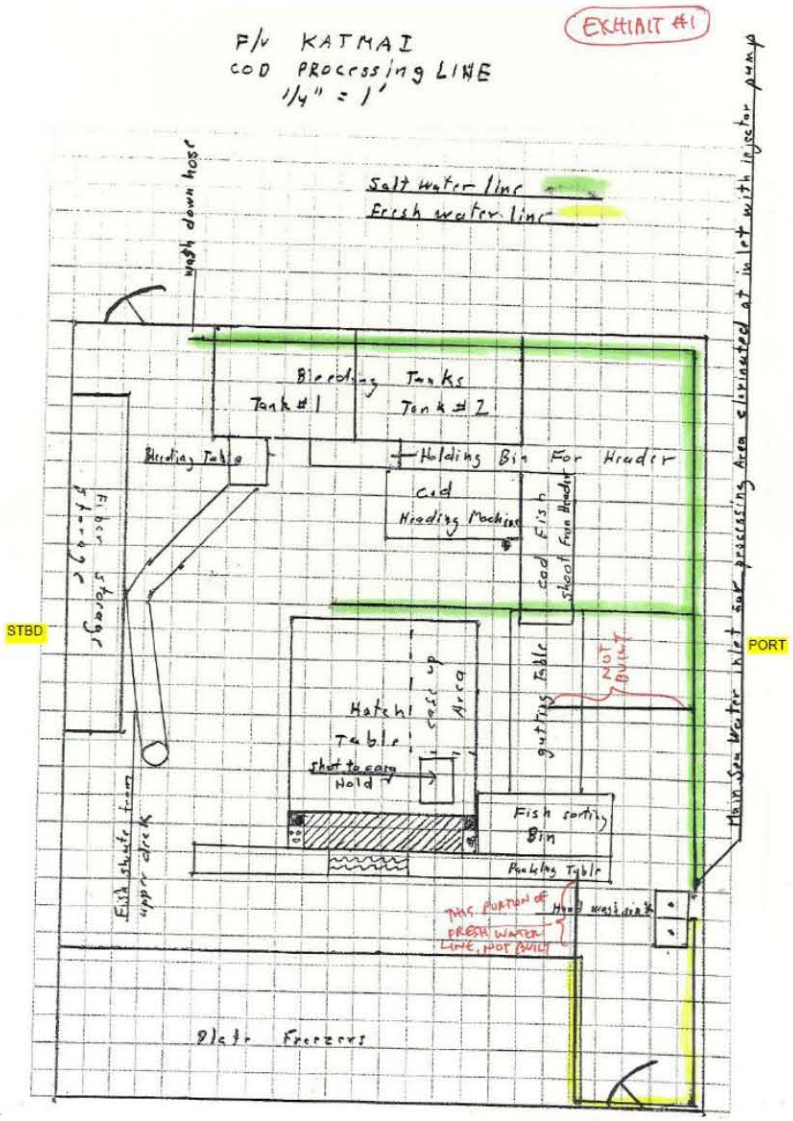


Figure 8: F/V KATMAI Processing Space (Drawn by Vessel Operations Manager)

d. Main Deck (Shelter Deck)

Directly aft of the processing space was the shelter deck. An Aurora hydraulic crane and Copeland refrigeration compressor driven by a 7 ½ hp motor was located on the forward port side of the shelter deck. A trawl gantry was located over the top of the shelter deck. The watertight door to the lazarette was located on the starboard side of the shelter deck. A hatch, flush with the deck, also providing access to the lazarette was located on the port side of the shelter deck. A 37" high steel bulwark enclosed the shelter deck and contained six scuppers.

The shelter deck was also used to prepare bait and to store fishing gear and equipment including bait totes, cod weight chains, spare Freon and spare transmission oil. Prior to the casualty, there were approximately 4 drums of transmission oil, 3 totes of bait, 12 black cod weight chains, 12 grey cod weight chains, and a Freon bottle stored on the shelter deck.

Testimony indicated that water would accumulate from 10" to 36" on the shelter deck during rough weather conditions.

e. Main Deck (Berthing and Accommodations)

The Main Deck forward of the Processing Space was divided as follows: all the way forward was the forepeak with a seven bunk stateroom with port and starboard doors and storage space, next a ladder way to below deck storage. See Appendix 4 for a listing of equipment located in the galley.

The crew head, containing a sink, shower and toilet was located to the port of the galley. Further aft was an engine room access and watertight door aft to the enclosed processing area.

F/V KATMAI Forward Berthing

F/V KATMAI Galley

f. <u>Superstructure and Wheelhouse Decks</u>

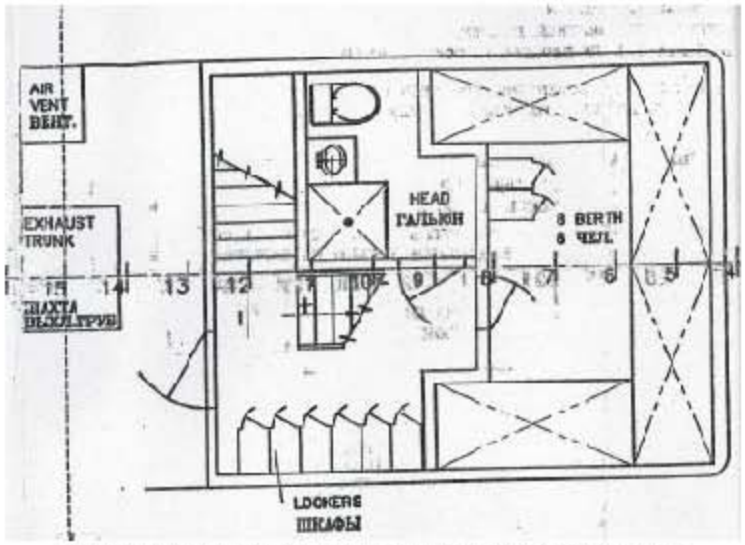


Figure 9: Superstructure Deck of F/V KATMAI

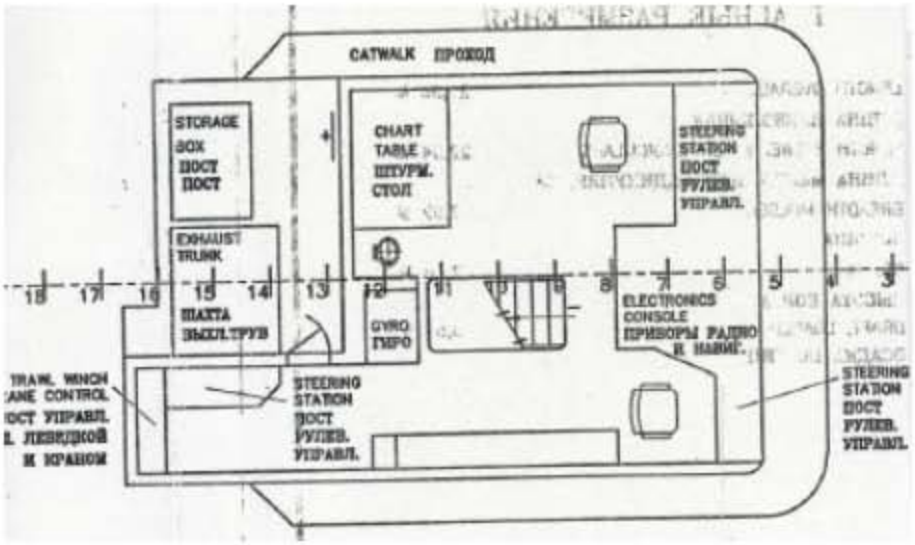


Figure 10: Wheelhouse Deck of F/V KATMAI

Figures 9 and 10 provide details of the Superstructure Deck and Wheelhouse Deck.

1) Superstructure Deck (Deckhouse)

On the superstructure deck forward were crew quarters with eight bunks and two lockers. Aft to port was a crew head with toilet, sink and shower. To starboard were six lockers for storage. At the aft end of the forepeak level of the deckhouse was an access way to the forecastle head and a thwart ship stairway. A weathertight door was located on the starboard aft deckhouse for access to the aft superstructure deck.

2) Superstructure Deck (Aft)

On the aft portion of the forepeak deck, fishing operations were performed. This deck was used to store a majority of the fishing gear when the vessel was in transit. Testimony indicated that there were 420 to 450 cod pots on this deck at the time of the casualty ranging in weight from 37 lbs to 43 lbs. An access hatch to the processing space was located in the deck as shown in the pictures below.

Fishing Deck

3) Wheelhouse Deck

The pilothouse was located on the wheelhouse deck. The pilothouse had three helm stations. The helm configuration for this vessel consisted of electro-hydraulic toggle demand steering stations with the primary steering station located on the starboard side of the pilothouse, a second station located amidships, and the third station located starboard aft facing aft for deploying and retrieving fishing gear. See Appendix 4 for a listing of the equipment installed in the pilothouse. The Captain indicated that the Furuno 207 weather fax was inoperable due to a lack of ink/stylus and that he believed the system was tuned to a Hawaii radio frequency. He also stated that the Furuno 207 operator's manual was not onboard the vessel prior to the casualty.

The vessel was not equipped with an emergency steering system.

F/V KATMAI Pilothouse

g. Watertight/Weathertight Doors and Hatches

There were watertight doors located at the entrance to the lazarette and the forward & aft entrances to the processing space. There were two weathertight doors going into the deckhouse, one located on the aft starboard side of the deckhouse on the superstructure deck and one on the aft starboard inboard bulkhead of the pilothouse. Testimony indicated that the watertight door located on the aft entrance into the processing space may not have sealed properly. The Deck Boss stated that he "could see light through the crack of the door on the bottom and on the top and everywhere except" where the "latch came out and around the hinges." None of the watertight doors on the F/V KATMAI were visible from the pilothouse nor were they equipped with indicators that would let the operator in the pilothouse know the position of the doors.

There were three deck hatches on the F/V KATMAI, one in the overhead of the lazarette on the port side, one in the overhead of the processing space and one in the deck of the processing space providing access to the cargo hold.

5. FIREFIGHTING AND LIFESAVING EQUIPMENT

a. Firefighting Equipment

See Appendix 4 for a complete listing of the firefighting equipment installed on the F/V KATMAI.

b. Lifesaving Equipment

1) Liferafts

There were two inflatable life rafts manufactured by SMR Technologies, Inc. located on top of the pilothouse: one fifteen (15) person Crewsaver manufactured in April 1980 and one ten (10) person Crewsaver manufactured in February 1994. Both liferafts had satisfactory Necessary Additional Pressure (NAP), gas inflation and floor seam tests conducted in November and December 2007, respectively. The hydrostatic release units for the life rafts had expiration dates of November & December 2009.

During the casualty, the 15 person Crewsaver liferaft deployed and inflated satisfactorily, permitting seven of the crew to embark on the liferaft. Crew testimony indicated that they had great difficulty keeping the canopy attached to the liferaft especially with their immersion suits on and as a result the canopy was separated from the liferaft when the liferaft overturned soon after being deployed. The liferaft had ballast chambers but they were not sufficient to prevent the seas and wind from causing the liferaft to overturn multiple times during the 15 hour period facilitating the ejection of personnel in the liferaft. The floor of the liferaft also partially separated from the buoyancy chambers during the 15 hour period that the four survivors were in it.

Based on an examination of the recovered 10 person Crewsaver liferaft, the liferaft did not appear to have inflated properly. Two of the four survivors indicated that they saw the liferaft inflate. The remaining two survivors may not have been in a position to see this liferaft enter the water and did not witness the liferaft inflate. Video footage from a CG search and rescue helicopter showed that the liferaft at least partially inflated when deployed. The liferaft was recovered without a compressed gas cylinder attached, without ballast bags, the floor of the liferaft was separated completely from the buoyancy

chambers and the canopy was missing. The servicing manual for the 10 person Crewsaver liferaft required that the valve assembly on the compressed gas cylinder be attached to the 90 degree elbow on the inflation hose with 30 ft-lbs of torque. The checklist used by the liferaft servicing facility to service this liferaft did not indicate that the ballast bags were inspected or that the compressed gas cylinder was verified to be attached in accordance with manufacturer's specifications. See Analysis section for more information regarding the F/V KATMAI liferafts.

Recovered F/V KATMAI Liferaft

Inflation Hose Bottle Connection

2) Emergency Position Indicating Radio Beacon (EPIRB)

An ACR2774 Satellite2 406 MHz Category I EPIRB with Serial Number 53069 was installed on top of the pilothouse. The EPIRB was purchased in November 2007. All reports indicated that the EPIRB operated properly when it was manually activated by the Captain during the casualty.

Recovered F/V KATMAI EPIRB

3) Ring Life Buoys

Four 30" ring life buoys with float lights were mounted on the exterior of the F/V KATMAI.

4) Immersion Suits

According to crew testimony and upon examination of recovered debris, there were at least twelve (12) Coast Guard approved SOLAS immersion suits onboard the F/V KATMAI. Most were stored in a wood box located directly aft of the pilothouse on the port side but testimony indicated that some of the crew stored their immersion suits in their berthing area. All immersion suits were inspected in December 2007 by the Sector Seattle Commercial Fishing Vessel Examiner. During the casualty the immersion suits were reported to work as designed based on testimony taken from the four survivors. The immersion suits were not assigned/matched to specific crew to ensure that the immersion suits were the proper size for the crewmembers onboard the vessel. Testimony indicated that one of the crewmembers had a cut on the leg of their immersion suit caused during abandon ship operations. An examination of the deceased and testimony from the survivors indicated that some water was able to enter their immersion suits as a result of constant exposure to the rough weather and seas. See Analysis Section for more information regarding the F/V KATMAI's immersion suits.

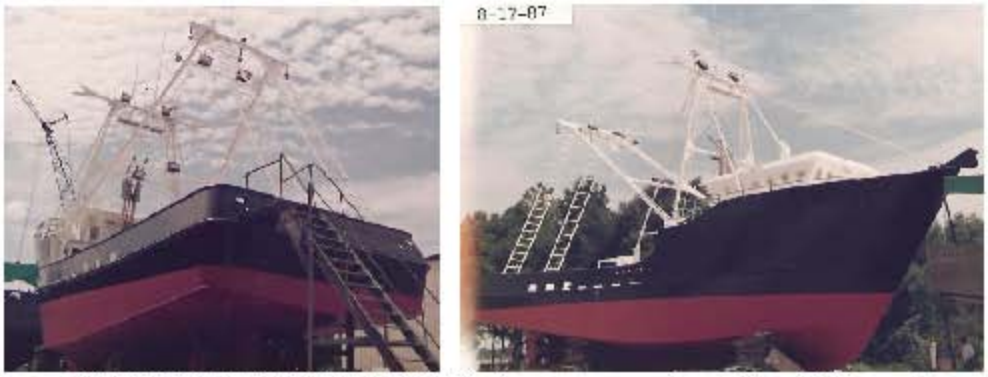
5) Distress Signals

Six hand, three rocket and three smoke emergency flares were carried onboard the vessel. According to testimony, the distress signals were not employed at the time of the casualty. Receipts indicated that these flares were purchased in December 2007.

6. HISTORY OF VESSEL, REPAIRS, MODIFICATIONS AND SURVEYS

a. <u>History</u>

The F/V KATMAI was originally built for Our Mother, Inc. by Patti Shipyard, Inc. in Pensacola, FL in 1987 as a gulf shrimp trawler and named the QUEEN OF THE UNIVERSE with the homeport designated as New Orleans, LA and was documented for Fishery service.



QUEEN OF THE UNIVERSE during construction at Patti Shipyard

The QUEEN OF THE UNIVERSE was sold in 1992 and renamed the AMY S. The AMY S had a designated homeport of Portland, OR and was documented for Fishery service but it is unknown what type of fishery that the vessel was employed in while located in Oregon.

The AMY S was sold in 1993 to Katmai Fisheries, Inc. and renamed the F/V KATMAI. The F/V KATMAI had a designated homeport of Juneau, AK and was documented for Coastwise, Fishery and Registry service. The vessel operated in Alaska targeting side stripe shrimp from 1993 to 1996.

In 1996 the Alaska Department of Fishing Operations banned the use of otter trawls for the catching of side strip shrimp so the vessel did not operate during this period. Katmai Fisheries, Inc. requested and received approval to transfer the F/V KATMAI to Belize then Russian registry and flag without changing the U.S. ownership of the vessel. The F/V KATMAI was never re-flagged and remained under U.S. registry.

In 1998 modifications were made to the F/V KATMAI to permit the vessel to use a long line pot system to catch fish in Hawaii. The vessel operated in Hawaii from June 1998 to June 1999 then returned to Seattle.

In 1999 Katmai Fisheries Inc. changed the homeport of the F/V KATMAI to Kodiak, AK.

During 2000 the F/V KATMAI was laid up in Seattle.

From September 2, 2001 to November 29, 2001, the F/V KATMAI was chartered for 89 days by NMFS and operated in Hawaii. Following this period, the F/V KATMAI was laid up in Hawaii.

From 2003 through 2004, the F/V KATMAI was used to long line pot fish for Spot Prawns in the Gulf of Alaska, Aleutian Islands and South East Alaska.

From March, 2005 to May, 2006, the F/V KATMAI returned to Hawaii to fish for shrimp.

In 2007, the vessel process line was modified to catch and process Pacific Cod. The F/V KATMAI remained in this fishery until the casualty occurred.

b. <u>Modifications</u>

It is unknown what repairs and/or modifications were made to the F/V KATMAI prior to Katmai Fisheries Inc. purchasing the vessel in 1993. Since 1993 the F/V KATMAI had undergone several modifications, two of which included new incline tests and the issuance of new stability reports. It is unknown when the net reel and trawl gantry were added to the vessel.

In 1993 Katmai Fisheries Inc. added a shelter deck, fish processing factory, processing equipment, one plate freezer, evaporator coils to the cargo hold, and condensing equipment with two compressors. A shrimp line was added to produce whole side stripe shrimp packed into 1 kg packages and then frozen. See Figure 12. At this time, the F/V KATMAI had the original pilothouse. Following this modification, an incline test was conducted in October 1993 at Foss Shipyard in Seattle, WA. The maximum cargo reviewed in the loading conditions of the new stability report was 32.59 long tons (LT) of frozen cargo. The stability report did not specify the maximum amount of cargo that could be carried on the vessel.

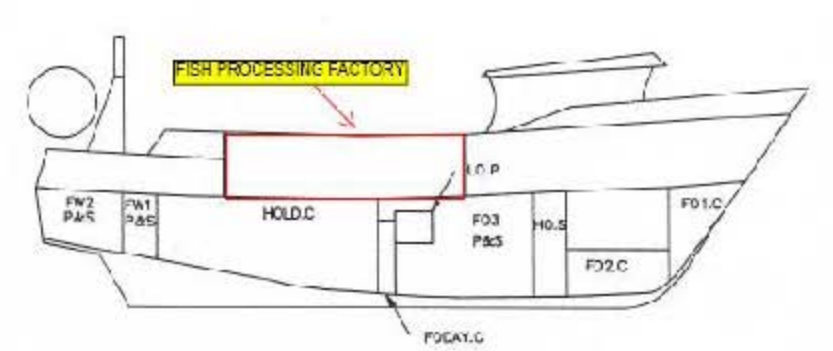


Figure 11: F/V KATMAI following addition of fish processing factory in 1993

In 1996 Katmai Fisheries Inc. added a new wheelhouse to the F/V KATMAI, modifying the deckhouse to three levels from the original two levels that were installed when the vessel was constructed. Also added during this modification was an additional plate freezer and refrigeration compressor. See Figure 1. Following this modification, an incline test was conducted in July 1996 at Foss Shipyard in Seattle, WA. The maximum cargo reviewed in the loading conditions of the revised stability report was 26.79 long tons (LT) of frozen cargo. The stability report did not specify the maximum amount of cargo that could be carried on the vessel.

In 1998 modifications were made to the vessel for fishing a long line pot system for catching and processing shrimp in Hawaii. The trawl winches, net reel and shrimp holding bin in the aft section were removed. An aluminum line bin was added to the aft deck and a live holding tank (the same tank used as a cod bleeding tank in 2008) was added to the process area. Approximately 400 rectangular shaped pots (2'x2'x4'; 50 lbs each) for fishing shrimp were added to the vessel. The vessel operations manager stated that a new incline test was conducted following this modification but no records of this test or a new stability report were available for examination.

During the period of October to November 2007, Katmai Fisheries Inc. drydocked the F/V KATMAI in Northlake Shipyard in Seattle, WA to perform routine maintenance and to modify the vessel to enable it to perform Pacific Cod fishing/processing operations. This modification included the addition of a bait chopper, heading machine, and associated piping in the fish processing factory. One of the plate freezer frames was replaced and six freezer plates were removed. The shrimp pots were also replaced with pots designed to catch Pacific Cod. Neither a new incline nor a stability review of the F/V KATMAI was performed following these modifications. According to testimony from the Captain of the F/V KATMAI, the stability report issued to the vessel following the 1996 inclining test continued to be used onboard the vessel following these modifications and change in fishing operations. Under the General Practices section of the 1996 stability report issued to the F/V KATMAI, the professional engineer who authored the report recommended that it be updated when equipment is added or the fishing operations are changed.

c. Repairs

According to information provided by the vessel operations manager, the F/V KATMAI was maintained by repairing any mechanical and structural deficiencies that were found. The vessel was periodically placed in drydock for the examination of shaft clearances/cutlass bearing wear, replacement of zinc anodes, and hull cleaning/painting.

The vessel operations manager provided extensive purchasing records and receipts for the F/V KATMAI which detailed some repairs and the replacement of shipboard equipment as needed. However, no specific records were available that detailed the repair or maintenance history of the F/V KATMAI. Based on crew testimony, the GMC 6-71 75 KW generator, Furuno Weather Fax, and fuel transfer pump were inoperable at the time of the casualty.

According to a prior engineer who served on the F/V KATMAI, all maintenance records were stored on the vessel. Copies of these records were requested but not available.

Witness testimony indicated that an estimated 8' x 4'aluminum plate was placed on the outboard side of the starboard bulkhead to the processing space. It is unclear what the purpose of this aluminum "doubler" was. It was reported by a previous crew member that the steel plate under the aluminum plate may have been deteriorated.

There was also a 2' – 3' crack in a horizontal weld seam of the starboard bulkhead of the processing space directly below the aluminum doubler approximately 2' - 3' above the main deck. Testimony indicated that water would spray into the processing space through this crack during more severe sea states. The crack had been temporarily repaired with a silicone seal which reduced leaking.

There is no evidence that shows permanent repairs were made to the starboard bulkhead of the processing space in way of the aluminum "doubler" plate or to the 2' - 3' crack.

d. Surveys and Safety Examinations

There were two professional surveys conducted on the F/V KATMAI during the period from 1993 to 2008.

In August 1996 a marine surveyor from M.A. Stream Associates, Inc. examined the F/V KATMAI while in drydock and afloat in Seattle, WA to ascertain the condition, valuation and suitability of the vessel for service. During this survey all equipment and machinery were examined as were the internal/external coating systems. The surveyor did not examine the interior plating and framing since they were sealed. The marine surveyor concluded that the F/V KATMAI was in satisfactory condition and suitable for operation in its intended service. No recommendations were issued.

In November 2007 the same marine surveyor who performed the 1996 survey examined the F/V KATMAI while dockside at Northlake Shipyard in Seattle, WA. The scope of this survey was identical to the survey performed in 1996 and the vessel was determined to be in satisfactory condition and suitable for operation in the intended service. No recommendations were issued. This survey report is provided in Appendix 4.

A Coast Guard Fishing Vessel Examiner from Sector Seattle conducted a Commercial Fishing Vessel Safety Examination (CFVSE) of the F/V KATMAI on December 7, 2007 at Fishermen's

Terminal in Seattle, WA. The F/V KATMAI was issued CFVSE decal number 135910 despite being issued a deficiency. The vessel was issued one requirement following this examination to conduct drills for the U.S. Coast Guard Marine Safety Detachment (MSD) prior to departing Dutch Harbor, AK for the fishing grounds. There is no associated activity in the MISLE database that indicates that this requirement was ever cleared. The vessel operations manager stated that he requested an examiner from MSD Unalaska to clear the requirement prior to the vessel departing for the fishing grounds but no one was available. It is questionable whether the F/V KATMAI should have been issued a CFVSE decal since the examination form stated that "a Commercial Fishing Vessel Safety Decal cannot be issued" if deficiencies exist.

7. VESSEL STABILITY

Since the F/V KATMAI was less than 79 ft registered length, it was not required by 46 CFR Part 28 Subpart E to evaluate the vessel's stability. However, stability analyses of the F/V KATMAI were conducted in October 1993 and July 1996 following the addition of the processing space and new wheelhouse respectively. The vessel operations manager indicated that a stability review including an incline test was performed following conversions that were made to the F/V KATMAI in 1998 to permit the vessel to fish for shrimp using a long line pot system and to account for the removal of the trawl winches, net reel and shrimp holding bin. No records were provided that confirms this stability review occurred or that detail the results of this stability analysis.

Based on testimony from the Captain of the F/V KATMAI, he used the August 1996 stability report to load the vessel. This report did not account for the modifications made in 1998 or thereafter and did not account for the change in fisheries from shrimp to pacific cod. Under the General Provisions section of the August 1996 stability report for the F/V KATMAI, "The stability report is to be updated when equipment is added, or the fishing operations are changed." Even if a new stability analysis had been conducted of the F/V KATMAI in 1998, this information was not provided to the Captain as shown by his reliance on the August 1996 stability report to load the vessel.

The Coast Guard Marine Safety Center (MSC) conducted a post sinking stability analysis of the F/V KATMAI to assist the Marine Board of Investigation in determining the cause of the casualty. This analysis is discussed in the Analysis section of this report. MSC evaluated several potential sinking scenarios. Witness testimony stated that prior to the vessel sinking water was trapped on the aft deck and calculations showed that the vessel had undersized drainage when compared to the standard in 46 CFR 28.555. Additionally, the vessel was heavily loaded, carrying more than double the amount of cargo reviewed in the most recent stability report, and operating in high winds and seas at the time of the casualty. Such conditions would have increased the likelihood that water could have collected and remained trapped on the aft deck and led to flooding in the processing space. The computer modeling suggested that progressive flooding into the processing space would have caused the vessel to sink.

Based on the MSC analysis, contributing factors to the sinking of the F/V KATMAI included: heavy wind and high seas; the flooding of the lazarette; the flooding of the engine room; the amount of frozen cargo in the hold; unsuitable drainage of the aft deck; open watertight doors ; and flooding of the processing space. The flooding of the processing space is the primary factor that caused the F/V KATMAI to sink.

The complete MSC report is provided in Appendix 2.

8. WEATHER

The reported weather at the time of the casualty was:

Winds: 60-70 knots
Direction: Easterly
Wave Height: 20-30 ft.
Seas: Same
Swell: Unknown
Prevailing Conditions: Rain
Ambient Temp: 38°F
Water Temp: 43°F
Pressure: 956mb
Tendency: Falling
Icing: None

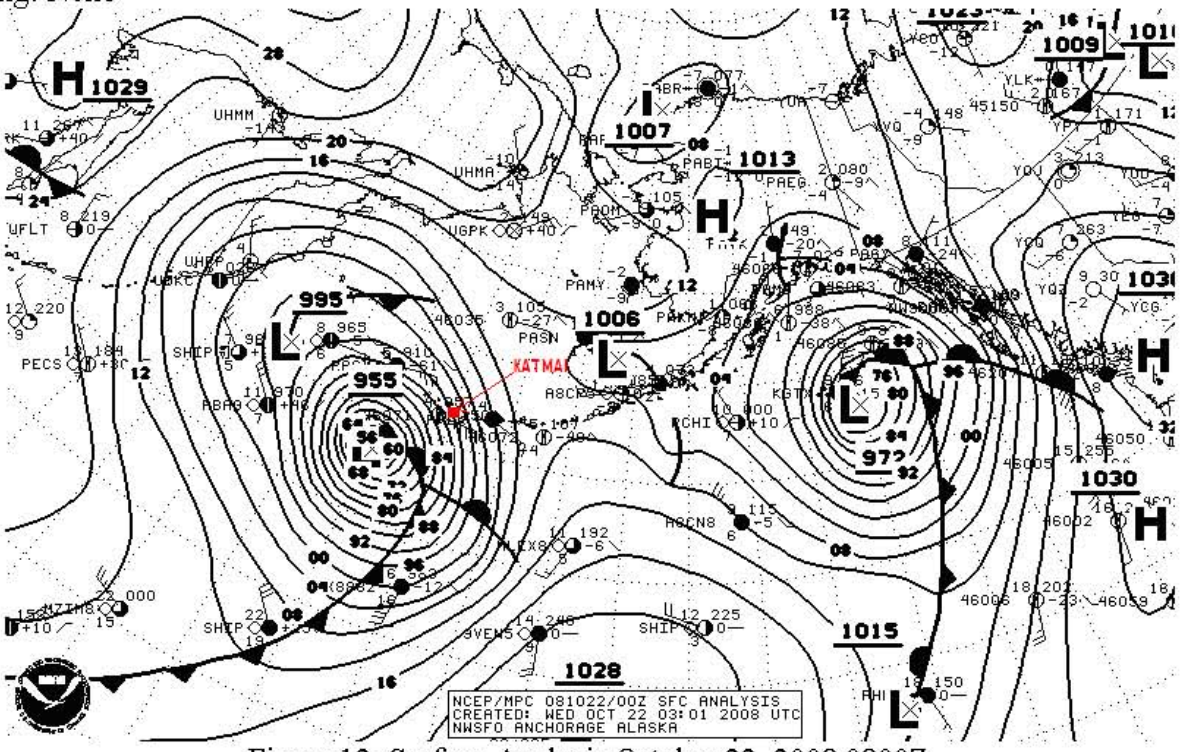


Figure 12: Surface Analysis October 22, 2008 0800Z

According to the Weather Forecast Office in Anchorage Alaska, the surface analysis leading up to the time of the sinking of the F/V KATMAI indicated an intensifying storm moving into the Aleutian Island region from the southwest. Based on QuickScat image analysis, a forecast hurricane force wind warning was issued at 0000Z on October 21, 2008. Winds at the time of

the casualty were most likely 60 to 70 knots within 120 NM in advance of the approaching front and within 150 NM around the center of the low beginning at 0800Z on October 22, 2008 through 0800Z on October 23, 2008. Figure 13 shows the surface analysis at the approximate time that the F/V KATMAI is reported to have sunk. Wind of this velocity and fetch along with the rapid movement of this storm indicated a sea state of combined wave heights 20 to 30 feet. The temperature of both the air and water indicated that freezing spray did not occur in this environment.

The Captain testified that he received weather forecasts of the storm from the vessel's SkyMate® VMS two or three days prior to the casualty. The Captain also indicated that the Furuno 207 weather fax was inoperable due to a lack of ink/stylus and that he thought that the system was tuned to a Hawaii radio frequency. He was unable to change the frequency to the F/V KATMAI's operations area because the owner's manual was not onboard.

The following is an excerpt of the weather forecast sent to the F/V KATMAI via the vessel's SkyMate® VMS at 1403Z, October 21, eighteen hours prior to the casualty:

From: wx@skymate.com
To: katmai@skymate.com
Message-ID: <13935863.64031224597796723.JavaMail.skymate@aquarius>
Subject: NWS-pkz175
MIME-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Expires:200810220200;;371825
FZAK52 PAFC 211140
CWFALU
COASTAL WATERS FORECAST FOR SOUTHWEST ALASKA
NATIONAL WEATHER SERVICE ANCHORAGE ALASKA
400 AM AKDT TUE OCT 21 2008
MARINE FORECAST FOR SOUTHWEST ALASKA+BRISTOL BAY+THE ALASKA PENINSULA WATERS AND THE ALEUTIAN ISLANDS UP TO 100 NM OUT.
WIND FORECASTS REFLECT THE PREDOMINANT SPEED AND DIRECTION EXPECTED. SEA FORECASTS REPRESENT AN AVERAGE OF THE HIGHEST ONE-THIRD OF THE COMBINED WIND WAVE AND SWELL HEIGHT.

PKZ175-220200-
WESTERN ALEUTIANS ADAK TO KISKA
400 AM AKDT TUE OCT 21 2008
...HURRICANE FORCE WIND WARNING TONIGHT...
.TODAY...SE WIND 25 KT BECOMING E 50 KT IN THE AFTERNOON. SEAS 12 FT. RAIN AND SNOW.
.TONIGHT...E WIND 70 KT. SEAS 24 FT. RAIN AND SNOW.
.WED...N WIND 45 KT DIMINISHING TO 35 KT IN THE AFTERNOON. SEAS 22 FT. RAIN AND SNOW.
.WED NIGHT...N WIND 25 KT. SEAS 17 FT.
.THU...NW WIND 35 KT. SEAS 14 FT.

9. THE CASUALTY AND RESPONSE

a. Sinking of the F/V KATMAI

October 21, 2008

Prior to the casualty, the F/V KATMAI was fishing for Pacific Cod in the waters of the western Aleutian Islands. At approximately 1100Z on October 21, 2008, the F/V KATMAI completed fishing operations with approximately 120,000 (53.6 LT) of Pacific Cod loaded into the vessel's cargo hold. Testimony indicated that this load of cod was the F/V KATMAI's first full load and also the largest haul of cod since the vessel began fishing for cod in January 2008.

Following the completion of fishing operations, at approximately 1400Z the Captain had the crew stow all gear and set course for Dutch Harbor, AK to offload the cargo. The Captain had the Engineer stand watch in the pilothouse while he and the other crew got some sleep. (Testimony indicated the crew typically worked 16 to 18 hours per day and were able to sleep 2 to 6 hours per day.) The Captain told the Engineer that the F/V KATMAI had to "make about 7.5 knots to make Tanaga before the storm hit."

Approximately six hours later (2000Z), the Engineer woke the Captain so that he could take the watch in the pilothouse. Once in the pilothouse, the Captain realized that the F/V KATMAI was near Semisophochnoi Island and had only been making 3½ to 4 knots. He also noted that the weather had begun to get worse and that the winds were picking up but that "it wasn't really rough yet." The Captain stated that the F/V KATMAI was loaded according to the stability report, the vessel was in perfect condition to deal with the weather and that it was handling fine. The Captain relieved the Engineer from watch and commenced his watch along with one of the deckhands. Since the F/V KATMAI had not gone as far as the Captain would have liked, he altered course towards deeper water so that the vessel would ride better as the weather continued to worsen. At 2340Z the Captain reported to the vessel operations manager via the SkyMate® VMS that the winds were blowing at 45-50 knots and that the F/V KATMAI was advancing slowly.

October 22, 2008

At 0001Z, the Captain sent an email to the F/V BLUE BALLARD stating that he had "missed his break" and that the F/V KATMAI was "getting beat up already" by the weather. At 0230Z, the Captain reported to the F/V BLUE BALLARD that he was doing OK but that the weather was bad. The Captain stated that the vessel was heeling to the port as a result of the wind and seas. The Captain asked the Engineer to transfer fuel from port to starboard to correct the heel. The Engineer tried to transfer fuel but the fuel transfer pump was not working properly. There was a cross-connect between the #3 P/S fuel tanks but, according to the Captain, fuel could only be transferred from tank to tank by using the fuel pump. A review of the fuel piping schematic for the F/V KATMAI also revealed that four valves would have had to be manually opened to permit fuel to flow from one tank to the other.

At approximately 0800Z the Captain realized that he had lost steering control. He sent the Deckhand to have the Engineer check the steering system. While the Deckhand was getting the Engineer, the Captain attempted to notify CG COMSTA Kodiak on channels 4125 and 2182 on one of the vessel's Single Side Band (SSB) radios with no response. The Captain used the F/V

KATMAI's second SSB to attempt to notify COMSTA Kodiak again with no response. The Captain then attempted to notify the Coast Guard on channel 16 on the vessel's VHF but received no response. After having no success in contacting the Coast Guard, the Captain used the F/V KATMAI's SkyMate® VMS to send an email at 0814Z to the F/V BLUE BALLARD stating that the F/V KATMAI had lost steering. The Engineer returned to the pilothouse and reported to the Captain that the door to the lazarette was open and that the lazarette was flooded but that he had secured the lazarette door. The Engineer then proceeded to the engine room to begin pumping the water out of the lazarette. (Note: Testimony from the Deck Boss indicated that the vessel was not equipped with a portable emergency dewatering pump and that he had recommended in a previous conversation with the vessel operations manager that one be provided onboard the F/V KATMAI.) The F/V KATMAI's propulsion system remained operable so the Captain attempted to use the engines to maintain the vessel's heading.

The Captain sent a second email to the F/V BLUE BALLARD at 0829Z stating that the F/V KATMAI's lazarette was flooded. He also had the Deckhand wake up the remaining crewmembers, have them report to the pilothouse and don immersion suits. The Engineer reported back to the Captain that the water level in the lazarette was coming down so the Captain told the crew that they could remove their immersion suits but to remain on the bridge until the situation was under control. Shortly after that report the F/V KATMAI's heel shifted from port to a starboard list so the Captain sent another Deckhand to the engine room to check on the Engineer and discovered that the engine room was flooded with approximately two feet of water above the deck plates. The deck plates were reported to be approximately 4 feet above the keel at the centerline of the vessel. According to testimony from the Captain, the source of the water in the engine room was not known. The Deck Boss stated that he saw the aft door to the processing space open prior to abandoning the vessel. During a conversation between the Captain and the Engineer a Deckhand heard that the aft deck of the F/V KATMAI was submerged and that water was entering the processing space. The Captain immediately called Mayday on both of the vessel's SSB radios and ordered the crew to don immersion suits and make preparations to abandon the vessel.

Two Deck hands dropped the liferafts from the top of the pilothouse to the deck. The 15 person liferaft got stuck between the port rail and a freezer basket and the 10 person liferaft fell on the starboard deck. The Deck Boss and several other crewmembers moved the 15 person liferaft to the port side of the pilothouse and the 10 person liferaft to the starboard fishing deck. The 15 person liferaft was deployed over the port side with the painter tied to the rail. The 10 person liferaft was deployed over the starboard side with the painter remaining attached to the weak-link. An inspection of the painter of the 10 person liferaft indicated that it appeared to have been cut manually from the weak link attachment to the cradle. Once inflated, several of the crew moved the 15 person liferaft located on the port side forward to the port bow. Testimony provided by two of the four survivors detailed that the 10 person liferaft deployed on the starboard side inflated. The two remaining survivors stated that they did not see the 10 person liferaft inflate. An inspection of the recovered liferaft indicated that may not have inflated properly.

Seven of the crewmembers, including the Captain, and three other survivors mustered on the bow of the vessel, entered the water, and boarded the 15 person liferaft which had been pulled to the starboard bow. The Captain had the EPIRB with him when he abandoned the vessel. Approximately 10 minutes prior to abandoning the vessel, the Captain activated the EPIRB. Three other crewmembers were last seen in their immersion suits on the starboard side near the

location of the 10 person life raft. The Engineer was last seen without an immersion suit on as he proceeded towards the engine room. It is unknown whether or not he was able to don an immersion suit or whether he abandoned the F/V KATMAI prior to sinking. While the crew was preparing to abandon ship, testimony indicated that the Engineer may have put the engines in gear forward, causing the F/V KATMAI to turn to port and to begin rolling over on its starboard side. The Captain stated that the vessel was laid over on the starboard side and going down by the stern prior to sinking. The F/V KATMAI sank at approximately 0845Z on October 22, 2008.

The seven crewmembers who abandoned the F/V KATMAI from the bow were able to enter the 15 person liferaft. The Captain indicated that Deckhand #2 was initially in the liferaft but disappeared soon after they had abandoned the vessel. It is unknown why Deckhand #2 left the liferaft. The seas and winds at that time were heavy causing the liferaft's canopy to begin coming apart from the raft. The immersion suit gloves made it difficult for the seven survivors to secure the liferaft's canopy to the liferaft. According to testimony, the Processor Foreman partially removed his immersion suit in an attempt to secure the canopy but soon after, a wave caused the life raft to overturn, detaching the canopy and throwing the six remaining crewmembers and EPIRB into the water. Four of the crewmembers made it back to the liferaft and managed to stay with the liferaft despite being tossed into the water numerous times throughout the night and the following day. They were located and rescued by Coast Guard HH-60J (CG6005) at 0028Z on October 23, almost sixteen hours after abandoning the F/V KATMAI.

b. Search and Rescue Operations

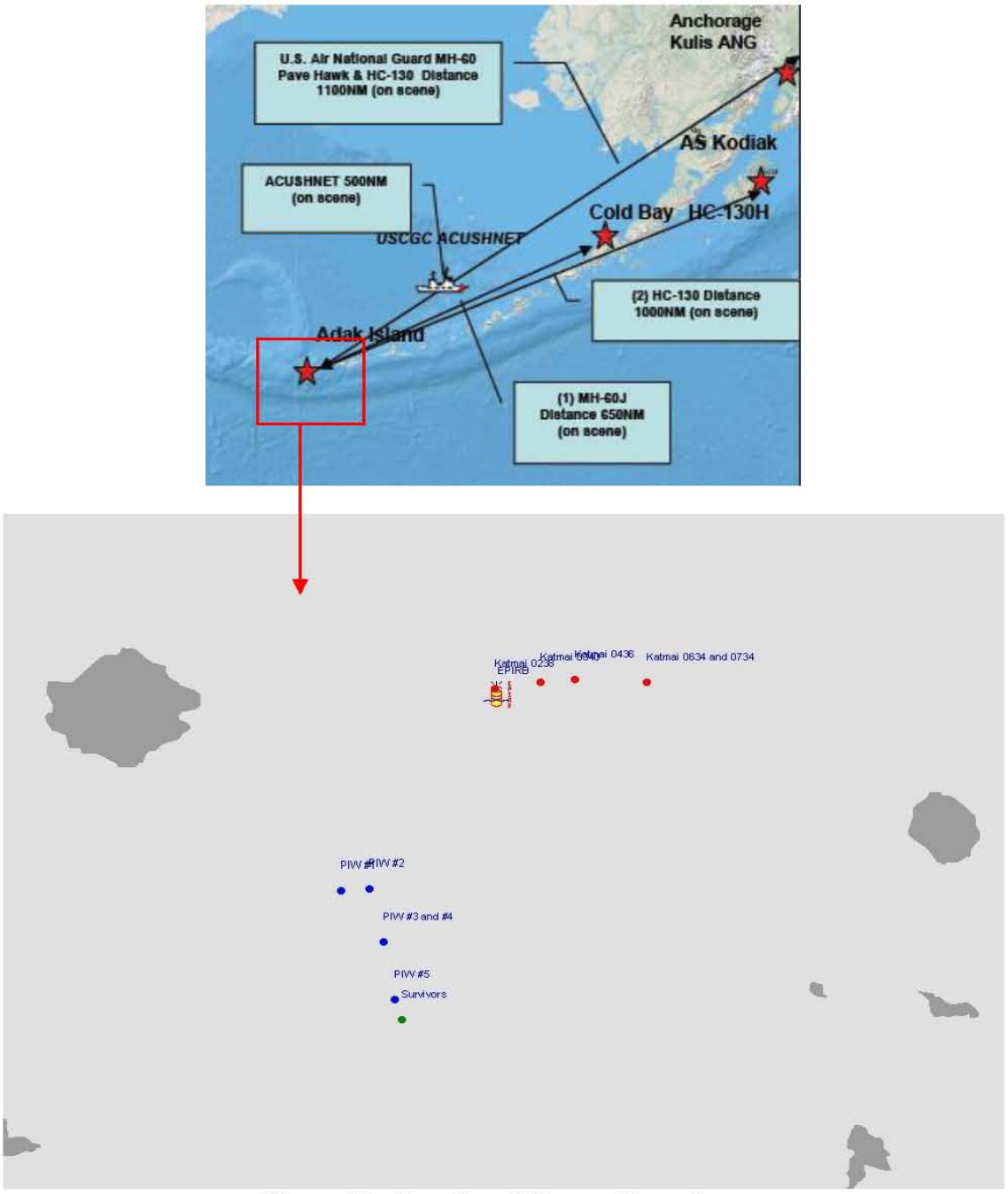


Figure 13: Search and Rescue Operations

At 0907Z on October 22, 2008, the NPSC received a 406 MHz alert IVO of Adak, AK from the EPIRB registered to the F/V KATMAI. Coast Guard District 13 received the same alert and contacted the vessel operations manager who stated that the F/V KATMAI was fishing near Adak, AK and reported that there were 11 persons on board the vessel. The following timeline of events is an excerpt of the Coast Guard search and rescue case file.

October 22, 2008

At 0935Z the NPSC ordered the launch of ready HC-130 and HH-60J aircraft forward deployed in Cold Bay, AK.

At 0954Z, the F/V BLUE BALLARD reported to NPSC that the F/V KATMAI sent emails stating that the vessel had lost steering and had a flooded lazarette.

At 1018Z, FPV COURAGEOUS notified the CG that they will see if they will be able to assist in SAR efforts.

At 1020Z, NPSC received a call from CG AIRSTA Kodiak who reported that the HH-60 and C-130 aircrews would be bagged (i.e., mandated period of rest upon reaching maximum permissible work hours) upon arrival to Adak. NPSC requested that relief aircrews be flown to Adak in a second C-130.

At 1033Z, a C-130 was requested from RCC Anchorage to provide assistance if possible due to a shortage of USCG aircraft resources.

At 1034Z, NPSC conducted a conference call with CG AIRSTA Kodiak OPS. CG AIRSTA Kodiak OPS was concerned that there were not enough air crews to meet the NPSC's requested "ideal" scenario with two C-130 and two HH-60 aircrews. NPSC requested AIRSTA Kodiak to make best possible efforts and launch as soon as possible with requested aircrews.

At 1042Z COMSTA Kodiak issued the UMIB alerting vessels to be on the lookout for the F/V KATMAI and/or survivors.

At 1122Z, CGC ACUSHNET was requested to transit toward incident location.

At 1136Z, RCC Anchorage was requested to provide HH-60 support.

At 1139Z, AIRSTA Kodiak reported that the HH-60 in Cold Bay blew an O-ring while fueling which resulted in a one hour delay. The C-130 relief aircrew will be departing AIRSTA Kodiak momentarily. RCC Anchorage reported that there was no HH-60 support available.

At 1152Z, CGC ACUSHNET reported that they were unable to respond due to weather.

At 1156Z, the request for C-130 support from RCC Anchorage was cancelled due to lack of availability of CG AIRSTA Kodiak aircrews.

At 1212Z, HH-60J (CG6005) launched from CG AIRSTA Kodiak. Deployment was delayed initially due to a maintenance problem.

At 1219Z, HC-130H (CG1700) launched from CG AIRSTA Kodiak.

At 1613Z, NPSC requested the use of a C-130 aircraft from Kulis Air National Guard (ANG) Base in Anchorage, AK.

At 1620Z, HC-130H (CG1700) located two strobes in the water. A Coast Guard liferaft was dropped in position near the strobes.

At 1630Z, Kulis ANG Base accepted tasking to provide C-130 support.

At 1646Z, CG1700 dropped a second liferaft.

At 1657Z, NPSC directed CGC ACUSHNET to get underway from Beaver Inlet to last known position of the F/V KATMAI's EPIRB to assist in search and rescue operations.

At 1714Z, COMSTA Kodiak attempted to contact FPV PATRICIA LEE.

At 1740Z, a C-130 from Kulis ANG Base launched to assist in search.

At 1804Z, the FPV PATRICIA LEE diverted course to assist in search.

At 1805Z, CGC ACUSHNET underway.

At 1826Z, HH-60J (CG6005) on scene.

At 1839Z, HC-130H (CG1703) launched from CG AIRSTA Kodiak.

At 1932Z, HH-60J (CG6005) located the F/V KATMAI's EPIRB, an empty survival suit with an active strobe, two Coast Guard liferafts and a partially inflated liferaft that appeared to be "beat up."

At 2034Z, FPV COURAGEOUS reported that they were enroute to search area.

At 2104Z, HH-60J (CG6005) reported that they recovered one deceased body in a survival suit at 2054Z in position 51-42.6N, 179-57.2W.

At 2252Z, FPV COURAGEOUS reported that they were on scene and picking up debris including buoys, 1 empty survival suit, and one life raft.

At 2313Z, FPV COURAGEOUS reported that the recovered life raft was "pretty torn up" but had no bodies inside. They also found a life ring in a storage bag. The recovered survival suit had "KATMAI" written on it.

October 23, 2008

At 0009Z, the FPV COURAGEOUS located a second body in a survival suit in position 51-42.7N, 179-54W.

At 0028Z, HH-60J (6005) located four (4) survivors in position 51-32.37N, 179-50.2W and commenced recovery operations.

At 0136Z, FPV PATRICIA LEE recovered a third body.

At 0211Z, FPV PATRICIA LEE recovered a fourth body.

At 0320Z, HC-130H (CG1703) diverted the FPV PATRICIA LEE to investigate objects in the water in position 51-40.5N, 179-52.1W.

At 0422Z, a health aide from Adak Clinic reported that all four (4) survivors were doing well and that core temperatures were above 97°F.

At 0440Z, FPV PATRICIA LEE located a fifth body in position 51-34N, 179-51W.

At 0455Z, HC-130H (CG1703) reported a debris field in position 51-39.7N, 179-51.3W.

At 0758Z, FPV COURAGEOUS recovered the F/V KATMAI's EPIRB.

At 0814Z, FPV COURAGEOUS recovered a CG liferaft in position 51-35.37N, 179-59.20W.

At 1001Z, FPV PATRICIA LEE transferred three deceased F/V KATMAI crew and debris to FPV COURAGEOUS. FPV COURAGEOUS enroute to Adak, AK to unload deceased and recovered debris.

At 1751Z, FPV COURAGEOUS reported the following debris from the F/V KATMAI on deck: liferaft (S/N SC2521), 1 empty survival suit, 1 PFD, 1 blue fishing tote, 3 sets of buoys, 1 EPIRB, 2 CG liferafts and several fishing boxes.

October 24, 2008

At 0145Z, FPV COURAGEOUS reported pulling into Adak, AK.

At 0810Z, CGC ACUSHNET reported on scene.

October 25, 2008

At 0515Z, HC-130H (CG1712) completed search area. They located a bundle of fishing gear believed to be from the F/V KATMAI.

At 2000Z, CGC ACUSHNET located a section of orange netting and a "fair sized" diesel sheen in position 51-28.4N, 179-23.2W.

At 2050, CGC ACUSHNET reported that they were unable to retrieve the orange netting.

October 26, 2008

At 1736Z, all search and rescue operations were suspended. 4 survivors and 5 deceased crewmembers from the F/V KATMAI were recovered. 2 crewmembers remain missing and are presumed dead.

c. Drug Testing and Autopsies

The four survivors were chemically tested for evidence of drug use. The Deck Boss tested positive for marijuana. The Deck Boss stated during preliminary testimony that he smoked marijuana after his medical check-up following the casualty. The three other survivors all tested negative for drugs.

The medical examiner determined that autopsies were not necessary for the five deceased due to the prolonged exposure to the cold water. Blood and urine specimens were obtained from all recovered deceased for toxicology and chemical testing. The test results were negative for controlled substances or alcohol. The cause of death for all recovered deceased crewmembers was determined to be hypothermia and drowning.

10. COMMUNICATIONS

The F/V KATMAI had three Very High Frequency (VHF) radios, two Single Side Band (SSB) radios, and a SkyMate® Vessel Monitoring System (VMS) that were used for ship-to-ship and ship-to-shore communications. At the time of the casualty, the F/V KATMAI was over 1000 nautical miles west of CG COMSTA Kodiak. The closest Hi-Sites were located in Cold Bay (VHF) and Attu (HF). The Captain provided testimony that indicated a bird strike may have damaged one of the small radio antennas on the vessel. It is unknown to what extent the damaged antenna affected the vessels communications but the Captain stated that he was able to communicate with other vessels on his VHF radios earlier in the day on October 21, 2008.

a. VHF Radios

The F/V KATMAI was required by 46 CFR Part 28.245(a)(1) to be equipped with at least one VHF radio. Marine VHF radios typically operate between 156 to 174 MHz and are primarily used for communicating with other vessels, requesting rescue services and communicating with harbors and marinas. The maximum communications range of VHF radios is about 60 nautical miles but this is dependent on the transmission power of the radio as well as the height of both the transmission and reception antennae. Typically ship-to-shore range is approximately 20 nautical miles.

b. SSB Radios

The F/V KATMAI was required by 46 CFR Part 28.245(a)(4) to have a radiotelephone transceiver that broadcasts in the high frequency range of 2 to 27.5 MHz. Prior to the sinking of the F/V KATMAI, the Captain issued distress calls on 2.182 MHz and 4.125 MHz.

SSB radios emit ground waves and sky waves which have different effective ranges as shown in Figure 14. Ground waves hug the surface of the earth/ocean and travel approximately 50 to 200 miles from the SSB radio transmitter. Ground waves are seldom influenced by atmospheric or ionospheric conditions.

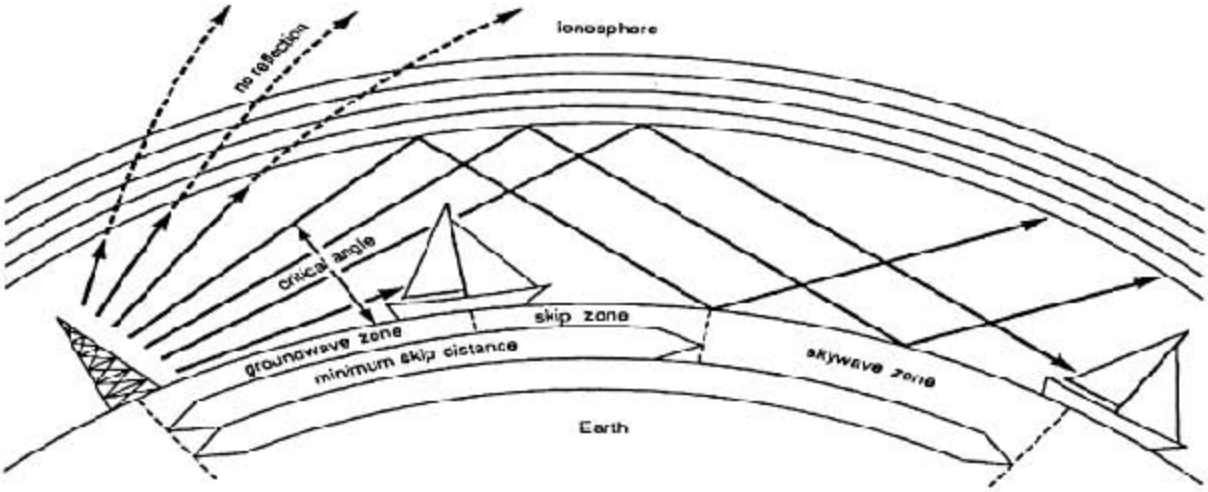


Figure 14: SSB Signal Transmission Qualities

Sky waves provide the longest range of communication but rely on the ionosphere to reflect the SSB radio signal back to the receiving station. The ionosphere's density and reflecting capabilities change with day and night, the season of the year, and the 11-year solar cycle. Basically, the higher the frequency, the longer the sky wave will travel. At night, the ionosphere gradually lowers decreasing the distance that SSB signals will bounce. Sky waves are not affected by local weather conditions. However, close-in communications are restricted by a phenomenon known as the skip zone which exists between where the ground wave ends and the first sky wave comes in. The extent of the skip zone is dependent on frequency, location, season and time of day.

The F/V KATMAI casualty occurred at night which decreased the effective range of the SSB radio transmissions sent on frequencies 2.182 MHz and 4.125 MHz. One unidentified MAYDAY was recorded by CG COMSTA Kodiak at the approximate time that the F/V KATMAI sank which was confirmed by the vessel's Captain to be his voice. The Captain stated that he sent MAYDAY calls using both 2.182 MHz and 4.125 MHz. The distress signal transmitted at 2.182 MHz had an estimated effective range of 1000 miles and may not have reached CG COMSTA Kodiak successfully. The distress signal transmitted at 4.125 MHz had an estimated effective range of 1500 miles and was most likely the one recorded by the Coast Guard. The MAYDAY call from the F/V KATMAI recorded by the Coast Guard failed to include the vessel's name, location, or nature of the distress.

There was a delay in the recognition of the Captain's MAYDAY call by the CG COMSTA Kodiak. A separate investigation was conducted by the Coast Guard to determine why the SSB transmissions were not heard by the CG COMSTA Kodiak duty personnel. These findings and recommendations of this investigation will be released separately from this report.

c. SkyMate® VMS

The SkyMate® VMS system installed on the F/V KATMAI was designed for commercial fishing vessels to meet NOAA tracking requirements. This system also provided regular weather forecasts and email capabilities. The Captain of the F/V KATMAI used the email function of this system for communications with the vessel owners/operations manager and for personal communications while the vessel was underway.

A representative of SkyMate® VMS stated the system was primarily designed for vessel monitoring purposes and was not intended to transmit large amounts of data or to be used as an emergency means of communication. Large packets of data severely decrease transmission rates which can prevent prompt delivery of the data/information.

The system is a store and forward system in which data or messages are stored in satellites or ground stations and then forwarded to the receiving unit when a communication link is established. The reliability of the SkyMate® VMS in sending/receiving data is highly dependent on the location of the vessel. Vessels operating in the North Pacific or Bering Sea may have difficulty transmitting data/information due to a lack of satellites and transmission towers in that region.

Emails that were sent and received to/from the F/V KATMAI's SkyMate® VMS system during the period of 14-22 October, 2008 were reviewed to determine if any significant transmission delays were evident while the vessel was operating in the Aleutian Islands. No significant delays were identified based on the time stamps of the emails.

11. OWNERS AND OPERATORS

The F/V KATMAI was the only vessel owned and operated by Katmai Fisheries Inc., a Limited Liability Company. Katmai Fisheries Inc. is comprised of several owners including an operations manager who handled the day to day operations of the vessel consisting of the hiring of crew, vessel scheduling and maintenance requirements. From documentation provided by Katmai Fisheries Inc., financial support was provided by accounts linked to All Alaskan Seafoods. Principles within Katmai Fisheries, Inc. also share interests with All Alaskan Seafoods.

There were no records of any violations issued to the F/V KATMAI or the vessel owner/operator in the Marine Information for Safety and Law Enforcement (MISLE) database.

12. ALCOHOL AND DRUG POLICY

As part of the standard crew contract developed by Katmai Fisheries Inc., a termination policy was incorporated that included the used of alcohol and/or drugs while on board the F/V KATMAI. A crewmember would be immediately discharged for "possession, distribution, or use of illegal drugs or alcohol while on board the vessel, or use of illegal drugs while in service with the vessel whether in port or not. "Illegal drugs" includes marijuana, barbiturates, amphetamines, LSD, heroin, cocaine, crack, ice, mushrooms, and any drug as defined in section 103 of the Comprehensive Drug Abuse Prevention and Control Act of 1970 (21 U.S.C. § 802)."

The crew contract also emphasized that illegal drugs were strictly prohibited and that the crewmembers agreed not to use, possess, or distribute illegal drugs as a condition of

employment. Katmai Fisheries Inc. also included provisions for searching crewmember's room, person, or personal effects at any time. Refusing a requested search by Katmai Fisheries Inc., the Master, or its agents would also result in immediate termination.

A crewmember would also be terminated for refusing to submit to a drug test upon demand or for testing positive for illegal drugs. The crew contract provided by the vessel operations manager did not indicate any requirement for pre-employment or random drug testing of the vessel's crew.

13. CREW EXPERIENCE & HIRING PRACTICES

a. Crew Experience

The crew of the F/V KATMAI had a diverse range of experience in the commercial fishing industry.

1) Captain

Testimony received from the Captain of the F/V KATMAI indicated that he had been involved in the fishing industry for his entire life beginning at age 3 when he fished with his father. His first job on a commercial fishing boat was as a deckhand in 1984/1985. The Captain had his first position as a fishing boat master in 1989 and continued to serve in that position on smaller fishing vessels up to 58' long. The Captain provided testimony that the F/V KATMAI was the largest fishing vessel that he had ever mastered. The Captain fished primarily in Alaskan waters his entire career with a few seasons spent fishing for albacore and crab in Washington and Oregon.

The Captain's experience as a master of a fishing boat operating in the Aleutian Islands commenced in 1996 when he was hired as a deckhand/master of the F/V HUNTER, a 58' long line commercial fishing vessel. The Captain first served as master of the F/V KATMAI from July to October 2003 when the vessel fished for shrimp from the Aleutian Islands to Southeast Alaska. On June 4, 2008, he was again hired as master of the F/V KATMAI to fish for Pacific Cod in the Aleutian Islands. The Captain did not hold a Coast Guard Merchant Mariner's License but had begun the process to earn his 200-ton master's license prior to the sinking of the F/V KATMAI. He also stated that he had no formal training regarding vessel stability.

2) Deck Boss

The Deck Boss provided testimony that he had over 30 years of experience in the commercial fishing industry and had served on over 100 different fishing vessels involved in numerous types of fishing operations.

The Deck Boss was hired by Katmai Fisheries Inc. on June 4, 2008. He worked on the F/V KATMAI for 29 days and then took a two week break. He returned to the F/V KATMAI in August 2008 and worked on the F/V KATMAI until the casualty occurred. The Deck Boss has never had a Coast Guard Merchant Mariner's License.

3) Engineer

According to the vessel operations manager, the Engineer worked on other fishing vessels owned by All Alaskan Seafoods over the past 15 years but primarily worked on the F/V MAGNUM as the chief engineer. He also served on the F/V SWELL RIDER as

the captain. The Engineer worked on the F/V KATMAI for shrimp fishing in Southeast Alaska from September 2004 to November 2004 and in Hawaii during 2006. He worked on the F/V KATMAI throughout 2008 during Pacific Cod season.

4) Factory Foreman

The Factory Foreman had 9 years of experience working for the Fishing Company of Alaska as the facility manager, deck crew, freezer boss, boatswain, and facility worker. He worked on the F/V KATMAI during the June/July 2008 cod season and returned to the F/V KATMAI in September 2008 and worked on the vessel until the casualty occurred.

5) Deckhand #1

Deckhand #1 worked for the Fishing Company of Alaska for two years as a processor. He worked on the F/V KATMAI during the June/July 2008 cod season and returned to the F/V KATMAI in September 2008 and worked on the vessel until the casualty occurred.

6) Deckhand #2

Deckhand #2 worked previously with the Captain on the F/V HERITAGE. He worked on the F/V KATMAI during the June/July 2008 cod season and returned to the F/V KATMAI in September 2008 and worked on the vessel until the casualty occurred.

7) Processor #1

Processor #1 worked on cod catcher/processors prior to working on the F/V KATMAI. He worked on the F/V KATMAI during the June/July 2008 cod season and returned to the F/V KATMAI in September 2008 and worked on the vessel until the casualty occurred.

8) Processor/Deckhand #1

Processor/Deckhand #1 had 5 years of experience working on fishing vessels in Alaska. He was hired in August 2008 and worked on the vessel until the casualty occurred.

9) Processor/Deckhand #2, #3, & #4

Processor/Deckhand #2, #3, and #4 had no prior fishing experience prior to working on the F/V KATMAI.

b. <u>Hiring Practices</u>

The key positions on the F/V KATMAI, as indicated by the vessel operations manager, were the Captain and Engineer. These positions were routinely filled by individuals that had previously worked for All Alaskan Seafoods or who had prior experience on the F/V KATMAI. Engineers were often recommended by the captains based on their personal knowledge and experience working with those individuals. The vessel operations manager did not require Coast Guard licensed mariners to fill these positions.

14. TRAINING

Since the F/V KATMAI was operating beyond the boundary line, the requirements detailed in 46 CFR Part 28.270 (Instructions, Drills, and Safety Orientation) were applicable. The master of

the F/V KATMAI was required to ensure that the crew received monthly training and drills for abandoning the vessel, fire fighting, man overboard, flooding, donning immersion suits, donning fireman's outfit, making radio distress calls, and launching survival craft. Testimony from the surviving crewmembers indicated that the training conducted onboard the F/V KATMAI was limited to: watching videos provided by the North Pacific Fishing Vessel Owners' Association (NPFVOA); the proper donning of immersion suits; and reading the liferaft placards posted on the F/V KATMAI. Crew drills included donning immersion suits (timed), fire, and man overboard drills. The Deck Boss stated that he ran the man overboard drills and that the Engineer ran the fire drills. The Captain stated that he ran the immersion suit drills. One witness indicated that during the immersion suit drills only one immersion suit was used to train the entire crew. The Captain stated that during some drills, not all crew participated. There was some indication that there was training regarding the launching of the liferafts but none of the survivors indicated that abandon ship or flooding drills were ever conducted.

The Captain stated that the Processor Foreman and Deckhand #1 were trained in conducting drills and conducted "the firefighting drills and the ship drills." The vessel operations manager indicated the Processor Foreman and Deckhand #1 had additional training in fire fighting and CPR/First Aid. The Fishing Company of Alaska Inc. confirmed that the Processor Foreman received Basic Safety Training in December 2006 and Deckhand #1 received Marine Firefighting training in November 2007. It was also confirmed by a review of the personal effects recovered from the Processor Foreman that he attended the North Pacific Fishing Vessel Owner's Association (NPFVOA) Drill Instructor Workshop on June 22, 2006. The vessel operations manager indicated the Engineer was trained in CPR and First Aid but no documentation of this training was provided.

No evidence or documentation was provided by the vessel operations manager or Captain that showed the individuals conducting the required drills were trained in the proper procedures for conducting drills as required by 46 CFR 28.270(c). The vessel owner did not maintain a record of the instructions, drills, and safety orientation of the crew. The vessel operations manager indicated that crewmembers of the F/V KATMAI were assisted in obtaining first aid training and in attending drill instruction workshops however no documentation of this training was provided.

15. FEDERAL REGULATIONS AND OVERSIGHT

a. United States Coast Guard

The Coast Guard enforces laws and regulations that apply to commercial fishing vessels and their safety. The F/V KATMAI was an uninspected commercial fishing vessel subject to the regulations contained in 46 CFR, Subchapter C entitled Uninspected Vessels. 46 CFR Part 28 contains the specific requirements for commercial fishing industry vessels. 46 CFR Part 28 is divided into seven parts, A through G, which have varying applicability standards depending on the fishing vessel's size, area of operation in regards to the boundary line, number of persons onboard and the type of fishing operations being performed. Navigation, pollution and pollution prevention regulations are contained in 33 CFR, Parts 80, 151, 155 and 156. Chemical testing requirements for commercial fishing vessels are contained in 46 CFR Part 16.

b. Federal Communications Commission (FCC)

The FCC regulations applicable to fishing vessels are contained in 47 CFR Part 80.405. This regulation requires a radio operator to hold a license and the radio station to be licensed.

33 CFR Part 26 requires all self propelled vessels over 20 meters (65.6 feet) in length to have a radiotelephone capable of operation from the navigation bridge, and capable of transmitting and receiving on the frequencies within the 156-162 MHz band using the classes of emissions designated by the FCC for the exchange of navigational information. Specific communication equipment and installation requirements for fishing vessels are detailed in 46 CFR Part 28.245.

c. National Marine Fisheries Service (NMFS)

NMFS is responsible for the preservation of the biomass. 50 CFR Part 679.50 requires a NMFS observer onboard fishing vessels to monitor and analyze biomass caught by fishing vessels. The regulations specify when fishing vessels are required to carry a NMFS observer. The observers sample and log all species caught. Fishing vessels required to have a NMFS observer must have either a valid Coast Guard or recognized third party issued Commercial Fishing Vessel Safety Examination Decal or a Certificate of Compliance (COC) issued by a certified third party organization.

d. Occupational Safety and Health Administration (OSHA)

The OSHA standards for work place safety applicable to uninspected commercial fishing vessels are contained in 29 CFR Parts 1910, 1915 and 1918. These regulations only apply to uninspected vessels carrying ten or more persons onboard operating within State Territorial Waters and if no other federal regulations supersede OSHA authority based on the vessel's activities.

e. Applicability to the F/V KATMAI

The F/V KATMAI was required to meet the regulations contained in 46 CFR Part 28: Subpart A – General Provisions; Subpart B – Requirements for All Vessels; and Subpart C – Requirements for Documented Vessels That Operate Beyond the Boundary Line or With More Than 16 Individuals On Board, or For Fish Tender Vessels Engaged in the Aleutian Trade.

The F/V KATMAI was required to meet the navigation requirements detailed in 33 CFR 80.1705.

The F/V KATMAI was required to meet all applicable pollution prevention requirements detailed in 33 CFR Pars 151, 155 and 156.

The F/V KATMAI was required to meet all applicable chemical testing requirements detailed in 46 CFR Parts 4 and 16.

The F/V KATMAI was required to meet the communications requirements detailed in 47 CFR Part 80.405, 33 CFR Part 26 and 46 CFR 28.245.

Prior to the casualty, the F/V KATMAI was involved in the Parallel Fishery in Alaska state waters. The F/V KATMAI was not required to carry a NMFS observer for this fishery.

The F/V KATMAI's crew complement exceeded 10 individuals therefore she was required to comply with the OSHA regulations found in 29 CFR Parts 1910, 1915 and 1918 when operating within the territorial seas of the United States.

16. INDUSTRY STANDARDS AND GUIDELINES

The following is a list of the standards applicable to commercial fishing vessels.

- NVIC 4-82: Uninspected Commercial Vessel Safety
- NVIC 1-83: Painters for Life Floats and Buoyant Apparatus
- NVIC 12-83: Intact Stability of Towing and Fishing Vessels; Research Results
- NVIC 4-86: Hydraulic Release Units for Life Rafts, Life Floats and Buoyant Apparatus and Alternate Float-Free Arrangements
- NVIC 5-86: Voluntary Standards for U.S. Uninspected Commercial Fishing Vessels
- NVIC 6-91: Fire Drills and On-Board Training
- NVIC 7-91: Determination of Cold Water Areas
- NVIC 1-92: Lifesaving Equipment Regulations for Commercial Fishing Vessels
- NVIC 1-92: CH-1: Implementation of Lifesaving Equipment Regulations for Commercial Fishing Vessels
- NVIC 1-92: CH-2: Implementation of Lifesaving Equipment Regulations for Commercial Fishing Vessels
- NVIC 7-93: Guidelines for Acceptance of "Fishing Vessel Safety Instructors" and Course Curricula for Training "Fishing Vessel Drill Conductors"
- NVIC 01-08: Shipboard Inspection and Testing of Immersion Suits
- D13INST 16710.1: Alternative Compliance and Safety Agreement (ACSA) for Fish Processing Vessels
- COMDTINST 16711.13B: Implementation of the Commercial Fishing Industry Vessel Regulations

17. FISHING AND PROCESSING OPERATIONS

a. Involved Fishery

The F/V KATMAI was a converted western rigged stern trawler that was engaged in the Pacific cod pot fishery as a catcher-processor at the time of the vessel's loss. The vessel was participating in the "parallel waters" Bering Sea / Aleutian Island (BSAI) groundfish season. The "parallel waters" fisheries occur in Alaskan State waters adjacent to the Federal BSAI management areas.

b. Head and Gut Processing

The vessel was considered to be a true "Head and Gut" operation in which the fish would be de-headed and cleaned of all viscera and blood prior to flash freezing on board the vessel. Baited cod pots were deployed from the vessel strung off a series of "longlines" that were approximately 2.5 nautical miles in length. The "longlines" were weighted on each end using anchor chain that was marked with buoys. The crew would retrieve the pots utilizing a spooling winch that was located on the starboard side of the vessel's fishing deck. The fish would be removed from the pots into a dump box. The by-catch (undesirable or untargeted species) would be discarded overboard and the cod delivered below into the processing space by means of a PVC tube measuring approximately 10" in diameter located on the starboard side of the vessel. Once the fish were delivered to the processing space the throats would be slit and the fish would be place into a "bleed tank" for approximately 30 minutes. Once removed from the "bleed tank" the heads would be removed using a header machine followed by removal of the guts. The head and guts would be discharged from the vessel by means of a chopping sub pump located on the port side of the processing space. Cleaned fish would then be sorted onto trays and placed in one of two flash freezers. Once frozen the fish would be bagged and placed into the vessel's cargo hold located directly below the processing space.

18. COMMERCIAL FISHING VESSEL SAFETY PROGRAM

a. General Overview

Pursuant to the passage of the Commercial Fishing Industry Vessel Safety Act of 1988 (P.L. 100-424), the Coast Guard published regulations detailing equipment, design, and operational requirements for commercial fishing vessels. These regulations are codified in 46 CFR 28. In 1995 the Coast Guard established a voluntary dockside examination program for commercial fishing vessels through the promulgation of Commandant Instruction (COMDTINST) 16711.13B, titled Implementation of the Commercial Fishing Industry Vessel Regulations. The Commercial Fishing Vessel Exam (CFVE) program is designed to promote fishing vessel safety by assisting vessel owners, operators, and crew in understanding the applicable regulations in 46 CFR 28. The examinations are no fault and non-adversarial. Commercial fishing vessels that successfully complete a voluntary dockside exam are issued an examination decal. The decal is valid for two years from the date of issue. The decal serves as an indicator for at sea boarding officers that the vessel has been comprehensively examined dockside and found to be in full compliance with all applicable federal regulations.

Although the official home port documentation for the F/V KATMAI was Kodiak, AK, the vessel operated out of Seattle, WA. Coast Guard Sector Seattle maintains a robust CFVE program. The F/V KATMAI successfully completed a CFVE in Seattle on December 7, 2007 and was issued CFVE decal number 135910. The vessel has no record of any USCG at sea boardings while operating in Alaskan waters.

b. Alternative Compliance and Safety Agreement (ACSA)

In June of 2006 the ACSA program was promulgated through a signed memorandum of agreement executed by the leadership of Coast Guard Districts 13 and 17 respectively. The ACSA program was instituted to assist in resolving regulatory applicability issues pertaining to the head and gut (H & G) fleet. The results of several major marine casualty investigations revealed that many of the more than 60 vessels operating in the H & G fleet were engaged in fish processing activities that exceeded "incidental or minimal processing". As such, these vessels

would be required to comply with the classification and load line requirements of subpart F of 46 CFR 28 or cease H & G processing methods. The Coast Guard believes that a strict interpretation of the "fish processing" definition, as denoted in 46 USC §2101, serves maritime safety and is consistent with Congressional intent. In making a final determination as to what products are to be considered "fish processing", the Coast Guard has utilized the standardized descriptions from the National Marine Fishery Service Product Codes (50 CFR 679).

Due to age restrictions imposed by classification societies, nearly 70% of the H & G fleet cannot meet loadline or vessel classification standards, and thus do not comply with the applicable regulatory framework. Exemptions to this regulatory framework may be granted by the cognizant District Commander provided good cause for such an exemption exists, and the safety of the vessel and crew would not be compromised.

The Coast Guard, in partnership with regional commercial fishing stakeholders, developed ACSA as a voluntary system of stringent safety standards that greatly improves watertight integrity, vessel stability, fire protection, machinery maintenance, lifesaving equipment usage, and crew training. As a condition of an exemption from loadline and vessel classification a vessel meeting the definition of Fish Processing Vessel must be enrolled and accepted into the ACSA program and inspected to ACSA standards.

c. ACSA and the F/V KATMAI

The fishing operations being performed on the F/V KATMAI did not meet the statutory definition of a Fish Processing Vessel as defined in 46 USC 2101. Therefore, the requirements of 46 CFR 28 Subpart F did not apply and the F/V KATMAI would not have needed to participate in the ACSA program as an alternative to compliance with Subpart F. Preliminary discussions were held between F/V KATMAI Fisheries, Inc. and the USCG Sector Seattle Commercial Fishing Vessel Safety Examiner concerning voluntary participation in the ACSA program. However, no evidence was obtained that indicated that the vessel's operators intended to enter the ACSA program.

D. SUMMARY OF FACTS

1. The vessel was built in 1987 by Patti Shipyard in Pensacola, FL.

2. The vessel was 148 GT with a registered length of 73.3 ft.

3. The vessel was originally named the QUEEN OF THE UNIVERSE and designed to be a shrimp trawler.

4. Katmai Fisheries Inc. purchased the vessel in 1993 and registered the vessel for Coastwise, Fishery and Registry Service.

5. The owners of the F/V KATMAI were not required by regulation to have a stability analysis of the vessel.

6. A shelter deck, fish processing factory, processing equipment, one plate freezer, evaporator coils for the cargo hold, and two compressors with condensing equipment were added to the vessel in 1993.

7. An incline test was performed on the vessel in October 1993.

8. A stability report was issued to the vessel in November 1993 for the vessel for an assumed cargo load of 32.59 LT.

9. A new pilothouse was added to the vessel in 1996 increasing the deckhouse from 2 levels to 3 levels above the main deck.

10. An incline test was performed on the vessel in July 1996.

11. A new stability report was issued to the vessel in August 1996 for the vessel for an assumed cargo load of 26.79 LT.

12. The August 1996 stability report was used by the Captain of the vessel to load the vessel and maintain stability prior to the casualty.

13. A survey of the vessel was conducted by an uncertified marine surveyor from M.A. Stream Associates, Inc. in August 1996 with no recommendations issued.

14. Modifications were made to the vessel for fishing a long line pot system for catching and processing shrimp in 1998. The trawl winches, net reel and shrimp holding bin in the aft section were removed from the vessel. An aluminum line bin was added to the aft deck and a live holding tank was added to the process area. Approximately 400 rectangular shaped pots weighing approximately 50 lbs each were added to the vessel.

15. There are no records to show that an incline test was conducted or that a revised stability report was issued to the vessel following the 1998 modifications.

16. The stability report issued in 1996 recommended that the stability report is to be updated when equipment is added, or the fishing operations changed.

17. The stability report issued in 1996 and being used by the Captain to load the vessel was for trawling and processing operations with the fish catch being hauled aboard.

18. The Captain did not have formal training regarding vessel stability or how to properly interpret the information contained in the stability report.

19. During a yard period in October/November 2007, the vessel was modified to change fisheries from shrimp to Pacific Cod. The modifications included the addition of a bait chopper, heading machine and associated piping in the fish processing factory. The shrimp pots were replaced with new pots designed for catching Pacific Cod.

20. A new incline test or update the vessel's stability report was not conducted to reflect the change in fishing operations from shrimp to Pacific Cod.

21. A survey of the vessel was performed by an uncertified marine surveyor from M.A. Stream Associates, Inc. in November 2007 with no recommendations issued.

22. A Commercial Fishing Vessel Exam was conducted by a Coast Guard fishing vessel examiner from Sector Seattle on December 7, 2007 and was issued CFVSE decal number 135910.

23. The Coast Guard fishing vessel examiner issued one requirement to the vessel requiring that safety drills be conducted prior to the vessel departing from Dutch Harbor, AK for the fishing grounds.

24. There is no record indicating that the safety drills were conducted in the presence of a Coast Guard fishing vessel examiner as required by the December 7, 2007 CFVSE.

25. There is no evidence or records to show that all drills required by 46 CFR 28.270 were conducted by crew who were trained in the proper procedures for conducting drills.

26. Testimony revealed that all crew did not participate as a group in each of the required drills conducted onboard the vessel as specified in 46 CFR 28.270(b).

27. There is no evidence or records that indicate that abandon ship or flooding drills were conducted onboard the F/V KATMAI prior to the casualty.

28. The vessel owner or Captain did not maintain a record of crew training or drills performed onboard the F/V KATMAI.

29. During the immersion suit drills only one immersion suit was used to train the entire crew.

30. The GMC 6-71 75 KW generator was inoperable but the vessel operations manager stated that the two remaining generators could handle all electrical loads on the vessel.

31. Prior to the casualty the vessel was fishing for Pacific Cod in the "parallel waters" Bering Sea/Aleutian Island (BSAI) groundfish season.

32. The catch was gutted and beheaded and then frozen and packaged in nylon-lined paper bags weighing approximately 45 lbs each.

33. The vessel completed fishing operations on October 21, 2008 with an approximate load of 120,000 lbs (53.57 LT) of frozen cargo in the hold.

34. The vessel had almost two times the amount of frozen cargo in the cargo hold than the most current stability report used for determining the vessel's stability characteristics.

35. The load of cargo onboard the vessel at the time of the casualty was the largest load of cod since the vessel began fishing for cod in January 2008.

36. The Captain set course for Dutch Harbor, AK to offload the cargo.

37. At approximately 1400Z on October 21, 2008, the Captain and crew went to bed while the Engineer stood watch on the bridge under orders to proceed towards Tanaga Island and try to maintain a speed of 7½ knots.

38. Testimony indicated the crew typically worked 16 to 18 hours per day slept only 2 to 6 hours per day while fishing operations were being conducted.

39. A weather forecast was delivered to the vessel via the vessel's SkyMate® VMS at 1403Z on October 21, 2008 indicating that sustained hurricane force winds were expected with winds estimated at 70 knots and seas of 24 feet with rain and snow.

40. The Captain testified that he had received weather forecasts of the incoming storm from the vessel's SkyMate® VMS two or three days prior to the casualty.

41. The vessel's Furuno 207 weather facsimile was inoperable due to a lack of ink/stylus and missing owner's manual preventing the Captain from receiving National Weather Service surface analyses.

42. During the evening of October 21, 2008, the Captain resumed watch in the pilothouse and realized that the vessel was near Semisophochnoi Island and had only been making 3 ½ to 4 knots.

43. The Captain testified that the vessel was loaded in accordance with the 1996 stability report and in good condition to handle the weather at that time.

44. The Captain decided to push ahead and altered the course of the vessel to deeper water to lessen the effects of the inbound storm.

45. At approximately 0000Z on October 22, 2008, the Captain stated in an email to the vessel operations manager that the vessel was advancing slowly and that the wind was already blowing 45 to 50 knots.

46. At approximately 0100Z on October 22, 2008, the Captain emailed the F/V BLUE BALLARD and reported that he had "missed his break and that the vessel was getting beat up."

47. The Captain stated that the vessel was heeled to the port as a result of the wind and seas.

48. The Captain asked the Engineer to transfer fuel from port to starboard to correct the port heel.

49. The Engineer reported to the Captain that the fuel transfer pump was not working.

50. At approximately 0800Z on October 22, 2008 the Captain realized that the vessel had lost steering control.

51. The Engineer was sent to investigate the problem and discovered that the lazarette watertight door was open and that the space was flooded.

52. The Engineer closed the lazarette watertight door and reported the flooding to the Captain and then proceeded to the engine room to commence dewatering efforts.

53. None of the watertight doors on the F/V KATMAI were visible from the pilothouse nor were they equipped with indicators or alarms that showed the status of the watertight doors in the pilothouse.

54. The F/V KATMAI did not have a mechanical means to control steering in the event of failure of the electric/hydraulic steering system.

55. The F/V KATMAI was not equipped with a portable emergency dewatering pump.

56. The Captain attempted to notify COMSTA Kodiak on frequencies 4125 and 2182 on one of the vessel's SSB radios with no response.

57. The Captain used the vessel's second SSB and VHF radios to notify COMSTA Kodiak again with no response.

58. At 0814Z on October 22, 2008, the Captain used the vessel's SkyMate® VMS to send an email to the F/V BLUE BALLARD stating that the vessel had lost steering.

59. At 0829Z on October 22, 2008, the Captain sent another email to the F/V BLUE BALLARD reporting that the lazarette was flooded.

60. The vessel's propulsion system remained operable prior to the vessel sinking.

61. The Captain had a deckhand wake up the crew, report to the pilothouse and don immersion suits.

62. The immersion suits were not assigned or matched to specific crew to ensure proper fit.

63. The Engineer reported to the Captain that the water level in the lazarette was coming down. It is unknown how the Engineer checked the status of water level in the lazarette.

64. The port heel of the vessel shifted to a starboard list so the Captain sent a deckhand to the engine room to check on the Engineer. It is unknown what caused the vessel to shift to a starboard list.

65. The deckhand reported to the Captain that the engine room was flooded with approximately two feet of water above the deck plates.

66. The source of the engine room flooding is unknown.

67. A deckhand heard the Engineer tell the Captain that the aft deck of the vessel was awash and that water was entering the processing space prior to the vessel sinking.

68. The Deck Boss reported that the aft door to the processing space on the starboard side was open prior to the vessel sinking.

69. The Captain called MAYDAY on the SSB radio and ordered the crew to get the liferafts off of the pilothouse, deploy them and prepare to abandon the vessel.

70. A separate investigation into why COMSTA Kodiak duty personnel did not hear the MAYDAY call was conducted by the Coast Guard independent of this investigation. The findings of this investigation were published prior to the completion of this report.

71. The 15 person Crewsaver liferaft was deployed over the port side forward and the 10 person Crewsaver liferaft was deployed over the starboard side off of the fishing deck.

72. The 15 person Crewsaver liferaft inflated properly.

73. Two of the four survivors indicated that they saw the 10 person Crewsaver liferaft inflate. The remaining two survivors did not witness the liferaft inflate.

74. Video footage showed that the 10 person Crewsaver liferaft at least partially inflated when it was deployed.

75. Seven of the vessel's crewmembers abandoned the vessel and entered the 15 person Crewsaver liferaft located off the starboard bow of the vessel.

76. Three crewmembers were last seen in immersion suits waiting on the starboard side of the vessel near the 10 person Crewsaver liferaft.

77. The Engineer was last seen heading towards the engine room without an immersion suit on.

78. The water temperature at the time of casualty was approximately 43°F and ambient air temperature was approximately 38 °F.

79. The F/V KATMAI sank at approximately 0845Z on October 22, 2008 and was located over 1000 nautical miles west of CG COMSTA Kodiak.

80. The canopy on the 15 person Crewsaver liferaft began to tear away from the liferaft hull in the heavy winds.

81. The 15 person Crewsaver liferaft was required by the Coast Guard to have ballast bags installed. There were no minimal size requirements for ballast bags in the regulations when the liferaft was manufactured in 1980.

82. One of the initial survivors partially removed his immersion suit in order to secure the canopy to the hull of the 15 person Crewsaver liferaft.

83. The 15 person Crewsaver liferaft capsized tossing the seven initial survivors, the EPIRB and liferaft equipment bag into the water. The capsizing event also removed the canopy from the liferaft.

84. Four of the crewmembers were able to re-enter the liferaft while three did not return. It is unknown why the three crewmembers were unable to re-enter the liferaft.

85. At 0907Z on October 22, 2008 the NPSC received a 406 MHz alert from the EPIRB registered to the F/V KATMAI.

86. The FPV PATRICIA LEE and FPV COURAGEOUS assisted the Coast Guard in the search and rescue operations.

87. A CG HH-60J recovered one deceased crewmember.

88. The FPV COURAGEOUS recovered one deceased crewmember and debris from the vessel including the vessel's EPIRB and the 10 person Crewsaver liferaft.

89. The FPV COURAGEOUS reported that the recovered liferaft was "beaten up".

90. The FPV PATRICIA LEE recovered three deceased crewmembers.

91. At 0028Z on October 23, 2008, the four survivors of the vessel were rescued by CG HH-60J (6005).

92. All deceased crewmembers recovered by the FPV PATRICIA LEE were transferred to the FPV COURAGEOUS which delivered them and the recovered debris to Adak, AK.

93. All deceased crewmembers were wearing immersion suits when they were recovered.

94. Drug testing was performed on the four survivors. The Deck Boss tested positive for marijuana. All other survivors tested negative for drugs.

95. The bodies of the five recovered deceased crewmembers were examined externally and a complete blood toxicology analysis was performed with no abnormalities noted.

96. The cause of death of the five deceased crewmembers was determined to be hypothermia and drowning.

97. The compressed gas cylinder, canopy, ballast bags, and equipment bag of the recovered 10 person Crewsaver liferaft was missing when the liferaft was recovered by the FPV COURAGEOUS.

98. There is no evidence based on the checklist used to examine the 10 person Crewsaver liferaft that the ballast bags were examined during the most recent servicing of the liferaft in December 2007.

99. There is no evidence based on the checklist and inspection documentation that the liferaft servicing facility properly attached the inflation cylinder to the inflation hose of the 10 person Crewsaver liferaft in accordance with manufacturer's specifications.

100. The vessel's EPIRB operated properly when manually activated by the Captain approximately 10 minutes prior to abandoning the vessel.

101. There are no records of any violations issued to the vessel or its owner/operator in the MISLE database.

102. The Captain of the vessel had over twelve years experience as a vessel master and over twenty four years of experience in the commercial fishing vessel industry.

103. There was an aluminum doubler plate installed on the outboard side of the starboard bulkhead of the processing space in way of reported deteriorated steel.

104. There was a two to three foot crack in a horizontal weld seam of the starboard bulkhead of the processing space approximately two to three feet above the main deck. The crack was repaired temporarily with silicone and there is no evidence that permanent repairs were made prior to the casualty.

105. No crewmembers of the vessel held CG merchant mariner's credentials.

E. ANALYSIS

1. VESSEL STABILITY

The Marine Safety Center (MSC) performed a technical analysis to evaluate the stability of the F/V KATMAI against stability requirements of 46 CFR Subchapter C and investigated potential scenarios that may have led to the vessel's sinking. In general, the stability report issued to the F/V KATMAI in August 1996 met the standards contained in 46 CFR Part 28.530 for providing stability guidance to the F/V KATMAI.

While the stability requirements of 46 CFR Subchapter C, Subpart E are applicable to vessels over 79 feet in length, they have been used in the past as a reasonable standard for smaller fishing vessels, and were used in the stability analysis of the F/V KATMAI, whose registered length was only 73.3 feet. The complete stability analysis is provided in Appendix 2. The following conclusions regarding the stability of the F/V KATMAI resulted from this analysis:

- In general, the August 1996 stability report met the basic purpose of the stability guidance standard in 46 CFR 28.530, in that operational recommendations and loading conditions for fishing were provided to the vessel;

- In the pre-casualty condition, the analysis model showed that the F/V KATMAI would likely have met the intact stability standards of 46 CFR Subchapter C, Subpart E;

- Two discrepancies were found in the stability test information provided in the August 1996 report that would have resulted in the test being marked, "Returned for Revision" from MSC: 1) Only two pendulums were used to conduct the stability test. ASTM F 1321 requires a minimum of three pendulums to allow identification of bad readings at any one pendulum station; 2) Only three freeboard readings on each side of the vessel were taken to establish the position of the waterline. ASTM F 1321 recommends at least five freeboard readings be taken on each side of the vessel;

- The F/V KATMAI stability report stated that it should be updated when equipment was added, or the fishing operations were changed. At the time of the casualty, the vessel's trawling spool had been removed and the vessel was using pots to fish for cod. As this is a different fishing operation from trawling for shrimp and different equipment was required, a new stability report should have been generated for the vessel. However, it is unlikely that these differences greatly affected the vessel's stability;

- In the F/V KATMAI's pre-casualty condition, more than twice the amount of cargo was being carried than was reviewed in the loading conditions examined in the August 1996 stability report. The information suggested that the vessel had more than 50 long tons of load and more aft trim than a similar loading condition (LC4) in the stability report. While the additional weight onboard lowered the vessel's Vertical Center of Gravity (VCG) making it more stable, the reduced freeboard and aft trim would have increased the vessel's potential to take on water. No operational recommendations were made in the August 1996 stability report that limited the total amount of frozen cargo that could be carried. The assumption could be made by the operator that the cargo hold could be completely filled;

- In the independent review of the vessel's stability against the intact stability standards of 46 CFR Subchapter C, Subpart E, several of the eleven loading conditions in the stability report did not meet the standards. In general, the Severe Wind and Roll Criteria in 46 CFR 28.575 was the most limiting due to the large wind profile from the carriage of the pots on the fishing deck;

- The analysis model indicated that the F/V KATMAI did not meet the damage stability standards of 46 CFR 28.580. In damage cases where the processing space was flooded, the model capsized.

- The heavy winds and high seas greatly affected the vessel's stability. While the effects of the high seas were not modeled in the analysis, the effects of high winds greatly decreased the stability of the model. In some scenarios, the model remained upright with no wind but capsized when high wind heeling moments were added;

- It appeared that the F/V KATMAI's freeing port area on the aft deck was substantially less that the standards in 46 CFR 28.555. Witness testimony suggested that the vessel would accumulate high water on the aft deck in rough weather. It was reported that the aft deck was under water at the time of the casualty. Water on the aft deck would have reduced the stability of the vessel and increased the potential for flooding of the processing space;

- Testimony indicated that the flooding aboard the F/V KATMAI began in the lazarette and that 2 feet of water above the deck plates was also reported in the engine room. Analysis indicated that flooding of the lazarette and engine room alone should not have resulted in capsize or sinking. This result is based on a calm water situation and does not include the dynamic effects from the reported heavy winds and seas, which would have drastically reduced the vessel's survivability in this condition.

- Witness testimony suggested that prior to the vessel sinking, the processing space began taking on water. The modeling analysis indicated that the F/V KATMAI would not remain afloat in the event of uncontrolled flooding into the processing space, whether through the aft watertight door or through downflooding from the fish opening in the overhead.

2. LIFERAFTS & IMMERSION SUITS

The F/V KATMAI had two Coast Guard approved inflatable liferafts onboard the vessel stored on top of the pilothouse, one fifteen (15) person Crewsaver manufactured in April 1980 and one ten (10) person Crewsaver manufactured in February 1994. Both liferafts had satisfactory NAP, gas inflation and floor seam tests conducted in November and December 2007 respectively.

a. 10 Person Crewsaver Liferaft (S/N SC2521, Lot# 234)

The 10 person Crewsaver liferaft was manufactured in July 1994 to meet the Coast Guard approval standards of 46 CFR 160.051 (Inflatable Liferafts for Domestic Service) and 46 CFR 160.151 (Inflatable Liferafts (SOLAS)). The liferaft was marked with Coast Guard approval numbers 160.051/214/1 and 160.151/15/1 and was also listed as being a SOLAS 74/83 Approved Modular Liferaft. According to the most recent servicing documentation, the liferaft was a "SOLAS A" liferaft meaning that the inflatable liferaft complied with SOLAS and was equipped with a SOLAS A equipment pack.

A modular liferaft, as shown in Figure 15, is a liferaft in which the canopy, canopy support, floor pads, if any, boarding ramp and at least one ballast are detachable from the liferaft hull and floor assembly.

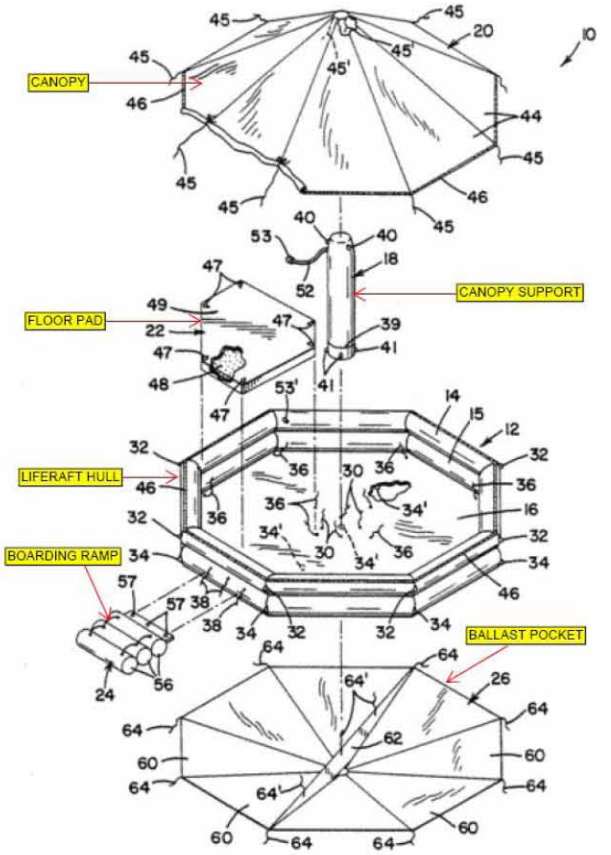


Figure 15: Modular Liferaft Design

The following pieces of the F/V KATMAI's 10 person Crewsaver liferaft were recovered: liferaft hull with boarding ramp and inflation hose assembly attached; liferaft floor detached from liferaft, canopy support attached to liferaft hull with inflation tube; floor pads; and painter. The canopy, ballast bags, equipment pack and compressed gas cylinder were not recovered.

An inspection of the recovered pieces of the 10 person Crewsaver liferaft indicated the canopy, canopy support, and floor pads were detachable from the liferaft. The primary means of attaching the canopy to the liferaft hull was a fabric hook-and-loop fastener. The canopy support could be detached from the liferaft floor by turning several clip mechanisms. An inspection of the canopy support indicated that it had ripped apart from the floor connections causing a seam in the support to split open.

Ballast bags should have been attached to the floor of this liferaft. 46 CFR 160.051-4 (1994 Edition) required that "water pockets to improve stability and reduce drifting" be fitted on the underside of the liferaft floor. This liferaft was manufactured in 1994 and would have been required to comply with this regulation. An examination of the underside of the liferaft floor indicated that the ballast bags were missing from the liferaft floor. The two pictures below show where the two ballast bags should have been attached to the liferaft floor. Based on an analysis of the pictures below, the liferaft manufacturer stated the ballast bag on each side would have been approximately 48" long with each holding approximately 3.5 cubic meters of water.


Missing Ballast Bags on Bottom of Liferaft Floor

The high seas experienced on October 22, 2008 may have pulled the ballast bags off of the floor of the liferaft but there are minimal indications of tearing. The following picture shows the stitching that connects the ballast bag to the liferaft floor. The stitching was intact but an examination of the remaining ballast bag material was inconclusive as to whether the ballast bags were torn off of the liferaft from exposure to the high seas or if they were manually cut/ripped off from the liferaft. Both ballast bags were completely removed from the liferaft making it difficult to determine if the ballast bags were properly attached prior to the casualty. Based on a review of the checklist used to service this liferaft in 2007, there is no indication that the servicing technician inspected or verified the proper installation of ballast bags on this liferaft.

Ballast Bag Connection to Liferaft Floor

The compressed gas cylinder should have been attached to the liferaft in the cylinder harness. The compressed gas cylinder was missing when the liferaft was recovered by the crew of the FPV COURAGEOUS on October 22, 2008. The following pictures show the cylinder harness on the recovered liferaft and also a picture of a similar harness with a compressed cylinder inserted into the harness.

Recovered Liferaft Gas Cylinder Harness

Sample Harness with Cylinder Inserted

The cylinder harness on the recovered liferaft was intact. In the left picture above, the right end of the harness that would permit the cylinder to be inserted or removed was also tied together as would have been done after a cylinder had been inserted into the harness prior to packaging of the liferaft. The left end of the harness shown in the left picture would have been looped around the neck of the cylinder as shown in the right picture. The only way the cylinder could have fallen out of the harness would have been improper installation or if the cylinder became disconnected from the inflation hose to permit the cylinder head to slide out of the loop and thus allowing the cylinder to slide out of the harness.

The inflation hose was removed from the liferaft hull and delivered to the National Transportation Safety Board (NTSB) for further analysis to determine the condition of the hose and 90 degree swivel elbow. A cursory analysis showed the hose was crushed near the end that would have connected to the inflation valve assembly and the hose was stretched approximately 4.5 inches beyond its original length of 31½ inches. See the picture on the left below. When the liferaft was recovered, the painter was wrapped tightly around the inflation hose as shown in section 5(b) of the Findings of Fact. The liferaft floor was completely detached from the liferaft hull but the painter line attached to the liferaft floor was wrapped tightly around the inflation hose and kept the liferaft floor connected to the liferaft hull. The tight knot and tensile stresses caused by the floor pulling away from the liferaft hull in the rough seas may have caused the

damage and elongation discovered on the inflation hose. The following picture shows that the elongation of the inflation hose caused the Teflon liner to rip at the end that was crushed causing a hole in the hose.

Torn Teflon Liner of Inflation Hose

The 90 degree swivel elbow that threads onto the inflation valve assembly showed signs of corrosion on the threads of the stainless steel connector and on the seating surface as shown in the picture on the right below. The threads were undamaged but NTSB did discover that the corrosion was actually rusted microscopic stainless steel particles that most likely came from a previous connection to the inflation valve assembly. The inflation hose was replaced during the servicing of this liferaft in December 2007 but the 90 degree swivel elbow was re-used following the 5-year inflation test that was performed on the liferaft in December 2007. The 90 degree swivel elbow would have been disconnected from the inflation valve assembly following this test so that the compressed gas cylinder could be tested and charged. The stainless steel particles most likely were a result of the friction between the stainless steel connector on the 90 degree swivel elbow and the inflation valve assembly when the fitting was removed or attached during each servicing period. These particles most likely corroded when they were exposed to seawater after the compressed gas cylinder became separated from the inflation hose following the deployment of the liferaft. The complete NTSB report is located in Appendix 3.

The presence of these particles does not indicate whether or not the 90 degree swivel elbow was properly attached to the inflation valve assembly on the compressed gas cylinder following the servicing of the liferaft in December 2007. The 90 degree swivel elbow should have been attached to the inflation valve assembly with 30 foot-pounds of torque. This fitting was either not installed properly by the servicing facility or it was forcibly removed following the deployment of the liferaft either by hand or by the force of the seas. There is no evidence or testimony from the crew or vessel owner to indicate that either Crewsaver liferaft had been tampered with by the vessel owner or crew of the F/V KATMAI prior to being deployed on October 22, 2008.

Liferaft Inflation Hose

90 Degree Swivel Elbow

The painter of the liferaft was examined and the nylon cord that would have attached to the cylinder lanyard as shown in Figure 16 was missing.

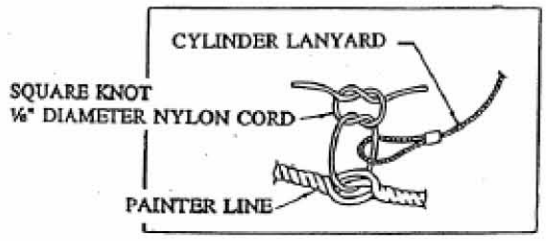
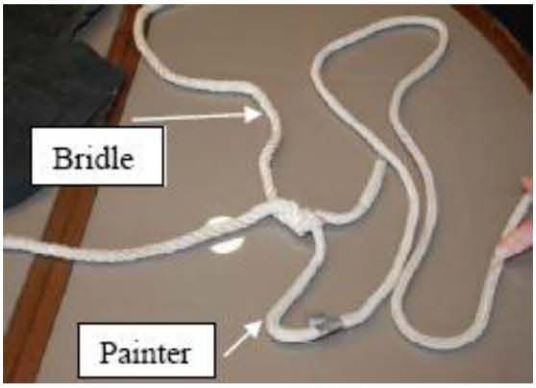


Figure 16: Cylinder Lanyard Attachment



Liferaft Bridle and Painter

The picture above shows the bridle and painter from the recovered liferaft. A 12" long 1/8" diameter nylon cord should have been installed at least 60" from the bridle attachment. There was one location on the painter where it appeared that a line had passed through to connect to the inflation cable. However, it cannot be determined if a nylon cord was installed in the painter during the most recent servicing in December 2007. If the nylon cord was not installed properly and attached to the cylinder lanyard, then the liferaft could not have been deployed by pulling the painter. The nylon cord most likely came loose as the painter was tossed around in the rough seas.

The liferaft hull was examined and did not appear initially to have inflated when it was deployed from the F/V KATMAI. The picture below shows the hull of the recovered liferaft in which the hull appears to be vacuumed similar to a liferaft stored in its container. However, a review of video footage from a Coast Guard search and rescue helicopter showed that both hull chambers of the liferaft had at least partially inflated when it was deployed from the F/V KATMAI. The condition of the liferaft hull when it was recovered was most likely a result from being tossed around in the rough seas.

Recovered Crewsaver Liferaft Hull

To evaluate the integrity of the liferaft hull, an inflation test was conducted on February 3, 2009 in Seattle, WA. The inflation hose was disconnected from the liferaft prior to this test for further analysis by NTSB. A compressed air hose was connected to the "Y" fitting on the liferaft hull allowing compressed air to enter the upper and lower chambers of the liferaft hull.

During the test, the lower hull chamber inflated properly and the pressure relief valve activated satisfactorily. A leak test was performed on all hull seams of the lower hull using a soap/water mixture with no leaks identified. The boarding platform did not inflate properly. It was discovered that the boarding platform had become partially separated from the raft which prevented it from inflating properly. The partial separation of the boarding platform was most likely a result of the recovery operations or from exposure to the heavy winds and high seas. A small leak was noted on one of the check valves used to inflate the boarding platform.

The upper chamber of the liferaft hull did not inflate at all when the inflation test commenced. It was discovered that the check valve that permitted pressurized gas to enter the raft was seized in a closed position. Following the satisfactory test of the lower chamber, the "Y" fitting was removed to permit an examination of the upper and lower chamber check valves. A visual examination of the check valves indicated mild corrosion most likely caused by exposure to sea water entering through the inflation hose due to the missing compressed gas cylinder. An air line was directly connected to the female inflation fitting on the upper chamber of the liferaft hull and compressed air was introduced. The seized check valve did not open until the air pressure was increased to approximately 100 psi. The service manual for the liferaft indicated that air pressure of 40 psi should have resulted in air flow through the inlet valves. However, the normal compressed gas cylinder pressure is over 1000 psi which would have opened the check valve in normal operating conditions even with the mild corrosion noticed during the inspection. There are no indications that there was anything wrong with this check valve other than being exposed to sea water which may have caused the valve to stick initially at the inflation pressure used during the test. Once opened the check valve permitted air to inflate the upper chamber properly.

A leak test was performed on all seams of the upper chamber with no leaks indicated. The upper chamber also supplied the canopy support inflation hose. The canopy support inflated but a hole was discovered at the bottom of the support where the canopy support connected to the floor of the liferaft. Several of the connecting mechanism had been torn out in way of the hole which

indicated that the hole was most likely caused by sheering forces between the floor and canopy connections due to the high seas and heavy winds. The canopy supply line was closed to permit the testing of the upper chamber relief valve. The relief valve opened satisfactorily.

Following the inflation test of the liferaft hull, a shop vacuum was used to remove all air from the lower and upper chambers of the liferaft as would be done prior to packaging a liferaft in its container. Once the air was removed from the liferaft hull, a visual comparison was made of pictures of the liferaft as recovered and the physical liferaft after the tests were completed. Based on photographs of the liferaft when it was received from the FPV COURAGEOUS, the 10 person Crewsaver liferaft did not appear to have inflated after being deployed from the F/V KATMAI and appeared to be in a vacuumed state. The upper buoyancy chamber may have had a slight air introduction through the hole in the canopy support but it still appeared to be in a vacuumed condition throughout most of the chamber. Since no leaks were noted in the lower buoyancy chamber of the hull, it should have been inflated when it was recovered had the liferaft inflated properly when deployed.

The liferaft could have only inflated if the compressed air cylinder had been attached to the inflation hose when it was deployed from the F/V KATMAI. The most likely reasons for the compressed gas cylinder to disconnect from the inflation hose was either improper installation when it was last serviced in December 2007, manual disconnection following its servicing, or the force of the seas. It is unlikely that normal vessel operations while the liferaft was stored in its container or the deployment process would have caused the compressed gas cylinder to disconnect from the inflation hose if it had been properly connected. It is also improbable that any crew that may have entered the liferaft would have been capable of removing the cylinder especially in the high seas and heavy winds and due to the physical limitations caused by wearing an immersion suit.

Testimony indicated that this liferaft, while it was still in its storage container, was dropped from the top of the pilothouse to the deck of the F/V KATMAI. This drop onto the steel deck could have damaged the storage container or prevented the liferaft from deploying properly. The F/V KATMAI was not equipped with a launching platform for its liferafts which prevented both liferafts from entering the water without additional assistance from the crew. Having an effective launching platform would ensure that liferafts enter the water and deploy properly when manually removed from their cradle.

b. <u>15 Person Crewsaver Liferaft (S/N 15MMUS10, Lot# 127)</u>

The 15 person Crewsaver liferaft was manufactured in April 1980 to meet the Coast Guard approval standards of 46 CFR 160.051 (Inflatable Liferafts for Domestic Service). According to the most recent servicing documentation the liferaft was marked with Coast Guard approval number 160.051/51/1. The liferaft was a model MK-3 liferaft and was outfitted with a SOLAS A equipment pack.

The F/V KATMAI's 15 person Crewsaver liferaft deployed and inflated satisfactorily. Initially seven crewmembers were able to enter the liferaft after abandoning the F/V KATMAI. Crew testimony indicated that the canopy of the liferaft began to detach from the liferaft hull soon after it was deployed even though it was glued to the upper inflation tube. The crew had great difficulty attempting to tie the canopy to the liferaft hull due to the decreased dexterity caused by their immersion suits, small tie down strings and the heavy winds and high seas. The canopy was permanently detached from the liferaft when the liferaft overturned soon after being

deployed tossing all crew and liferaft equipment into the water. Only four crewmembers were able to reenter the liferaft following its initial capsizing.

Crew testimony indicated that the 15 person Crewsaver liferaft did not have ballast bags installed that would have minimized the potential to capsize. However, the liferaft should have been outfitted with small ballast bags that were not required to meet the current standards detailed in 46 CFR 160.051-5(g). It is possible that the crew did not notice these ballast bags due to their size and color or that they were missing. Throughout the 15 hours that the four survivors relied on the liferaft for survival, it capsized numerous times causing the crew to reenter the water. During this period, the floor of the liferaft also began to separate from the hull permitting seawater to continuously enter the liferaft. An examination of the search and rescue video taken at the time the four survivors were rescued indicated that the hull of the 15 person Crewsaver liferaft was fully inflated even after exposure to the high seas, heavy winds and numerous capsizing events.

c. Aged and Modular Liferafts

Coast Guard and SOLAS approved liferafts do not have an expiration date and can be used onboard vessels as long as they continue to pass the required NAP, gas inflation and floor seam tests. The working life of liferafts is highly dependent on the environment in which they are employed. Fishing vessels that operate in the North Pacific Ocean and Bering Sea are routinely exposed to harsh environments that can increase maintenance demands and affect the satisfactory operation of equipment, including liferafts that are stowed in containers only partially protected from the elements.

The recovered liferaft from the F/V KATMAI was a modular design that permitted specific parts to be easily removed. It suffered significant damage from the heavy winds and high seas and lost parts as a result of its design. The loss of the canopy and small ballast bags on the 1980 liferaft in which the seven crewmembers had sought refuge permitted continuous exposure to the elements and most likely facilitated the capsizing of the liferaft and contributed to the loss of three crewmembers and all survival equipment from the liferaft.

46 CFR Parts 160.051 and 160.151 were updated in 1997. The most current SOLAS requirements for liferafts were included in the 2001 Amendments and are contained in the Lifesaving Appliance (LSA) Code. In general, liferafts approved under these standards meet much more stringent requirements than the liferafts installed on the F/V KATMAI. The revised standards include: improved ballast systems; canopy attachment standards; improved boarding ramps; wind velocity tests; and improved liferaft righting requirements.

d. Liferaft Servicing

1) Requirements

All inflatable liferafts carrying approval numbers listed under 46 CFR 160.051 or 160.151 are required to be inspected and serviced periodically by Coast Guard approved servicing facilities in accordance with 46 CFR 160.151-41. Liferaft servicing facilities may only service Coast Guard approved liferafts manufactured by companies listed on an approval letter issued by the cognizant Coast Guard Officer in Charge Marine Inspection (OCMI). Prior to servicing a liferaft under the servicing facility's Coast Guard approval, the owner or operator of the facility must notify the cognizant OCMI of each liferaft to be serviced. The OCMI will inform the servicing facility whether the servicing must be witnessed by a Coast Guard inspector. There is no policy that mandates Coast Guard or 3rd party inspectors witness the servicing of Coast Guard approved liferafts.

2) Quality Assurance

Coast Guard approved servicing facilities must have at least one technician who has been trained by the liferaft manufacturer to service the liferafts listed on the servicing facility's Coast Guard approval letter. At a minimum, liferaft servicing technicians must follow the servicing procedures provided by 46 CFR 160.151-57 as well as any other procedures required by the liferaft manufacturer. Testimony and documentation received from the servicing technician who serviced the two F/V KATMAI liferafts indicated that Coast Guard and manufacturer's procedures were followed and that a co-worker assisted in servicing both liferafts. A Coast Guard inspector did not witness the servicing of these liferafts. The Coast Guard was not notified prior to the servicing of these liferafts because the servicing facility indicated that local OCMI only required notification for liferafts from Coast Guard inspected vessels.

There is currently no manufacturer requirement or Coast Guard policy or regulation that requires approved liferaft servicing facilities to integrate a quality assurance program into their liferaft servicing procedures. It is highly likely that most Coast Guard approved liferafts are serviced without the presence of a witness to ensure that all servicing procedures are followed and completed correctly. When Coast Guard inspectors witness the servicing of approved liferafts, they are responsible for ensuring that the servicing facility meets all requirements and that liferafts are correctly serviced. Liferafts used by the Coast Guard for search and rescue operations have established servicing procedures that include numerous quality assurance checkpoints where the work of the servicing technician is validated by another person to ensure that the servicing and packing procedures are followed correctly. Without the presence of a Coast Guard or 3rd party witness there is no reliable means to ensure that all Coast Guard approved liferafts are serviced correctly in accordance with Coast Guard and manufacturers requirements. The requirement for liferaft servicing facilities to develop and implement quality assurance programs as well as mandating that the Coast Guard or a recognized 3rd party witness the servicing of all Coast Guard approved liferafts would ensure that servicing procedures are followed and increase the probability that liferafts will function correctly.

e. Immersion Suits

According to crew testimony and upon examination of recovered debris, there were at least twelve (12) Coast Guard approved SOLAS immersion suits onboard the F/V KATMAI. Most were stored in a wood box located directly aft of the pilothouse on the port side but testimony indicated that the Captain and the Deck Boss stored their immersion suits in their berthing area. All immersion suits were inspected in December 2007 by the Sector Seattle Commercial Fishing Vessel Examiner.

Five immersion suits (three Bayleys and two Imperial) were recovered from the deceased crewmembers and were inspected by members of the Marine Board of Investigation following the casualty. Four of the recovered immersion suits were 16-19 years old. The fifth was only 4 years old. All suits were generally in good condition. Several of the suits were torn which was most likely caused during the recovery of the deceased crewmembers based on testimony taken from the survivors as well as the Good Samaritan vessels who recovered the deceased.

Several of the immersion suits were designed with five finger orange gloves glued to the sleeves while the other immersion suits had three finger mitts integral to the suit itself. While the orange gloves improved the dexterity of the user, it was discovered that the gloves became detached from the sleeves of the immersion suits with very little effort when they were inspected after the casualty. There is no indication that the gloves detached while being worn by the crewmembers. The degradation of the glue that connected the orange gloves to the suits may have been a result of extended exposure to the cold water but could have also been a result of age. The materials used in immersion suits, the main zipper, Velcro tabs, and seams are all products that deteriorate over time. Neoprene is subject to degradation from UV sunlight, chemicals, humidity, improper storage techniques such as folding or creasing, and contact with sharp objects. Over time, this may lead to decreased protection. Under current regulations, immersion suits may continue to be used as long as they are maintained in a good and serviceable condition.

Although, there are currently no age limits or expiration dates for immersion suits despite the fact that the materials of which they are made degrade over time, NVIC 01-08 does provide guidance in the shipboard inspection and testing of immersion suits. It states the procedures to follow during an inspection of an immersion suit, and that each suit be subjected to an air pressure test at intervals not exceeding three years or more frequently for suits over ten years of age. If immersion suits are found to be unsatisfactory then they should be removed from service.

Unfortunately, none of the immersion suits that the survivors wore were maintained following the casualty and therefore could not be examined by the Marine Board of Investigation. Three of the four survivors stated that their immersion suits worked very well and only permitted a small amount of water into the suits despite continued exposure over a 15 hour period. One survivor stated that water leaked into his immersion suit filling the legs between his knees and feet and filling the arms between his elbows and hands. This crewman thought that his immersion suit may have had some small holes that permitted water to enter. The suit may also have been the wrong size. It was also noted that in reviewing a picture of one deceased crewmember that the immersion suit he had donned was too large which likely decreased the effectiveness of the suit in protecting him from the cold water.

The immersion suits were not marked or assigned to specific crewmembers. Also, one witness indicated that during the immersion suit drills only one immersion suit was used to train the entire crew which may have prevented some of the crewmembers from learning which size suit

they needed in the event of an emergency. In at least one case, this practice permitted a crewmember to grab an immersion suit that was too big for his body which afforded him little protection from the cold water when he abandoned the vessel. It is essential that fishing vessel crews identify the correct size of immersion suit for their body and understand that different manufacturers have different size specifications especially for those vessels that carry immersion suits made by different manufacturers. Ensuring that crewmembers are provided with and don properly fitting and well maintained immersion suits is critical to survival in cold water environments. For incidents where survival suit usage is known, the results indicate that fisherman survive more than twice as often when survival equipment is properly used.

NVIC 1-92 provides guidance for the maintenance, inspection and marking of immersion suits. This NVIC also recommends that whistles, dye markers, aerial flares, and personal EPIRBs be carried on each immersion suit to "help attract attention." Several of the immersion suits recovered from the F/V KATMAI had whistles and lights installed on them but no other signaling equipment was installed as recommended in NVIC 1-92 to facilitate the search and rescue teams in locating the crewmembers.

3. ENGINE ROOM FLOODING

Based on testimony received from the four survivors of F/V KATMAI and that of previous crewmembers, there is no clear indication of what may have caused the engine room to flood on October 22, 2008. The Engineer never reported to the Captain that the engine room was flooding while he worked on dewatering the lazarette. The flooding in the engine room was only realized after the vessel's port heel shifted to a starboard list and the Captain sent a deckhand to check on the Engineer who then reported that there was 2 feet of water above the deck plates. Following this report, the Captain ordered the crew to abandon the vessel and no further reports regarding the flooding in the engine room were noted.

Prior to the casualty, testimony indicated that there were no problems with machinery or water ingress into the engine room from piping or through the hull. The shaft seals were reported to have leaked more than normal with the starboard shaft seal permitting a small stream of water in. It is not believed that the shaft seals caused the rapid flooding of the engine room indicated from crew testimony.

The most likely scenarios that could have led to rapid flooding of the engine room are:

- One source of the flooding of the engine room may have been the 1½" - 2" drain pipe that was reported to go from the lazarette to the engine room. There are conflicting accounts as to whether this pipe drained directly into the engine room or was part of the F/V KATMAI's fixed bilge system. After the Engineer reported that the lazarette was flooded, he went to the engine room to dewater the space which meant that the drain pipe in the lazarette was most likely part of the F/V KATMAI's fixed bilge system. Even if the lazarette drained directly into the engine room bilge, the volume of water would not have accounted for the level of water witnessed in the engine room. Prior to the vessel sinking, the Engineer reported that he had dewatered the lazarette prior to the report of flooding in the engine room;

- Witness testimony indicated that the shaft seals leaked a little more than normal. A failure of either of the shaft seals could have led to a higher flow rate of water into the engine room but it is not believed that this caused the rapid flooding of the engine room;

- Witness testimony indicated that a broken hose on a water supply pump for the processing space had caused some flooding in the engine room in 2005 however the vessel was not processing fish at the time of the casualty making this scenario unlikely;

- Witness testimony indicated that there was one open vent pipe located on the forward superstructure deck directly aft of the house. Rough seas greater than 15' could have permitted water to enter the engine room through this vent pipe. Unless the starboard fishing deck was under water, there would not be a continuous or substantial flow of water into the engine room. Based on crew testimony, the fishing deck was not flooded until the vessel began to sink just after the crew had abandoned the vessel;

- The most likely cause of the flooding of the engine room was due to a catastrophic failure in the hull or in the sea water supply system attached to the vessel's sea chest.

A fracture or hole in the hull or broken sea water piping could have resulted in rapid ingress of water into the engine room. The vessel's hull may have been severely stressed by the amount of cargo onboard, the severe weather, and the heading of the vessel as a result of the loss of steering. The combined effect of these forces could have caused a hull fracture or damaged the sea water cooling system for the main engines and generators.

The exact cause of the flooding in the engine room is not known and cannot be identified. None of the four survivors witnessed the source of the flooding in the engine room and could only report that prior to abandoning the vessel, the water level in the engine room was approximately 2 feet above the deck plates.

4. VOYAGE PLANNING AND HUMAN FACTORS

a. Position and Heading

Prior to the casualty, the F/V KATMAI was proceeding east across Amchitka Pass heading towards Dutch Harbor to offload cargo.

b. Decision to Proceed to Dutch Harbor

After the completion of fishing operations on October 21, 2008, the Captain had the crew stow all gear and set course for Dutch Harbor to offload cargo. He had hoped to make 7 ½ knots to avoid the storm but the F/V KATMAI was only able to make 3 ½ to 4 knots, putting the F/V KATMAI directly in the storm's path. The Captain intended to cross Amchitka Pass and proceed east ahead of the storm. He stated that there were no outside influences that would have prevented him from waiting for the storm to pass prior to proceeding to Dutch Harbor. At one point prior to the storm's arrival the Captain indicated potential concern for the impending storm which was expressed in an email to his wife at 1452Z on October 21 in which he stated that he may have to wait the storm out instead of proceeding onward towards Dutch Harbor. Despite this concern, the Captain decided to proceed through the storm solely based on his prior experience on smaller fishing vessels when operating in similar weather conditions.

Approximately eight hours prior to the casualty, the Captain stated to the vessel operations manager in an email that the F/V KATMAI was advancing slowly and that the wind was already blowing 45-50 knots. Seven hours prior to the casualty, the Captain emailed the F/V BLUE BALLARD and stated that he had missed his break and the F/V KATMAI was getting beat up. The F/V BLUE BALLARD stated that the weather was a nightmare. Despite the worsening weather conditions, the Captain of the F/V KATMAI pushed ahead and altered course to deeper water in an attempt to lessen the effects of the inbound storm.

Testimony was received from two different fishing vessel captains who were operating in the same region as the F/V KATMAI. The captains of the FPV COURAGEOUS and FPV PATRICIA LEE, both substantially larger than the F/V KATMAI, acknowledged the severity of the storm that entered Amchitka Pass on October 22, 2008 and chose to find shelter for their vessels while the storm passed. The FPV COURAGEOUS was exposed to one hundred (100) knot winds and over 20 ft seas while in a sheltered location.

The decision to proceed to Dutch Harbor in lieu of finding shelter was the sole responsibility of the Captain. His decision to proceed was ultimately based on the weather report received via email from SkyMate® VMS which forecasted hurricane force winds of up to 70 knots and 24 ft seas. Based on this information and the forecast arrival of the storm, the Captain believed that the F/V KATMAI could make enough headway to avoid the brunt of the storm. Due to the inoperable Furuno 207 weather fax, a graphic picture of the storm similar to Figure 13 was not available to the Captain which may have prevented him from understanding the true size and strength of the incoming storm. By the time the Captain realized that the F/V KATMAI had only been able to make 3½ knots instead of the 7 knots he had hoped to make, he stated that there was little that could be done to avoid the brunt of the incoming storm. The Captain's decision to proceed to Dutch Harbor instead of seeking shelter and waiting for the storm to pass unnecessarily exposed the F/V KATMAI to the severe weather conditions.

c. Human Factors

Human factors consist of factors that influence the human behavior including environmental, organizational and job factors, and human and individual characteristics. Evaluating the human factors that are present in the workplace can assist in reducing or preventing marine casualties and also protect crew health and safety. The primary factors that are commonly attributed to marine casualties include work-related stress, fatigue, handling of equipment, ship design, human/machinery interfaces, and the design of operational procedures. All of these factors are common on commercial fishing vessels. Fishing vessel crews often work long hours in extreme environments under tight time constraints. The machinery used on commercial fishing vessels to catch and process fish also present numerous hazards to personnel that must be addressed through well developed operating procedures and in the design of the equipment itself. Additionally, the severity of the weather and sea state most certainly had in all aspects of this casualty.

1) Fatigue

During the hearings, the survivors stated that they typically worked 16 to 18 hours per day when fishing and slept only 2 to 6 hours per day. According to the National Institutes of Health the average adult human being needs approximately 8 hours of sleep per day. Not getting enough sleep leads to fatigue which can lead to poor decision making and is considered to be a causal factor in accidents. Based on the testimony received from the survivors of the F/V KATMAI, all crew onboard were deprived of sleep and most likely suffered from fatigue. Since the F/V KATMAI was an uninspected fishing vessel, there were no requirements for manning or maximum permissible work hours per 24 hour period. More information concerning fatigue can be found at http://www.nih.gov.

The Captain stated that he was able to get approximately 6 hours of sleep prior to going on watch just before the casualty occurred. The other survivors were able to get as much as 8 hours of sleep just prior to the casualty. All crew stated that the only time they were able to get 8 hours of sleep was when the vessel was in port or transiting to/from port. The crew was most likely suffering from chronic fatigue to the lack of adequate sleep over a long period of time. The 8 hours of sleep that the crew was able to get prior to the casualty had little or no effect on the existing chronic sleep deficit being experienced by the crew.

Fatigue may was a factor that may have reduced the survivability of the crew after abandoning the vessel by limiting their physical abilities. Fatigue was a factor that may have affected the Captain's decision making process when he decided to proceed to Dutch Harbor in lieu of finding shelter for the F/V KATMAI until the storm passed.

2) Work-related Stress

The primary mission of the F/V KATMAI was to catch as much Pacific Cod as possible. The crew of the F/V KATMAI was paid based on the total amount of product caught and delivered. Based on a review of the crew contracts, each crewmember received a certain percentage of the total value generated from the catch. The surviving crewmembers indicated the load of Pacific Cod onboard the vessel at the time of the casualty was the most that had been caught since the vessel began fishing for cod in January 2008. However, the crew would not get paid until the catch was delivered to Dutch Harbor. The quicker that this catch was delivered to port, the quicker the crew would get paid. Testimony from the survivors indicated that they were excited about the amount of fish that had been caught and undoubtedly they were anxious to deliver the

catch so they could get paid. Getting to Dutch Harbor was definitely a priority for the Captain and crew of the F/V KATMAI and may have been a factor in the decision to proceed to Dutch Harbor in lieu of finding shelter. In addition, emails retrieved from the SkyMate® VMS also indicated that there was pressure from the Captain's spouse to finish fishing and return home as soon as possible. The combined pressure to deliver the cargo and return home may have prevented the Captain from properly assessing the inherent risks of the incoming storm and may have influenced his decision to proceed through the storm rather than find shelter until the storm passed.

3) Inadequate Resource Management

In the early afternoon of October 22, 2008 when the Engineer assumed watch in the pilothouse, the Captain indicated in testimony that he told the Engineer that the F/V KATMAI had to "make about 7.5 knots to make Tanaga before the storm hit." Following that conversation, the Captain went to bed for approximately six hours. When the Captain resumed watch in the pilothouse, he quickly realized that they had only been making 3.5 to 4 knots over the previous six hours.

There was a lack of adequate communication between the Captain and the Engineer with regard to running the vessel at 7.5 knots. The Engineer may not have understood the need to maintain 7.5 knots and, therefore, did not wake the Captain when the vessel would not travel faster than 3.5 to 4 knots. Had the Captain known that the vessel could not make 7.5 knots, it may have affected his decision to proceed in lieu of finding shelter from the incoming storm.

5. FISHING VESSEL CASUALTIES

Commercial fishing continues to rank at or near the top of the most dangerous occupations in the United States and it comprises the largest percentage of major marine casualties (MMC). The Coast Guard Office of Investigations and Analysis conducted an analysis of all lost fishing vessels and crew fatalities from 1992 through 2007. This analysis can be accessed in the Investigations section of the Coast Guard's web portal known as Homeport using the following link: http://homeport.uscg.mil/.

Coast Guard records show that fishing vessel casualties account for a large percentage of the most serious incidents including over 40% of all major marine casualties. As with the F/V KATMAI casualty, a majority of all fishing vessel losses and personnel casualties were not directly related to fishing operations but to other operations such as traveling to or from port. Most often, fishermen are dying because their vessel sank and they entered the water.

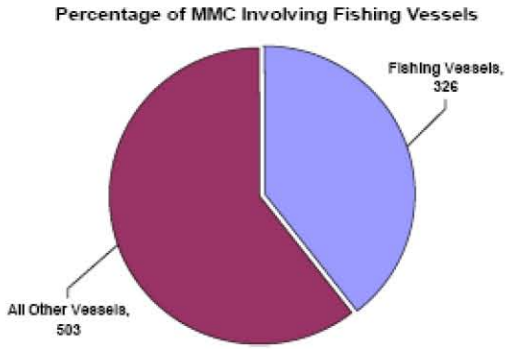


Figure 17: MMC Involving Fishing Vessels

Overall, a majority of fishing vessel losses and deaths occur in District 17 (Alaska), District 8 (Gulf of Mexico) and District 1 (New England). Fishing vessels between 11 and 30 years old, with valid Certificates of Documentation, represented the greatest number of fishing vessel losses. Flooding and fire were the initiating events of over 56% of fishing vessel losses. Water exposure was the most significant causal factor in fishermen deaths representing over 78% of all fatalities.

A comparison of vessel losses and safety exams revealed that the safety exams have had a minimal impact in reducing fishing vessel losses. However, loss of life was much lower on fishing vessels that received a safety decal. When deaths did occur on these vessels, the vessel was lost suddenly with little time for the crew to respond or prepare. Current fishing vessel regulations focus primarily on crew safety rather than the structural integrity of the vessels. This is due to a lack of statutory authority to regulate structural conditions on commercial fishing vessels.

As shown in Figure 18, uninspected vessels are over 3 times more likely to be involved in a major marine casualty.

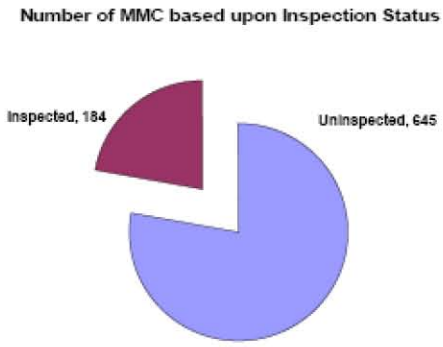


Figure 18: MMC vs. Inspection Status

Uninspected fishing and towing vessels account for over 70% of all major marine casualties. In order to improve the safety of towing vessels, safety regulations have been developed and should be published in FY09 that will require towing vessels to become inspected. These regulations were created to address the risk that the towing vessel fleet poses to America's ports and waterways as well as to improve crew safety. Despite being involved in more major marine casualties and suffering greater loss of life than towing vessels, fishing vessels remain uninspected. It is evident by the number of fishing vessel casualties each year that current safety requirements and regulatory oversight for fishing vessels is inadequate. Without the development of new safety standards and mandatory inspection requirements, fishermen will continue to die and fishing vessels will continue to sink as a result of casualties that may have been completely preventable.

6. HEAD AND GUT OPERATIONS VERSUS PROCESSING

The term fishing vessel is defined in 46 USC §2101(11a) as "a vessel that commercially engages in catching, taking, or harvesting of fish or an activity that can reasonably be expected to result in the catching, taking, or harvesting of fish." Fishing vessels which catch fish and then behead and remove the internal organs of the fish are involved in "Head and Gut" operations which are excluded from the definition of a fish processing vessel. 46 USC §2101(11b) defines a fish processing vessel as "a vessel that commercially prepares fish or fish products other than by gutting, decapitating, gilling, skinning, shucking, icing, freezing, or brine chilling."

On the F/V KATMAI, Pacific Cod were caught using pots attached to long lines which were then transferred to the processing space. In the processing space, the fish were bled out, beheaded, gutted, frozen and then packaged prior to placing the fish in the vessel's cargo hold. All of these activities are excluded from the definition of a fish processing vessel with the exception of packaging. By packaging the fish, the product is prepared for sale in the commercial fish market which is technically outside the exceptions listed in the definition of a fish processing vessel. However, a Coast Guard Chief Counsel decision from May 1985 stated that processing did not include operations, such as packaging, performed to facilitate preservation, handling and storage as long as the catch was not ready for market.

NMFS defines processing in 50 CFR 679.2 as "the preparation of, or to prepare, fish or crab to render it suitable for human consumption, industrial uses, or long-term storage, including but not limited to cooking, canning, smoking, salting, drying, freezing, or rendering into meal or oil, but does not mean icing, bleeding, heading, or gutting." Under this definition, the F/V KATMAI would be considered a processor since the product was frozen and packaged for long-term storage. The conflict between 46 USC §2101(11b) and 50 CFR 679.2 is confusing and permits vessels to be categorized differently by various federal agencies. Ultimately, the definition of what is and what is not a processing vessel should not only be based on the activities that the vessel performs but also on the number of crew that are employed on the vessel.

Fishing vessels that engage in "Head and Gut" operations typically have additional crew assigned with fish processing duties. The F/V KATMAI had seven crewmembers that were hired to process the catch as part of their daily responsibilities. Fishing vessels that simply catch fish and then store the catch in a cargo tank/hold without performing any after catch processing operations would not require this additional crew and thus have a reduced level of manning.

Increasing any vessels manning increases the inherent risk because the potential loss of life is increased. Safety requirements for all types of vessels are usually related to the number of crew and/or passengers carried on the vessel. More crew and/or passengers typically results in greater safety requirements. For example, fishing vessels that operate as processors as currently defined must meet more stringent safety requirements detailed in 46 CFR 28.700 (Subpart F – Fish Processing Vessel) which mandate that processing vessels be examined and issued a certificates of compliance every two years. These examinations ensure that fish processing vessels are in compliance with all applicable requirements of 46 CFR Part 28.

There are also requirements for processing vessels to be classed by ABS or a similarly qualified organization if the vessel was built after or underwent a major conversion after July 27, 1990. The F/V KATMAI underwent two major conversions in 1993 and 1996 which would have

required the vessel to be classed had the vessel been considered to be a fish processor. In order for a vessel to be classed, it must undergo numerous periodic examinations to ensure the safety and structural integrity of the vessel.

As noted previously in the fishing vessel casualty analysis section, vessels that are required to be inspected are involved in fewer marine casualties that result in the loss of lives and vessels. It is a fact that fishing vessels are involved in the greatest number of major marine casualties when compared to all vessel types both inspected and uninspected. Commercial Fishing Vessel Examinations are voluntary and primarily focus on the safety regulation provided in 46 CFR Part 28. It is difficult to show that strict compliance with theses safety regulations would prevent vessel loss. The only way to reduce the number of fishing vessel casualties is through the development of enhanced fishing vessel safety regulations and the requirement of mandatory vessel examinations. Requiring all currently uninspected fishing vessels to have routine "check-ups" by either the Coast Guard or a recognized 3rd party will improve fishing vessel safety and prevent unnecessary loss of life.

F. CONCLUSIONS

1. The watertight door at the entrance to the lazarette was not properly secured which permitted it to open and water to enter the space.

2. The flooding of the lazarette caused the electric motors for the steering system which were also located in the lazarette to stop working resulting in a loss of steering.

3. The lack of an emergency steering system on the F/V KATMAI prevented the Captain from maintaining the vessel's heading while exposed to heavy winds and high seas.

4. The exact cause of the flooding in the engine room remains unknown. The most likely cause of the flooding was a catastrophic failure in the vessel's hull or in sea water supply piping.

5. Accurate maintenance and repair records of the F/V KATMAI were not kept by the vessel owners or operations manager preventing an evaluation of the overall condition of the vessel.

6. The aluminum doubler plate installed on the starboard steel bulkhead of the processing space was an improper repair due to the potential for galvanic corrosion caused by contact of the dissimilar metals in the saltwater environment.

7. The crack in the weld seam on the starboard side of the processing space was not repaired properly.

8. The aft watertight door to the processing space did not seal properly and was open prior to the vessel sinking.

9. Drainage of the shelter deck was not sufficient to permit water that accumulated in rough seas to drain efficiently. Water on the aft deck would have reduced the stability of the vessel and increased the potential for flooding of the processing space.

10. The F/V KATMAI was carrying almost twice the amount of cargo reviewed in the loading conditions provided in the most current stability report. The additional cargo coupled with the flooding of the engine room decreased the freeboard and aft trim of the vessel and increased the vessel's potential to take on water.

11. The stability report being used by the Captain did not account for the amount of cargo onboard the F/V KATMAI at the time of the casualty making any loading recommendations from that report questionable.

12. The owners of the F/V KATMAI failed to complete a new stability review of the vessel following the vessel's conversion to fishing using a long line pot system in 1998.

13. The owners of the F/V KATMAI failed to provide a current stability report that reflected the change in fishing operations to Pacific Cod. It is unlikely that this change significantly affected the causal reasons which led the vessel's sinking.

14. The 1996 stability report did not provide an Operational Recommendation regarding the maximum amount of frozen cargo that could be carried permitting the Captain to assume that the cargo hold could be completely filled.

15. The vessel owners and Captain did not ensure that all drills required by 46 CFR 28.270 were conducted by crew who were trained in the proper procedures for conducting drills increasing the potential for the crew to respond inadequately to emergency situations.

16. The Captain failed to ensure that all safety drills were conducted as required by 46 CFR 28.270. The failure to conduct regular abandon ship or flooding drills may have reduced the crew's ability to effectively respond to these emergency situations at the time of the casualty.

17. The crew suffered from chronic fatigue due to a lack of adequate sleep/rest as a result of extended fishing operations which may have decreased their survivability following the casualty.

18. Fatigue, work-related stress and inadequate resource management negatively impacted the Captain's decision making process.

19. The Captain's decision to proceed to Dutch Harbor, AK instead of waiting for the incoming storm to pass contributed directly to the sinking of the vessel by unnecessarily exposing the vessel to heavy winds and high seas.

20. The F/V KATMAI sank as a result of the amount of cargo onboard, exposure to heavy winds and high seas, and a failure to maintain watertight boundaries.

21. Immersion suits were not assigned or matched to specific crew increasing the potential for crew to don improperly sized suits in an emergency.

22. At least one crewmember donned an immersion suit that was too large for his body, decreasing potential for survivability.

23. The lack of requirements for personal EPIRBs or signaling devices to be installed on the F/V KATMAI's immersion suits limited the ability of search and rescue assets to locate potential survivors.

24. The 28 year old 15 person Crewsaver liferaft in which the four survivors were discovered did not afford the crew protection from the elements and did not have adequate ballast bags to prevent the capsizing of the liferaft.

25. Based on evidence, the compressed gas cylinder was not properly connected to the inflation hose of the 10 person Crewsaver liferaft.

26. Based on evidence and a review of the checklist used to service the 10 person Crewsaver liferaft, may not have been serviced or inspected properly in December 2007.

27. Current Coast Guard regulations do not require the Coast Guard or a recognized 3rd party to witness the servicing of Coast Guard approved liferafts increasing the potential for liferafts to be improperly serviced.

28. The adoption of quality assurance programs for Coast Guard approved liferaft servicing facilities would substantially decrease the potential for liferafts to be serviced improperly.

29. Implementing a mandatory inspection program in lieu of the voluntary CFVE program for currently uninspected fishing vessels would significantly improve fishing vessel safety and decrease fishing vessel casualties.

30. Existing regulations for uninspected fishing vessels similar to the F/V KATMAI focus primarily on safety and do not contain hull, machinery, stability, or maintenance requirements that are essential in reducing the number of fishing vessel losses.

31. The current CG and NMFS definitions of fish processing as provided in 46 USC §2101(11b) and 50 CFR 679.2, respectively, are confusing and permit vessels to be categorized differently by CG and NMFS. Neither definition of processing vessels takes into account additional crew employed on fishing vessels to perform processing operations.

32. The lack of requirements to install indicators or alarms on watertight doors prevented effective management of watertight doors on the F/V KATMAI.

33. The installation of a portable emergency dewatering pump would have increased the capacity to dewater the vessel.

34. The remote location of the F/V KATMAI at the time of casualty negatively impacted search and rescue operations due to a lack of permanently deployed Coast Guard assets in that region.

35. The remote location of the F/V KATMAI at the time of casualty hindered the Captain's ability to notify the Coast Guard or other vessels regarding the nature of the distress due to the limited capabilities of the communications equipment installed on the vessel.

G. RECOMMENDATIONS

Regulatory Changes

1. The Coast Guard should initiate an LCP to amend 46 U.S.C. 2101 (11b) to clarify which activities exempt a vessel from being considered a fish processing vessel (and which activities would not). The analysis section of the LCP would need to identify the safety concerns that exist as a result of these vessels being classified as uninspected vessels despite the elevated risks associated with these activities (in which they act like fish processing vessels). Change the definition of fish processing vessels to include head and gut operations on fishing vessels that carry more than 6 crewmembers. (ARCTIC ROSE ROI, Recommendation 4)

2. The Coast Guard should develop regulations requiring all watertight doors to be alarmed and equipped with a visual and audible system in the pilothouse to indicate the position of the door(s). (ARCTIC ROSE ROI, Recommendation 2)

3. The Coast Guard should develop a regulation requiring all fishing vessels to document required drills found in 46 CFR 28.270. (ARCTIC ROSE ROI, Recommendation 5)

4. The Coast Guard should initiate an LCP to require masters of commercial fishing vessels 30 feet and greater to hold operators licenses for that position based on the specific route and tonnage of the vessel. This recommendation is in direct support of the USCG-2003-16158 ANPRM.

5. The Coast Guard should conduct a risk based analysis of fishing vessel casualties to determine the appropriate parameters under which the requirements of 46 CFR Part 28, Subpart E should apply in lieu of the current length based standard of 79 feet. New regulations should be developed to change the stability applicability standard in accordance with the recommendations from this study. At a minimum, the revised stability applicability standard should include vessels that have a dedicated fish processing space, use of pots/traps, or carry additional crew to perform any type of fish processing duties. The current proposed rulemaking (USCG-2003-16158) which expands the applicability of stability requirements for commercial fishing vessels should be completed as soon as possible.

6. The Coast Guard should seek legislation that requires masters and owners of commercial fishing vessels to have stability training to minimize the potential for preventable vessel losses attributed to improper loading and operation of fishing vessels.

7. The Coast Guard should seek legislation to require all fishing vessels be inspected periodically to verify compliance with the current requirements detailed in 46 CFR Part 28. This inspection should be performed by appropriate Coast Guard personnel or a 3rd party surveyor recognized by the Coast Guard.

8. The Coast Guard should review and revise the requirements of 46 CFR Part 28 as soon as possible to ensure that they adequately address all commercial fishing vessel safety concerns that have been identified in previous commercial fishing vessel marine casualties.

9. The Coast Guard should change the current requirements detailed in 46 CFR 160.151-53 to require that the servicing of all Coast Guard approved liferafts be witnessed by a Coast Guard marine inspector or 3rd party inspector accepted by the OCMI. The Coast Guard should place greater emphasis and dedicated resources toward the execution of the Liferaft Inspection Program.

10. The Coast Guard should require Coast Guard approved liferafts that were manufactured before 1997 to be outfitted with ballast bags of a size meeting current liferaft stability requirements provided in 46 CFR 160.051 and 160.151 and in accordance with manufacturer recommendations.

11. The Coast Guard should determine if an age limit should be imposed on existing liferafts to ensure proper operation in all marine environments and to ensure that all liferafts are compliant with the most current safety requirements. Simply because an older liferaft passes the required periodic tests does not make the liferaft suitable for operational environments that demand greater protection and extended survivability.

12. The Coast Guard should determine if an age limit should be imposed on immersion suits to account for material deterioration as a result of exposure to UV sunlight, chemicals, humidity and improper storage techniques.

13. The Coast Guard should amend 46 CFR 160.171 to include the minimum equipment recommended in NVIC 1-92 be carried on each immersion suit to facilitate locating personnel in the water.

14. The Coast Guard should require all commercial fishing vessels that operate beyond the boundary line to have an emergency means to communicate such as a satellite telephone or GMDSS. (ARCTIC ROSE ROI, Recommendation 7)

General Policy

15. The Coast Guard should publish a Safety Alert that details the limitations and potential hazards of modular liferafts when used in inclement and/or cold weather environments. Consideration should be given to employing liferafts that provide the greatest amount of protection and survivability especially for fishing vessels operating in the harsh environments often prevalent in the North Pacific and Bering Sea.

16. The Coast Guard should publish a Safety Alert that informs fishing vessel owners to routinely inspect immersion suits on their vessels for damage and deterioration. This notice should also recommend fishing vessel owners to consider the assignment of immersion suits to individual crewmembers to ensure that crewmembers don properly sized immersion suits in the event of an emergency.

17. The Coast Guard should promulgate a policy that requires all commercial fishing vessel owners to revise vessel stability information following major modification or when fishing operations are changed.

18. The Coast Guard should require liferaft manufacturers to develop checklists to ensure critical inspection items are completed during the servicing process by approved liferaft

servicing facilities. This should be accomplished by using a witness other than the servicing technician to confirm critical inspection items have been conducted.

19. The Coast Guard should develop a policy to require Coast Guard approved liferaft servicing facilities to develop and implement quality assurance programs to ensure that all aspects of the liferaft servicing process are performed in accordance with Coast Guard and manufacturer requirements.

20. The Coast Guard should develop a policy that requires all commercial fishing vessel owners to maintain crew training records.

21. The Coast Guard should develop guidance regarding the proper maintenance of watertight doors and recommend that all commercial fishing vessel owners perform routine inspections of all watertight doors onboard their vessels.

Coast Guard Policy

22. D13 and D17 should identify all fish processing vessels and fishing vessels performing head and gut operations which are operated or home ported in their respective AORs. A risk assessment of these vessels should be performed by the Coast Guard to determine whether additional locally developed safety interventions are necessary to mitigate risk to crewmembers participating in these fisheries.

23. The Coast Guard should consider deploying Coast Guard SAR assets in Adak, AK to improve SAR capabilities in D17. The SAR operations following this casualty were commendable but were delayed due to the considerable distance between AIRSTA Kodiak and the location of the casualty.

24. The Coast Guard should conduct an analysis of commercial fishing vessel casualties to determine the frequency of human factors including fatigue, work-related stress, drug/alcohol use, and/or working conditions as causal or contributing factors.

25. The Coast Guard should increase emphasis on commercial fishing vessel casualty investigations to focus on the collection of human factors related information including fatigue, work-related stress, drug/alcohol use, and/or working conditions.

26. The FPV COURAGEOUS and FPV PATRICIA LEE should receive Public Service Awards for their actions and efforts during the search and rescue operations following the sinking of the F/V KATMAI.

27. A copy of this report should be provided to the National Transportation Safety Board.

28. A copy of this report should be provided to the International Maritime Organization.

29. A copy of this report should be provided to families of the next-of-kin, the owner of the F/V KATMAI, and Puget Sound Inflatables.

30. This report should be given wide dissemination throughout the commercial fishing industry vessel community including major fisheries journals, the National Council on Fishing Vessel Safety and Insurance, the North Pacific Fishing Vessel Owners'

Association, The Alaska Marine Safety Education Association, The Society of Architects and Marine Engineers, The Groundfish Forum and other major fishing vessel associations in the Pacific Northwest.

31. Notice of this report should be provided to each Coast Guard District Fishing Vessel Safety Coordinator.

32. Recommend this investigation be closed.

H. APPENDICES

Appendix 1: SUMMARY OF MARINE BOARD ACTIVITIES

1. Investigation

The investigation was conducted by investigators from the Coast Guard with assistance provided from the National Transportation Safety Board in Anchorage, Alaska and Seattle, Washington. The investigators interviewed 24 witnesses including the four survivors, vessel owners, crew and Captains of the FPV PATRICIA LEE and FPV COURAGEOUS, previous F/V KATMAI crewmembers, naval architects, and Coast Guard Fishing Vessel Examiners to gather facts surrounding the events leading up to the sinking of the F/V KATMAI, its overall condition, and its operations.

2. Hearings

The hearings for the Marine Board were held in two locations, Anchorage and Seattle, to accommodate witness travel and facilitate the investigation. The Marine Board received testimony on topics including the vessel's operations, stability, manning, training, industry practices, weather conditions and the Coast Guard response to the incident. The Marine Board also performed an inflation test of the recovered liferaft in Seattle, WA to help determine if the raft properly inflated when it was deployed at the time of the casualty.

3. Support Staff

The success of the Marine Board of Investigation was dependent on the support provided by several Coast Guard commands. Sector Anchorage, D11, D13, and Sector Seattle provided superb administrative, investigative, legal, logistical, and public affairs support.

The Sector Anchorage investigative staff provided key support by performing the preliminary interviews, collecting evidence and commencing logistical preparations for the hearings which commenced less than four days after the incident. Sector Anchorage also provided one of their staff to serve on the Marine Board as a member and recorder. Throughout the investigation, it was found that including a local Coast Guard investigator on the Marine Board was essential to the success of the overall investigation. Local representation on the Marine Board permitted expedited preparation for the hearings but, more importantly, provided regional expertise essential to the success of the investigation.

Both District 11 and District 13 public affairs offices eagerly volunteered to provide public affairs representatives for the hearings conducted in Anchorage and Seattle. Their outstanding support in hearing preparations, daily public affairs briefs, and liaison support with the various press representatives was essential to meeting the public affairs obligations of the Marine Board.

District 13 also provided technical support regarding Bering Sea fishing operations and in preparing formal recognition awards for the two Good Samaritan vessels that assisted in the search and rescue operations. Employing Coast Guard personnel who offer technical expertise was essential to identifying potential witnesses and becoming familiar with the unique operations of fishing vessels working in the Bering Sea.

The importance of legal assistance cannot be overstated. D13 assigned a legal representative to the Marine Board immediately following the incident. Legal counsel was an integral part of the Marine Board. The representative provided by D13 was excellent and provided guidance on the evidence processing and FOIA requests as well as assistance with formal requests for information. Legal counsel was also very important in ensuring that the line of questioning used by 3rd party counsel representatives was appropriate and supportive of the Marine Board of Investigation.

The Materials Laboratory Division of the National Transportation Safety Board's (NTSB) Office of Research and Engineering assisted the MBI considerably with the analysis of the inflation hose from the 10 person Crewsaver liferaft. Their expertise was essential to the evaluation of the condition of the hose. The NTSB also provided two investigators who assisted the MBI during the formal hearings that were held in Anchorage and Seattle. The support that the NTSB provided throughout the investigation was greatly appreciated and extremely beneficial.

Appendix 2: STABILITY ANALYSIS

U.S. Department of Homeland Security
United States Coast Guard

Commanding Officer
United States Coast Guard
Marine Safety Center

2100 2nd St. SW
Washington, DC 20593
Staff Symbol: MSC-1
Phone: (202) 475-3401
Fax: (202) 475-3920

16710/P014559
Serial: H1-0900187
11 Feb 2009

MEMORANDUM

From: S. P. McGee, CDR
CG MSC-1

Reply to Attn of: T.T Cost
(202) 475-3362

To: M. R. McLellan, CDR
Chairman, Marine Board of Investigation

Subj: POST SINKING STABILITY ANALYSIS OF THE KATMAI, O.N. 918779

Ref: (a) Your memo dated 18 Dec 2008

1. As requested in ref (a), we performed a technical analysis to evaluate the stability of the KATMAI against the stability requirements of 46 CFR Subchapter C and investigate potential scenarios that may have led to the vessel's sinking.

2. The Stability Report developed by Paul Schwitters and Ira Stevenson did, in general, meet the standard in 46 CFR 28.530 for providing stability guidance to the KATMAI.

3. While the stability standards of 46 CFR Subchapter C are not strictly applicable due to the vessel's length, they are a standard which has been used in the past to review smaller fishing vessels similar to the KATMAI. In our independent review of the eleven loading conditions contained in the Schwitters/Stevenson report and the estimated pre-casualty condition, several did not meet the intact stability standards in 46 CFR Subchapter C. None of the conditions examined met the damaged stability standards in 46 CFR 28.580, primarily due to the lack of watertight subdivision in the processing space.

4. The freeing ports on the KATMAI where undersized when compared to the standards in 46 CFR 28.555. Water trapped on the aft deck would have significantly reduced the vessel's stability and increased the potential for flooding into the processing space. Our analysis showed that the 15-20 degree list described in reference (a) could have been caused by water trapped on the aft deck and as little of 2 inches of water in the processing space. Ultimately, our model indicates that uncontrolled flooding into the processing space would have sunk the KATMAI.

5. Enclosure (1) is a detailed explanation of our assumptions and analysis.

#

Encl: (1) Explanation of Analysis & Assumptions

EXPLANATION OF ANALYSIS & ASSUMPTIONS

As requested, a computer model was developed by the Marine Safety Center to assist with the investigation into the sinking of the fishing vessel KATMAI. In particular we were asked to:

- Review the vessel's 1996 Stability Report, created by Paul Schwitters and Ira Stevenson, to determine if it provided sufficient stability guidance to the vessel operator as detailed in 46 CFR 28.530;
- Examine whether the vessel met the regulatory stability standards in 46 CFR Subchapter C, Subpart E; and,
- Investigate the potential casualty scenarios that may have led to the vessel's sinking.

The Schwitters/Stevenson report evaluated eleven different loading conditions for compliance with the Torremolinos stability criteria in 46 CFR 28.570. This evaluation was used to generate stability information for use by the vessel's master and individuals in charge to maintain the vessel in a satisfactorily stable condition. In general, we found that the stability guidance of the Schwitters/Stevenson report met the standard in 46 CFR 28.530.

While the stability requirements of 46 CFR Subchapter C, Subpart E are applicable to vessels over 79 feet in the length, they have been used in the past as a reasonable standard for smaller fishing vessels, and were used in our stability analysis of the KATMAI, whose registered length was only 73.3 feet. Eleven loading conditions in the Schwitters/Stevenson report, as well as the estimated loading condition just prior to when the vessel sank, were evaluated against the 46 CFR Subchapter C stability criteria. Our independent review of the vessel's intact stability suggested that the Severe Wind and Roll criteria in 46 CFR 28.575 was more limiting than the Torremolinos Righting Energy criteria used in the Schwitters/Stevenson report. Of the twelve conditions we evaluated, four did not pass the 46 CFR 28.575 criteria; however, our computer model did meet the intact stability criteria in the pre-casualty condition. Based on our analysis, the vessel did not meet the damage stability standards of 46 CFR 28.580 in any of the twelve loading conditions evaluated. Furthermore, our computer model capsized in cases where the processing space was flooded.

We evaluated several potential sinking scenarios. Witness testimony stated that prior to the vessel sinking water was trapped on the aft deck and our calculations showed that the vessel had undersized drainage when compared to the standard in 46 CFR 28.555. Additionally, the vessel was heavily loaded, carrying more than double the amount of cargo reviewed in the Schwitters/Stevenson report, and operating in high winds and seas at the time of the casualty. Such conditions would have increased the likelihood that water could have collected and remained trapped on the aft deck and led to flooding in the processing space. Our computer modeling suggested that progressive flooding into the processing space would have caused the vessel to sink.

Encl (1)

1 General Comments Regarding Our Stability Analysis

- Creative Systems General HydroStatics (GHS) software version 11.44 was used for our analysis.
- The primary stability guidance provided to the vessel was contained in the 1996 Stability Report done by Paul Schwitters and Ira Stevenson. While we were able to review this report as part of our analysis and noted that GHS data was presented as part of the report, the GHS model used to develop the data was unavailable for our review. As such, we created a model of the KATMAI using the vessel's lines plan. Wood/Cannon Dwg. 20003, Rev. -, "Lines Plan," 1 Sheet, dated April 13, 1995.
- Our model's compartmentation and outboard profile were created from the vessel's 1996 general arrangement plans, All Alaskan Seafoods Dwg. 20001, Rev. 1, "General Arrangement," 2 Sheets, dated July 29, 2006. These plans were included in the vessel's 1996 Stability Report.
- All longitudinal references in this report were measured from the forward perpendicular, at frame 0. Vertical references and drafts were measured from the baseline.
- All weights were reported in long tons (LT).
- The model's engine room was assigned a permeability of 85%. The model's tank permeabilities were set at 98% to more closely match the tank table values provided with the 1996 Stability Report. All others spaces in the model were assumed to be 95% permeable.
- The location of the downflooding points used for the Schwitters/Stevenson report was not provided. Based on drawings and photos provided by the Marine Board, we used the engine room air vent next to the crew's berthing entrance and the fish tube that led from the fish deck to the processing space as the downflooding points for our model. Although witness testimony suggests that the aft watertight door into the processing space was left open, it was not considered as a downflooding point in our Subchapter C stability analysis as this door should have been kept closed during normal operating conditions. Our model's engine room air vent downflooding point was placed at frame 13, 4 feet starboard of the centerline, flush with the fish deck, or 20.5 feet above the model's baseline. The location of the fish processing tube in the model was set at frame 19, 10 feet starboard of the centerline, 3 feet above the fish deck, or 23. 5 feet above the model's baseline. While there were most likely other downflooding points on the vessel, in the absence of any other information, only the downflooding points above were used in our stability analysis.
- Although a stability analysis of the vessel's compliance with the lifting and towing standards in 46 CFR 28.545, 46 CFR 173.025 and 173.095 were requested, the heeling moments needed for this analysis was not provided. Since the vessel was not towing and was not reported to be hauling pots over the side prior to the casualty, the relevance of the KATMAI's ability to meet these standards was not believed to be significant for this investigation.
- As requested in reference (a), the effects of icing, both in our review of the vessel's intact stability analysis and our investigation into the sinking of the vessel, were not performed.

2 Model Development

2.1 Model as Compared to 1996 Report

Our model's hydrostatics were compared to the "as inclined" waterline from the Schwitters/Stevenson report using the freeboards and heeling moment from the 1996 stability test. Our model had the same lightship displacement, longitudinal center of gravity (LCG) and vertical center of gravity (VCG) to within 0.5% of the values listed in the report. Figure (1) shows the profile and plan view of the vessel from the Schwitters/Stevenson report and Figure (2) shows the profile, plan and orthogonal view of our model.

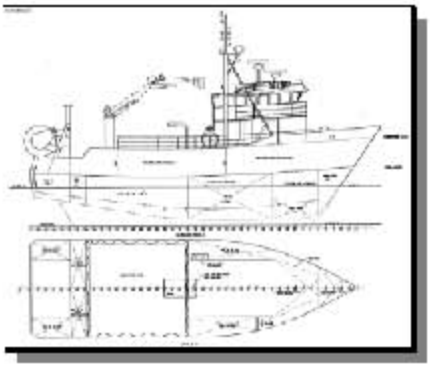


Figure (1). Profile and Plan View of KATMAI from 1996 Stability Report

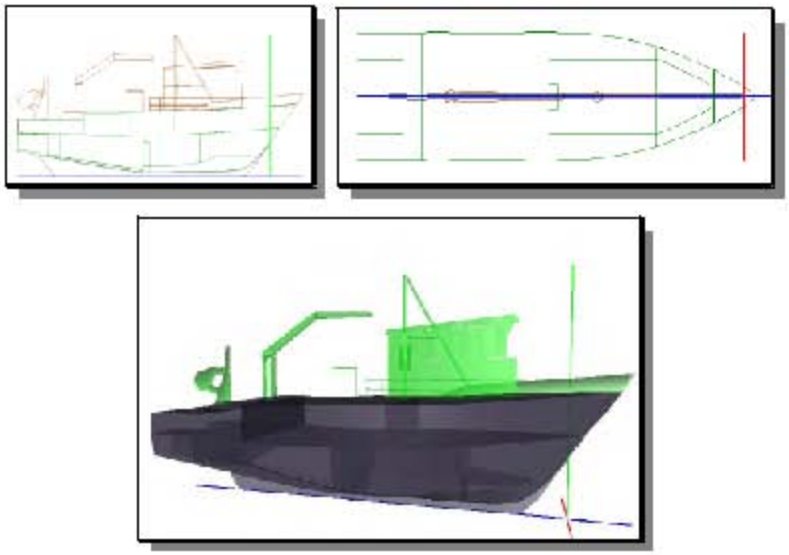


Figure (2). Profile, Plan and 3-D model of KATMAI

2.2 *Model as Modified for Stability Review*

As part of our review of the material provided with reference (a), pictures of the vessel from as recent as 2007 showed a different wind profile than developed in the model shown in Figure (2). In order to more accurately assess the vessel's stability, an additional wind profile was added to the model equal to the height and length of the pots stored on the fishing deck. We also removed the trawling spool wind profile from the model. Additionally, a tank, with a height equal to the aft bulwarks, was added to our model to simulate the entrapment of water on the aft deck; this was necessary to evaluate the water on deck criteria of 46 CFR 28.565. Figure (3) shows a picture of the KATMAI representing these differences. Figure (4) shows the model from the same aspect with these changes applied. While the wind profile in the model is not identical to Figure (3), it is a more accurate than the model from Figure (2) and provided us with a more realistic assessment of the KATMAI's stability at the time of the casualty.

Figure (3). KATMAI with Pots on Deck and Spool Removed

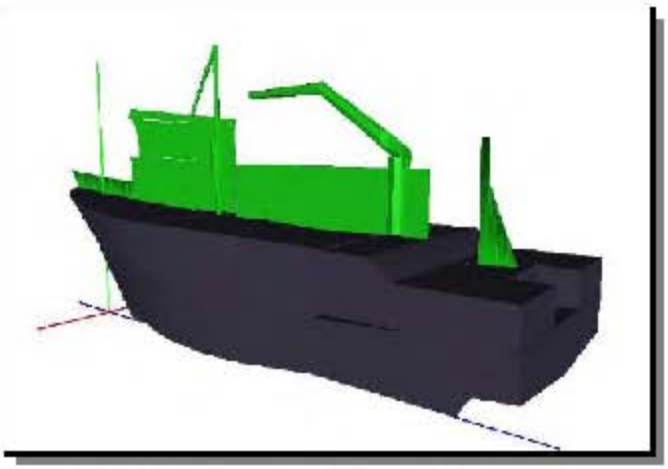


Figure (4). KATMAI 3-D Model for Stability Analysis

3 Regulatory Stability Review

3.1 Stability Test Review

As requested in reference (a), we reviewed the stability test information provided in the Schwitters/Stevenson report from July 1996. Using the data recorded during the stability test, our independent calculations confirmed the numerical results calculated in the report. We found two discrepancies in the conduct of the test that would have resulted in the test being marked, "Returned for Revision," had it been submitted to our office for review and approval.

The two discrepancies noted above are as follows:

- Only two pendulums were used to conduct the stability test. ASTM F 1321 requires a minimum of three pendulums to allow identification of bad readings at any one pendulum station.

- Only three freeboard readings on each side of the vessel were taken to establish the position of the waterline. ASTM F 1321 recommends at least five freeboard readings be taken on each side of the vessel.

Additionally, the stability report stated that it should be updated when equipment was added, or the fishing operations were changed. At the time of the casualty, this vessel's trawling spool had been removed and the vessel was using pots to fish for cod. As this is a different fishing operation from trawling for shrimp and different equipment was required, a new stability report should have been generated for the vessel.

Despite the discrepancies noted above, the lightship data calculated in the 1996 stability report was used as the baseline for the load conditions examined in the remaining sections of the stability report and as the baseline for the operating guidance provided to the master.

While there would be some differences in the vessel's lightship due to the trawling spool removal and any other weight changes that might have occurred when the vessel began fishing for cod, it is unlikely that these differences greatly affected the causal reasons which led to the vessel's sinking. As such, the lightship values from the 1996 stability were used throughout the remainder of our analysis.

3.2 Stability Guidance and Loading Conditions for Schwitters/Stevenson Report

Reference (a) requested that our office review the vessel's stability to the standards in 46 CFR Subchapter C, Subpart E. While these standards are only applicable to vessels over 79 feet in the length (the KATMAI's registered length is 73.3 feet), they have been used in the past as a reasonable standard for which to evaluate the stability of smaller fishing vessels.

Our office reviewed the stability guidance provided to the KATMAI in the Schwitters/Stevenson report against the standards in 46 CFR 28.530. The standards of this part are relatively general stating that loading constraints and operating restrictions must be provided which maintain the vessel in a condition that meets the applicable stability standards of the subpart. It provides examples of the format in which the stability guidance should be provided, including: (1) simple loading instructions; (2) a simple loading diagram; (3) a stability booklet with sample calculations; or, (4) any other appropriate format for providing stability information.

The Schwitters/Stevenson report for the KATMAI is divided into four parts:

- Part I - Stability Test Data and Operational Recommendations
- Part II - Conditions of Loading for Fishing
- Part III - Righting Energy and Related Loading Factors
- Part IV - Tank Tables and Capacities

We noted that loading guidance was provided to the master in the Operational Recommendations section of Part I as follows: (1) a usage sequence for the vessel's fuel tanks, burning from the #3 fuel tanks first, followed by the #5 and #4 fuel tanks; (2) the #4 fuel tanks must not go less than half full; (3) the #2 fresh water tank must remain full in low fuel conditions; (4) codends onboard be limited to not more than 9 tons (for trawling operations rather than the cod pots being used when the casualty occurred); and, (5) no more than 4.5 tons of wet fish or shrimp be lifted into the fishbin.

Additionally, Part II of the Schwitters/Stevenson report provided 11 conditions of loading, several of which included the addition of 9.5 tons of ice (see Table (1) below for a description of these loading conditions). It is stated that the vessel's stability was compared to the International Maritime Organization (IMO) Resolution A.168 (ES.IV) as published in Coast Guard Navigation and Vessel Inspection Circular (NVIC) 5-85, "Recommendation of Intact Stability of Fishing Vessels." This criterion, known as the Torremolinos Convention criteria, has since been incorporated into Subchapter C as 46 CFR 28.570. From the data contained in Part II of the Schwitters/Stevenson report, it appears that the vessel met this criterion in all conditions of loading; however, the downflooding locations were not mentioned. NVIC 5-85, which was superseded by NVIC 5-86 in August of 1986, also discussed other intact stability criteria for fishing vessels, including Lifting over the Side, Severe Wind and Roll and Water on Deck. It is unclear from the Schwitters/Stevenson report if the vessel was evaluated against any of these criteria.

Based on this information, even though the KATMAI's stability was not evaluated against all of the criteria in NVIC 5-86 or Subchapter C, it appeared that the Schwitters/Stevenson report did, in general, meet the standard of 46 CFR 28.530 in providing some type of stability guidance to the master.

It is worth noting however, that since no Operational Recommendations were made limiting the total amount of frozen cargo that could be carried, the assumption could be made by an operator that the cargo hold could be completely filled. Of the loading conditions provided in Part II, the maximum weight of frozen cargo in the hold evaluated was 60,000 pounds (26.79 long tons). At the time of the casualty, the vessel was reported to have approximately 120,000 pounds (53.57 long tons) of frozen cargo aboard.

3.3 *Pre-Casualty Loading Condition*

At the time of the casualty, the KATMAI's loading was considered to be similar to load condition 4 in the Schwitters/Stevenson stability report, with additional modifications as described in paragraph 4-c of reference (a). This estimated pre-casualty condition is summarized in Figure 5. While the fuel and water loads were similar, the variations provided in reference (a) substantially increased the vessel's displacement, shifted the vessel's longitudinal center of gravity (LCG) aft, and lowered the vessel's vertical center of gravity (VCG). The additional 27 long tons of cargo in fish hold most likely had the greatest impact in the differences noted. It was estimated that 9000 gallons of fuel were onboard the vessel with the #4 tanks full and 5000 gallons in the 45 tanks. Based on the Tank Tables in Part IV of the Schwitters/Stevenson report and our model, the maximum amount of fuel that could have been contained in the #5 tanks was 1834 gallons each, for a total of 3,668 gallons. Paragraph 4-c of reference (a) stated that the fuel from the #5 tanks was moved to the #3 tanks. As such, the 3,668 gallons are shown evenly distributed in #3 tanks in Figure (5) below. Including an assumed full day tank and full #1 fuel tanks, the total fuel amount in the model was approximately 9,025 gallons. In such a condition, the vessel would have been heavily loaded with the water line 4 inches below the main deck in calm water.

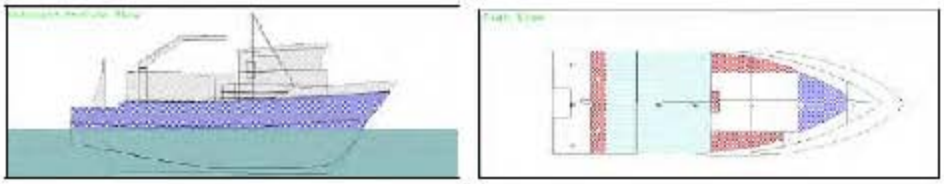


Figure (5). Summary of Pre-Casualty Condition

Table (1) provides a summary of the eleven loading conditions from the Schwitters/Stevenson report as well as our estimated pre-casualty loading condition.

Load Cases	Disp	VCG	LCG	Description
LC1	216.80	14.50	39.40	Lightship
LC2	311.62	13.07	40.33	Departure - 100% fuel, 0 lbs cargo
LC3	288.03	13.18	39.74	Fishing - 50% fuel, 17,500 lbs cargo
LC4	288.92	12.98	40.79	Fishing - 40% fuel, 60,000 lbs cargo
LC5	309.42	13.26	40.40	Fishing - 40% fuel, 60,000 lbs cargo, icing
LC6	347.90	12.85	40.59	Fishing - 100% fuel, 60,000 lbs cargo, icing
LC7	330.41	12.59	40.94	Fishing - 100% fuel, 60,000 lbs cargo
LC8	205.44	13.52	40.56	Fishing - 10% fuel, 30,500 lbs cargo, codends onboard
LC9	206.02	13.64	39.37	Fishing - 10% fuel, 30,500 lbs cargo, no codends, icing
LC10	202.91	13.67	39.05	Fishing - 10% fuel, 30,500 lbs cargo, icing
LC11	347.90	12.85	40.89	Fishing - 100% fuel, 60,000 lbs cargo, icing
LC12	347.04	12.80	42.26	Estimated Pre Casualty Condition

Notes: 1. Conditions with icing include 9.5 long tons of ice
2. LC11 is similar to LC8 except LCG of cargo is 4 feet further aft
3. 100% fuel is 18,082 gallons
4. 60,000 pounds of cargo was max cargo evaluated in Schwitters/Stevenson report
5. LC12 (pre-casualty) include 120,000 pounds of cargo

Table (1). Loading Conditions

3.4 Intact Stability Review

Reference (a) requested we evaluated the stability of the KATMAI against the following intact stability standards:

- 46 CFR 28.545 – Intact Stability when using lifting gear
- 46 CFR 28.550 – Icing
- 46 CFR 28.555 – Freeing Ports
- 46 CFR 28.560 Watertight and Weathertight Integrity
- 46 CFR 28.570 – Intact Righting Energy
- 46 CFR 28.575 – Severe Wind and Roll
- 46 CFR 173.020 Intact Stability When Using Lifting Gear
- 46 CFR 173.095 – Dynamic Towline Pull

Since icing was not considered a factor per paragraph 4.c.(19) of reference (a), the vessel's stability was not evaluated against the standards in 46 CFR 28.550. In conversation with the Marine Board after the memo was submitted, rather than evaluating the vessel's stability against the standards in 46 CFR 28.560, we evaluated the water on deck stability standards in 46 CFR 28.565.

Due to lack of information provided, and because the KATMAI was not believed to have been engaged in trawling or towing prior to the casualty, the standards of 46 CFR 173.095 were not evaluated. Additionally, while this vessel engaged in lifting catch over the side, insufficient information regarding the maximum heeling moment generated while lifting was provided to properly evaluate the vessel against the stability standards of 46 CFR 28.545 and 173.020. Again, the information provided did not suggest that the vessel was actively engaged in lifting pots over the side just prior to the casualty.

In accordance with 46 CFR 28.555, the formula to calculate the freeing port area on each side of the vessel is:

A $7.6 \times 0.115(l)$, where

A = freeing port area in square feet

l length of recess

The length of the recess on the aft deck was approximately 21 feet long, measured from the aft bulkhead of the processing space to the transom. As such, the KATMAI would have needed approximately 10 square feet of freeing port area per side, or a total of 20 square feet, or 2880 square inches, of freeing port area. Paragraph 4.b.(3)(c) of reference (a) stated that the vessel had approximately 240 square inches of drainage. Even if the two oval shaped mooring holes, which were located 2-1/2 feet above the main deck and would not typically count as freeing ports due to their height above deck, were counted towards to the total drainage on the aft deck, the total amount of drainage was approximately 360 square inches. This value is far less than the standard specified in 46 CFR 28.555.

As none of these stability standards, with the exception of 46 CFR 28.570, were evaluated in the Schwitters/Stevenson report, we used our model to evaluate the same loading conditions listed in Part II against the intact stability standards in 46 CFR 28.565, 28.570 and 28.575 assuming the downflooding points previously mentioned (the engine room air vent and the fish tube in the processing deck).

As part of our intact stability review, maximum VCG curves were generated. A maximum VCG curve shows maximum allowable VCGs for the vessel over a range of displacements. Because the shape of maximum VCG curves is dependent on trim, separate curves were generated for different LCGs. A composite set of curves for the three intact stability criteria evaluated by our office was generated by finding the most restrictive criteria for each displacement/LCG combination. Figure (6) and (7) show various maximum VCG curves at different LCGs, with the points in the figures representing various loading conditions from the Schwitters/Stevenson report. Furthermore, the comparison of the pre-casualty condition to the maximum VCG curves is discussed in section 3.6 below.

Based on our review, several of the conditions did not meet the intact stability requirements evaluated, specifically LC 1, 8, 9 and 10. In general, the limiting criteria were the Severe Wind and Roll requirements contained in 46 CFR 28.575. Adding the extra sail area to model the pots on the fish deck significantly reduced the maximum allowable VCG. Had the sail area from the pots not been included in the computer model's wind profile, LC 8, 9 and 10 would have met the requirements of 46 CFR 28.575.

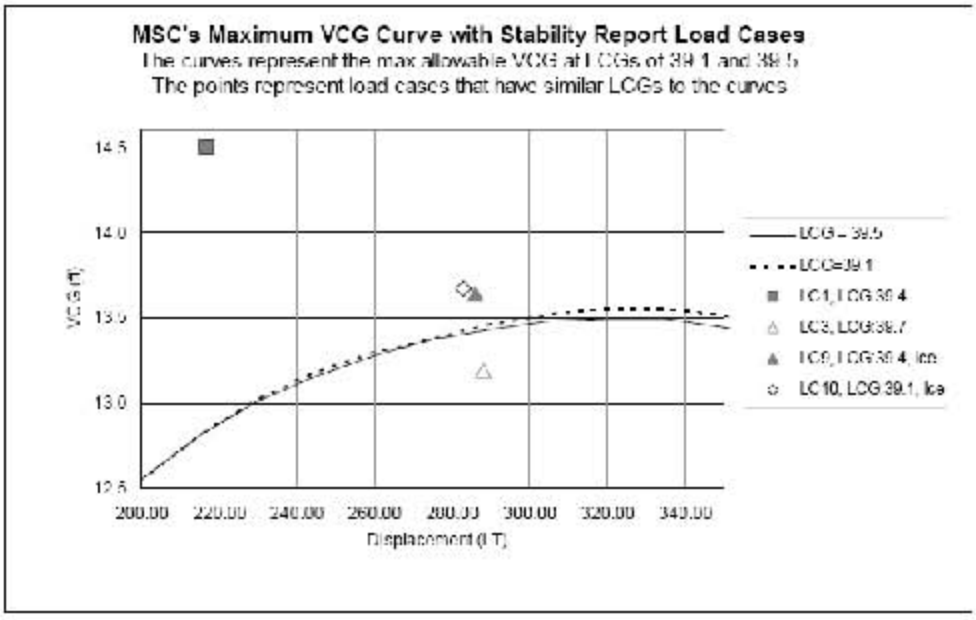


Figure (6). Max VCG curve with vessel LCGs of 39.1 and 39.5

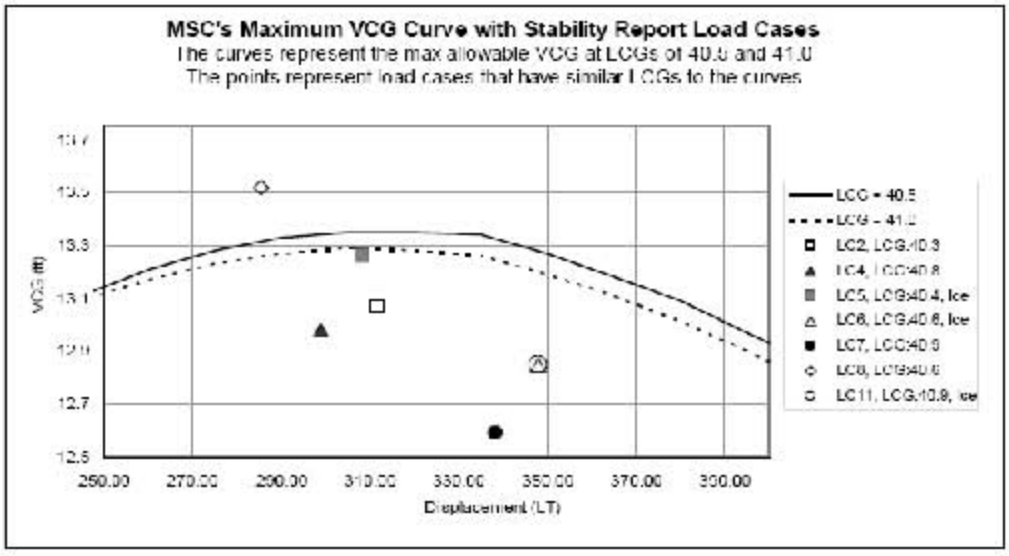


Figure (7). Max VCG curve with vessel LCGs of 40.5 and 41.0

3.5 *Damage Stability Review*

The damage stability standards for commercial fishing vessels over 79 feet in length and built after September 15, 1991 are located in 46 CFR 28.580. Again, as the KATMAI's registered length is only 73.3 feet, while not required, the standards of this part have been used in the past to evaluate the damage stability of smaller fishing vessel.

Based on the information provided in the Schwitters/Stevenson report, it does not appear that the vessel's damage stability was evaluated. However, using the load cases provided in the Table (1), we performed an independent analysis to see if our model would have met the damage stability standards in 46 CFR 28.580. The results are summarized in Table (2). Our model failed the stability criteria in all of the loading conditions analyzed. It was assumed that the watertight bulkheads and doors shown in the vessel's drawings were effective for all cases.

Damage Case	Compartments Damaged	Stability Report Load Case											Pre-Cas
		1	2	3	4	5	6	7	8	9	10	11	12
1	FP freshwater tank #1, Accomodation	P	P	P	P	P	P	P	P	P	P	P	P
2	Freshwater tank #2, Stowage and Accomodation	P	P	P	P	P	P	P	P	F	F	P	P
3	Starboard Fuel Oil #3, Hydraulic Tank, Accomodation and Processing Space	F	F	F	F	F	F	F	F	F	F	F	F
4	Cargo Hold and Processing Space	F	F	F	F	F	F	F	F	F	F	F	F
5	Starboard #4 Fuel Oil and Starboard #5 Fuel Oil	F	P	P	P	P	P	P	P	P	P	P	P
6	Lazarette	P	P	P	P	P	P	P	P	P	P	P	P
7	Engine Room	P	P	P	P	P	P	P	P	P	P	P	P
8	Engine Room and Lazarette	P	P	P	P	P	P	P	P	P	P	P	P

Table (2). Damage Stability Evaluation

The failure to meet the standards in 46 CFR 28.580 was due to the configuration of watertight compartments rather than the loading conditions. The stability standard assumes a 30 inch transverse extent of damage which extends vertically without limit. Typically, vessels subject to this damage stability standard are constructed with a strip of tanks down each side in order to mitigate the effect of flood water. The KATMAI only had such tanks from the keel to the main deck. However, the processing deck and accommodation spaces lack this 30 inch wide belt of tanks. As a result, flooding in these spaces created a large floodable volume and a very large free surface that prevented the model from passing the damage stability criteria. It should also be noted that where the processing deck was flooded in damage cases 3 and 4, the model not only failed all the regulatory standards, but the large free surface also caused capsize.

Reference (a) indicated that the flooding aboard the KATMAI began in the lazarette space and that 2 feet of water above the deck plates was also reported in the engine room. Although not a standard flooding condition per 46 CFR 28.580, damage case 8 suggests that flooding of the lazarette and engine room alone should not have resulted in capsize or sinking. While this damage case result is based on a calm water situation and does not include the dynamic effects from the reported heavy winds and seas, which would have drastically reduced the vessel's survivability in this condition, it does give some indication of the likelihood that addition flooding may have occurred on the vessel leading to the KATMAI's rapid sinking.

3.6 *Limiting Displacement and Trim*

Paragraph 2.e of reference (a) requested a determination of the maximum trim angles and displacements for which the KATMAI could pass the applicable intact and damaged stability standards. Since the vessel did not meet the damage stability standards in 46 CFR 28.580 in any of the conditions of loading, damage stability was excluded from this portion of the analysis.

Figure (8) displays the limiting VCG curves over the range of displacements considered in our analysis. The solid upper curve represents the forward most LCG considered among the load cases and corresponds to 3.85 feet of forward trim. The lower dotted curve represents the aft most LCG corresponding to approximately 6 inches of forward trim. The points shown depict load condition 4 and the estimated pre-casualty condition.

In our review, we noted that in all eleven loading conditions from the Schwitters/Stevenson report, the vessel had forward trim. Even the fuel burn sequence in Operational Limitations in Part I of the report was based on the vessel having forward trim as fuel was to be burned from the #3 tanks then the #5 tanks. In reference (a) however, it was reported that the master ordered the transfer of fuel from the #5 tanks to the #3 tanks, contrary to the stability guidance in the Schwitters/Stevenson report. In load condition 4 the vessel has 1.5 feet of forward trim. In the vessel's estimated pre-casualty condition above, even after shifting the fuel from the #5 tanks to the #3 tanks, the vessel only had 0.3 feet of forward trim. Given the aft trim in the pre-casualty condition, it is not surprising that the master wanted to shift fuel from the #5 fuel tanks to the #3 fuel tanks to reduce the vessel's aft trim.

The estimated pre-casualty conditions were outside the range of displacements and LCGs reviewed in the Schwitters/Stevenson report; however, our model showed that the vessel likely would still have met the intact stability limits in Subchapter C.

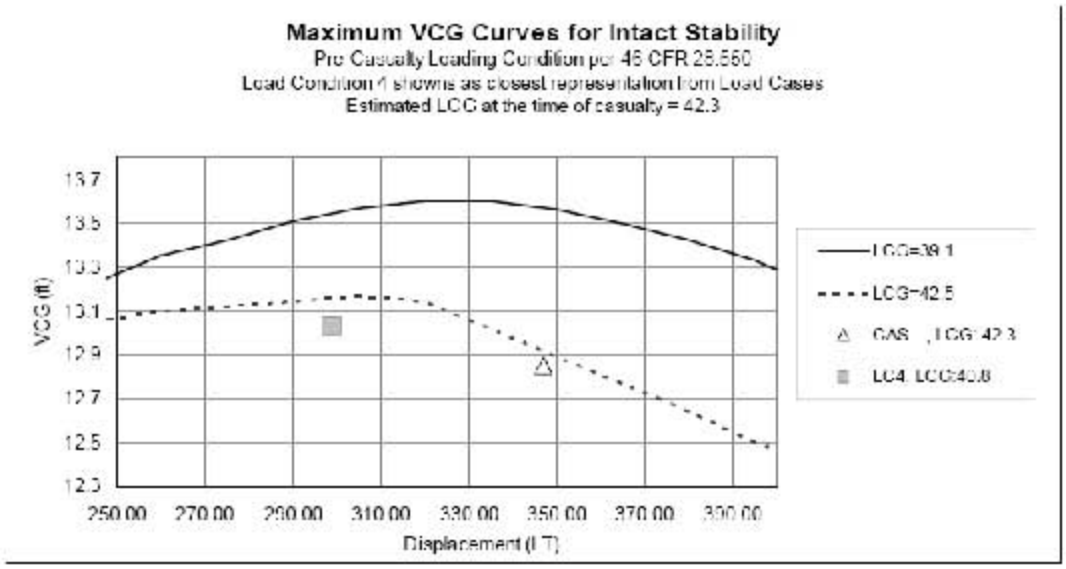


Figure (8). Range of Stability

4 Flooding Scenarios

4.1 Flooding Rate Assessment

The initial report of flooding on the KATMAI was that the lazarette space had completely flooded due the watertight door being left open. From the information provided in reference (a), a 1-1/2 to 2 inch drain pipe may have connected the lazarette space to the engine room. While this has been disputed, witness testimony suggests that the Chief Engineer entered the engine room to start the bilge pumps to drain the lazarette space when it was found to be flooded. To be more conservative in our analysis, we assumed the drain pipe was 2 inches in diameter.

Presuming that the drain pipe existed and was the pipe that allowed floodwater to enter the engine room, one simple method to estimate the flow rate through the pipe is:

$Q = 3600 A \sqrt{H}$, where:
Q = Flow rate in gallons per minute
A = Area of the hole in square feet. (0.02 square feet)
H = Height of water above pipe entrance in engine room (12.1 feet)

The height of the water above the pipe entrance was based on the height difference between the top of the lazarette space and the bottom of the aft end of the engine room, assuming that the lazarette space was completely flooded. Since reference (a) reported the amount of flood water in the engine room referenced to the deck plates, a reference point was added to the model about 6 feet forward of the aft engine room bulkhead, setting the deck plates at the height of the chine, approximately 2 feet above the keel. From these assumptions, Table (3) shows the volume and percent flooding in the engine room, as well as the flood water height above the engine room deck plates, as flooding may have taken place. Reference (a) stated that 2 feet of water was reported in the engine room before any type of dewatering was attempted and Table (3) suggests that with a full head of water in the lazarette space, this amount of water could have accumulated in the engine room over approximately a 22 minute time period. Since it is uncertain how long water may have been in the lazarette space, it seems reasonable, based on the estimated timeline given in reference (a), that, flooding in the lazarette space may have led to 2 feet of water above the deck plates in the engine room if a 2 inch drain pipe connected the lazarette to the engine room.

Time (min)	Vol (gal)	% Flooded	Height above deck plate (ft)
1	273.33	1.3%	--
5	1,366.63	6.3%	--
10	2,733.25	12.6%	0.54
15	4,099.88	18.9%	1.21
20	5,466.51	25.2%	1.86
22	6,013.16	27.7%	2.13
25	6,833.13	31.5%	2.51
30	8,199.76	37.8%	3.16
35	9,566.39	44.1%	3.77

Table (3): Flooding Analysis from 2" Drain Pipe

Unfortunately, the rates of progressive flooding from other sources into the engine room such as the shaft seals, the vent on the fish deck, or other compartments in the vessel, cannot be estimated in the same manner. In order to predict such rates, the shapes, sizes and locations of each penetration from one compartment to another would need to be known. However, any other source of downflooding would have accelerated the rate of flooding onboard the vessel.

4.2 Drainage of Water from Aft Deck

A witness stated that in rough weather the aft deck often became swamped with water and in some cases, the water was reported to be at least waist high. Furthermore, a witness that survived the incident stated that he overhead the Master and Chief Engineer, who were discussing the dewatering of the lazarette space, say that the aft deck was under water and water was entering the processing space. As discussed in Section 3.4 above, the vessel had substantially less freeing port area than the standard in 46 CFR 28.555. In the heavy seas experienced during the casualty, it is reasonable to believe that waves were repeatedly breaking over the aft bulwarks. Water collecting on the aft deck would not only drastically reduce the vessel's stability as discussed below, but since the watertight door into the processing space was located on the aft deck, any water collecting would greatly increase the risk of flooding into the processing space.

4.3 1st Flooding Scenario

Figure (9) depicts the compartments on the body plan sections used throughout the remainder of the analysis. These are the primary areas of interest for the flooding scenarios to follow (note the location of the downflooding point into the processing space in the left figure).

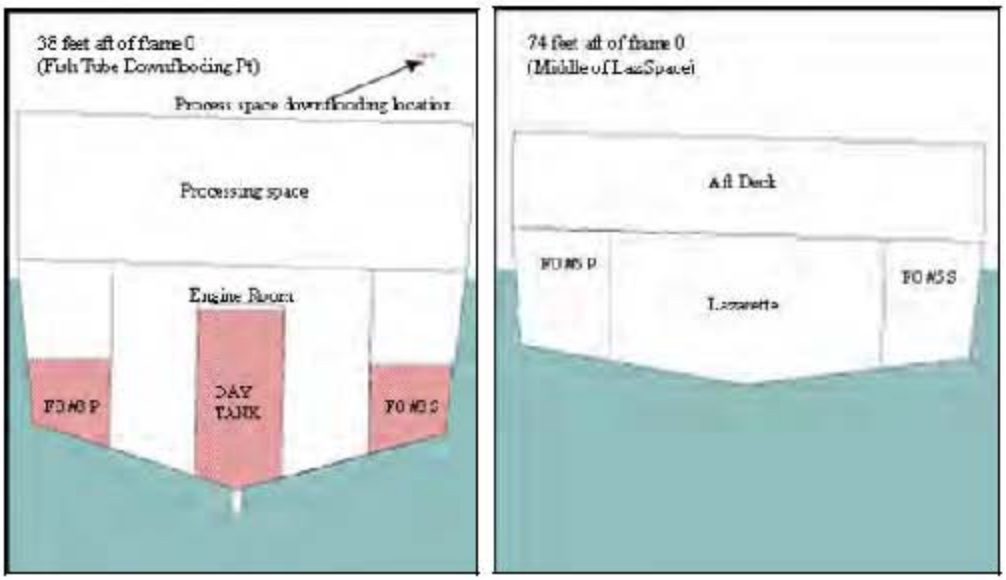


Figure (9). Body Plan Space Description

Based on the information contained in reference (a), flooding occurred in the lazarette space and 2 feet of water above the deck plates was reported in the engine room. It was also reported that water was trapped on the aft deck. Additionally, the vessel was in 25-30 foot seas and experiencing 60-100 knot winds. Table (4) shows the results from our modeling analysis for this potential flooding scenario. The downflooding points in the engine room and processing space are listed referencing the height above the waterline.

Step	Compartments Flooded	Heel Angle (°)	Main Deck Freeboard (ft)	Eng Rm DF Point (ft)	Process Space DF Point (ft)	Total Flooding (LT)
A	None	1.35	0.32	8.16	11.07	0.00
B	Lazarette Space	1.34	-0.42	8.37	10.86	22.91
C	B + 2 feet of water above deck plates in Engine Room	1.24	-0.64	7.67	10.37	42.32
D	C + Aft Bulwarks holding water	8.89	-3.49	7.17	8.63	67.66
E	D – 80 knots of wind	22.91	0.56	5.86	5.60	71.79

Table (4). 1st Flooding Scenario

Step C is graphically shown in Figure (10). The model remained afloat with flooding of the lazarette space and water 2 feet above the deck plates in the engine room.

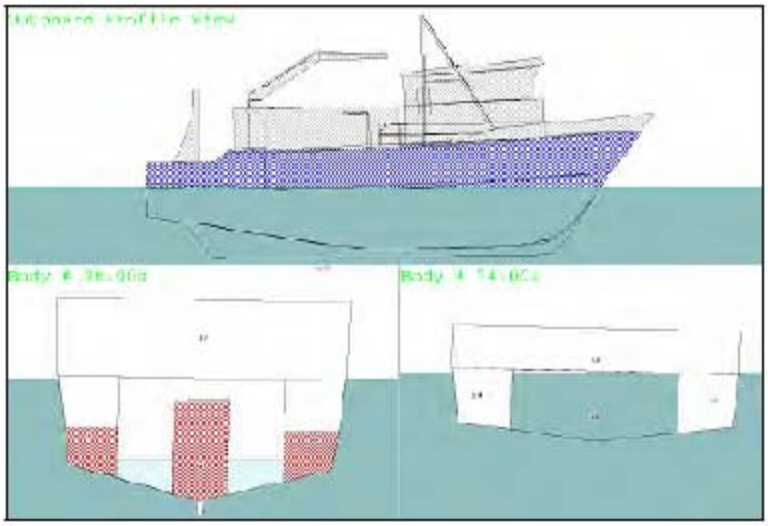


Figure (10). Step C in 1st flooding scenario

In Step D of Table (4), the addition of 2 feet of water on deck, corresponding to 24.7 long tons of additional weight, was added to the model to simulate standing water on deck from a wave. When 80 knots of wind was applied to the model, it heeled over to 23 degrees. This placed the starboard aft bulwark to below the waterline and allowed 29.33 long tons (or slightly more than 2.25 feet of water at even keel) to flood into the aft bulwarks. In this condition, the downflooding locations for both the processing space and engine room were less than 6 feet above the water. In the high seas reported, it seems possible that water could have risen high

enough to enter these spaces through the downflooding locations. Figure (11) shows the model in this condition, which corresponds to Step E in Table (4).

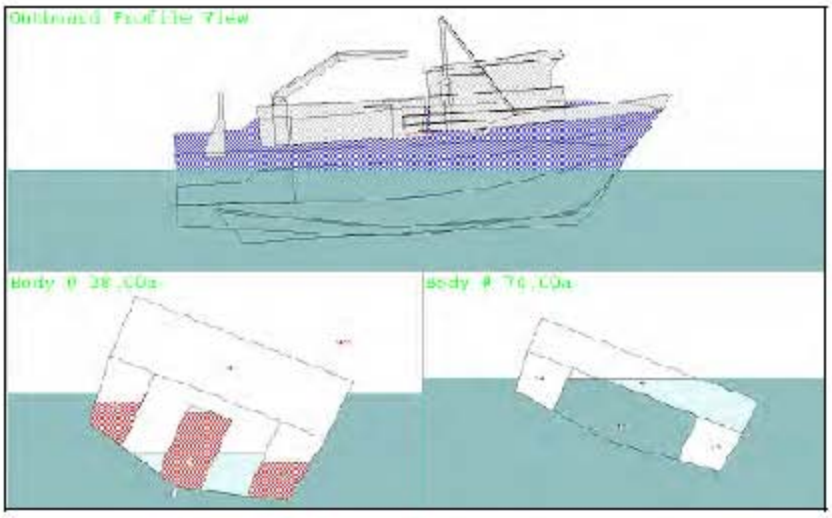


Figure (11). Step E in 1st Flooding Scenario

4.1 2nd Flooding Scenario

Step	Compartments Flooded	Heel Angle (°)	Main Deck Freeboard (ft)	Eng Rm DF Point (ft)	Height of DF Point (ft)	Total Flooding (LT)
A	None	1.35	0.32	8.16	11.07	0.00
B	Aft bulwarks holding water	11.41	-2.55	7.41	8.89	22.18
C	B + 2 inches of water in processing space	17.59	-3.97	6.54	7.40	29.17
D	C + 6 inches of water in processing space	25.77	-6.15	5.53	5.26	48.60
E	D + 80 knots of wind (model capsizes)	175.00				

Table (5). 2nd Flooding Scenario

Reference (a) indicated that the Chief Engineer reported that the flooding in the lazarette space and engine room was under control and going down. The flooding scenario in Table (5) examines the situation were the lazarette space and engine room have been pumped dry, but water was unable to drain from the aft bulwarks and water was starting to enter into the processing space through the reportedly open aft door into the space. As can be seen, even if the engine room and lazarette space were pumped dry and their buoyant volume restored, uncontrolled water entering the processing space led to the sinking of the model. Figure (12) shows Step D in the second flooding scenario with 6 inches of water in the processing space.

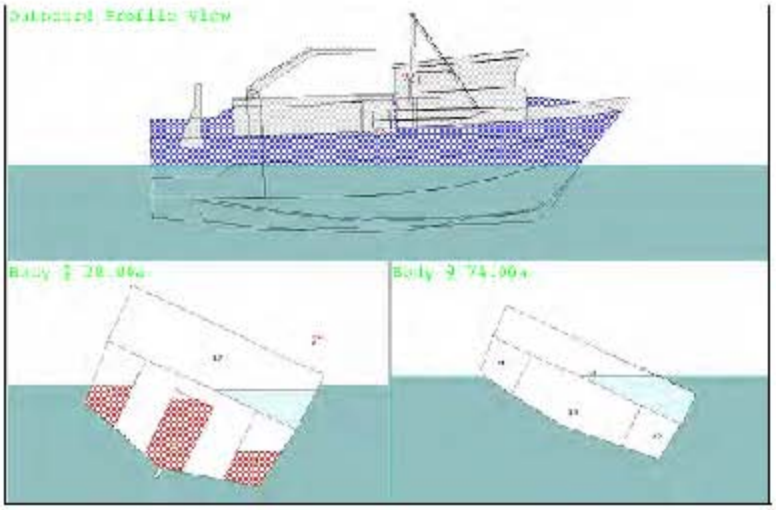


Figure (12). Step D in 2nd Flooding Scenario

The heel angles in this flooding scenario were largely caused by the large free surface effect that would occur with progressive flooding into the processing space. Even 6 inches of water in the space could lead to a significant heel angle. This step excluded the effects of heavy winds or seas as these would only shorten the time that the vessel could sink in this condition. When we tried to apply 80 knots of wind to the scenario in Step E, the model capsized.

It was reported that the vessel initially had a 15-20 degree port list and both flooding scenarios examined above support the possibility that a list of this degree was attainable. As shown in Step E of Table 4 (1st flooding scenario), water trapped in the aft bulwarks and in the engine room with 80 knots of wind acting on the vessel could have caused 23 degrees of list. Additionally, witness reports provided with reference (a) state that the processing space often had a couple of inches on deck water. As can be seen in Step C of Table 5 (2nd flooding scenario), even without wind generated heeling moments, 2 inches of water in the processing space could cause a significant heel angle (18 degrees). If 60 to 100 knots of wind were added to the free surface effect of water moving around on the processing space, the heel angle would only be further increased. Once the vessel could not maintain headway, any water in the aft bulwarks or processing space could shift suddenly in the reported sea state, and could easily cause the vessel to flounder from port to starboard. If the processing door located on the starboard side was open or blown open by the wind when the vessel listed to starboard, water would have entered the space and the vessel would have begun to sink. It has been suggested that fuel was transferred from the #3 port fuel tank to the #3 starboard fuel tank to help counteract the port list. If this happened, it would only provide another reason why the vessel suddenly shifted to starboard as reported. However, that likely would not have been the sole reason why the vessel shifted from port to starboard.

5 Conclusions and Recommendations

- There were some discrepancies noted in our review of the 1996 Stability Test results. These discrepancies would be significant for a vessel subject to the Code of Federal Regulations and if submitted to the Marine Safety Center for review, would likely have been, "Returned for Revision," requiring a new stability test to be performed.

- The Schwitters/Stevenson report did, in general, meet the basic purpose of the stability guidance standard in 46 CFR 28.530, in that operational recommendations and loading conditions for fishing were provided to the vessel.

- In the vessel's pre-casualty condition, it was carrying more than twice the amount of cargo reviewed in the loading conditions examined in the Schwitters/Stevenson report. Furthermore, the information suggested that the vessel had more than 50 long tons of load and more aft trim than a similar loading condition (LC4) in the report. While the additional weight onboard lowered the vessel's VCG making it appear more stable, the reduced freeboard and aft trim would have increased the vessel's potential to take on water.

- In our independent review of the vessel's stability against the intact stability standards of 46 CFR Subchapter C, Subpart E, several of the eleven loading conditions in the Schwitters/Stevenson report did not meet the standard. In general, the Severe Wind and Roll Criteria in 46 CFR 28.575 was the most limiting due to the large wind profile from the carriage of the pots on the fishing deck.

- In the pre-casualty condition, our model showed that the vessel would likely have met the intact stability standards of 46 CFR Subchapter C, Subpart E.

- Our modeling analysis suggests that the vessel did not meet the damage stability standards of 46 CFR 28.580. In damage cases where the processing space was flooded, the model capsized.

- The heavy winds and high seas greatly affected the vessel's stability. While the effects of high seas were not modeled in our analysis, the effects of high winds greatly decreased the stability of the model. In some scenarios, the model remained upright with no wind but capsized when high wind heeling moments were added.

- It appears that the vessel's freeing port area on the aft deck was substantially less than the standard in 46 CFR 28.555. Witness testimony suggested that the vessel often had waist high water on the aft deck in rough weather. It was reported that the aft deck was under water at the time of the casualty. Water on the aft deck would have reduced the stability of the vessel and increased the potential for flooding of the processing space.

- Witness testimony suggested that prior to the vessel sinking, the processing space began taking on water. Our modeling analysis indicated that the vessel would not remain afloat in the event of uncontrolled flooding into the processing space, whether through the aft watertight door or through downflooding from the fish opening in the overhead.

Appendix 3: NTSB Report on Liferaft Inflation Hose

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Materials Laboratory Division
Washington, DC 20594

May 18, 2009

MATERIALS LABORATORY FACTUAL REPORT Report No. 09-014

A. ACCIDENT

Place : Bering Sea, Adak, Alaska
Date : 10/22/2008
Vehicle : Fishing Vessel *Katmai*
NTSB No. : DCA09CM001
Investigator : [redacted]

B. COMPONENTS EXAMINED

CO_2 inflation hose (drawing number 4RA1174) and 90° fitting assembly (no part or drawing number)

C. DETAILS OF THE EXAMINATION

The purpose of this report is to document the condition of a CO_2 inflation hose assembly present on a Crewsaver® life raft used on the fishing vessel *Katmai*. The U.S. Coast Guard Marine Board of Investigation provided the hose assembly for evaluation to support the investigation of the sinking of the *Katmai*.

Figures 1, 2, and 3 show the CO_2 inflation hose assembly as found on the life raft when retrieved from the Bering Sea by the fishing vessel *Courageous* about 17 hours after the life raft's deployment during the sinking of the *Katmai*. The life raft did not appear to be inflated when brought on board the *Courageous*. During the life raft's duration at sea, the painter (a rope line that attaches the raft to the vessel and activates the inflation mechanism when pulled) became entangled with the inflation hose as shown in Figures 1 and 2. As evident in Figures 1, 2, and 3, the CO_2 tank was not attached to the inflation hose, nor was it found with the un-inflated life raft. Figure 3 shows the CO_2 inflation hose assembly after removal of the painter.

Figure 4 shows the hose and 90° fitting assembly as received by the NTSB Materials Laboratory. According to the Coast Guard Marine Board of Investigation, the hose was supplied by SMR Technologies as drawing number 4RA1174 at a length of 31 inches +/- 0.5 inch. The drawing indicates that the hose is composed of an inner Teflon® liner, an over-braid of stainless steel wire, an outer clear vinyl abrasion tube, and Type 316 stainless steel hose-connector and connector-nut fittings on each end. As shown in Table 1, the

overall length of the hose is 36.1 inches, which is nominally 5 inches longer than the specified length. The length of the clear vinyl outer abrasion tube is 29.5 inches long. The length of the abrasion tube is consistent with a nominal overall hose assembly length of 31 inches.

Table 1. CO_2 Inflation Hose Dimensions

Dimension	Specification (inches)	Measured (inches)
Length overall	30.5 to 31.5 *	36.1
Length of abrasion tube	Must cover braided length of hose (28 to 29.5)	29.5

* Nominal hose length is 31 inches as provided by the Coast Guard; drawing tolerance is +/- ½ inch

As shown in Figure 4, the hose is kinked in 5 different regions. At the hose end connected to the 90° fitting, there is approximately a 5-inch region with multiple kinks. The braiding in this region shows evidence of stretching (as indicated by distortion of the regular pattern of the braiding). The length of this stretched region is consistent with the longer-than-specified length of the hose.

Photomacrographic details of the 90° fitting are shown in Figures 5 and 6. The inflation-valve connection-nut is fabricated from a stainless steel alloy consistent with UNS S31600 as indicated by energy dispersive spectroscopy. The body of the fitting is fabricated from a brass alloy as indicated by energy dispersive spectroscopy. As shown in Figure 6, the top surfaces and the surfaces of the internal threads on the inflation-valve connection-nut are stained with brownish-orange deposits. Additionally, the surfaces adjacent to the gap between the 90° fitting body and the inflation-valve connection-nut are stained with brownish-orange deposits.

At the NTSB Materials Laboratory, the 90° fitting was mechanically removed from the hose connection nut by hand using a conventional open-end wrench. The hose connection nut was found to be mechanically tight to the 90° fitting.

Once removed, the 90° fitting was x-rayed as shown in Figure 7. The inflation-valve connection-nut is mechanically attached to the body through the use of a series of retaining balls. These retaining balls are intended to allow the inflation-valve connection-nut to rotate relative to the body. However, with hand rotation using moderate torsional force, the inflation-valve connection-nut did not rotate freely relative to the body as intended by the design.

After removal of the 90° fitting, the hose assembly was pressure-tested for leaks. One end of the hose was blocked with a rubber stopper, the other end was fitted with a

rubber-tipped hand-valve connected to 35 psig house air. Pressure testing revealed a large leak at the inflation-valve end of the hose as indicated in Figure 8 a.

To determine the nature of the leak, the braiding in the vicinity of the leak was cut open using small side-cutting pliers to reveal the Teflon liner. As shown in figure 8 b, the inner Teflon liner, adjacent to the hose connector, is ruptured across the entire cross-section. The rupture is immediately adjacent to the compression ferrule used to clamp the Teflon liner and braiding to the hose connector. Stereo microscopic analysis indicates that the rupture is due to tensile mechanical overload by shear yielding. The fracture surface of the Teflon liner exhibits fibrils indicative of tensile-overload fracture. Additionally, moderate necking of the Teflon liner wall is apparent in the region of the failure, consistent with strain localization from tensile overload. No indications of stress rupture or environmental stress cracking were observed. The location of the fracture, adjacent to the termination of the ferrule, is consistent with stress concentrations present in the Teflon liner from compression damage associated with wire braids penetrating into the wall thickness of the Teflon liner. A small region on the fracture surface in Figure 8 b was stained with brownish-orange deposits similar to those observed on the 90° fitting.

[redacted]
Chief, Materials Laboratory Division

Figure 1. The un-inflated *Katmai* life raft as recovered on fishing vessel *Courageous*. The painter is a rope line that attaches the raft to the vessel and when pulled, it activates the inflation mechanism.

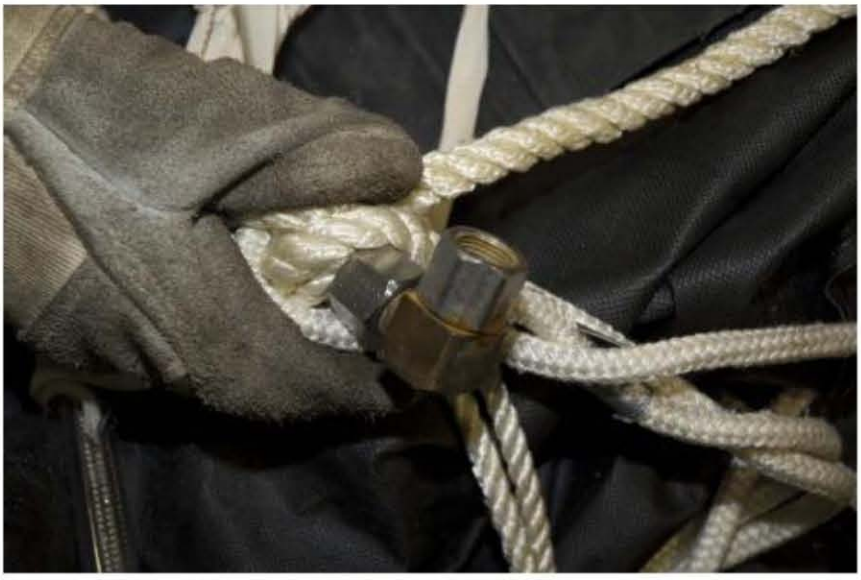


Figure 2. Close-up of the CO_2 inflation hose fitting, which is typically connected to the inflation valve and CO_2 tank.

Figure 3. Image of the CO_2 inflation hose attached to the life raft fitting (painter is removed). No CO_2 tank was found with the life raft.

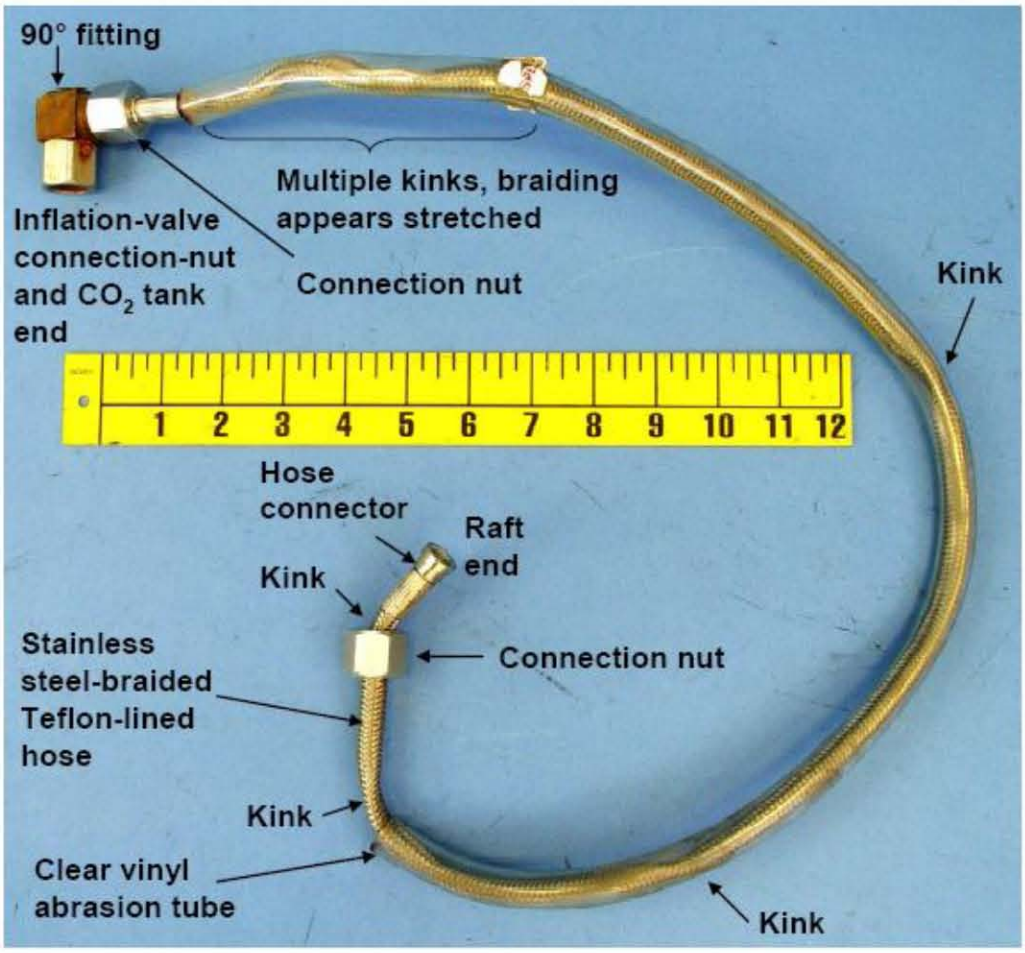


Figure 4. CO_2 inflation hose assembly as received in the NTSB Materials Laboratory. All critical features are identified in this figure.

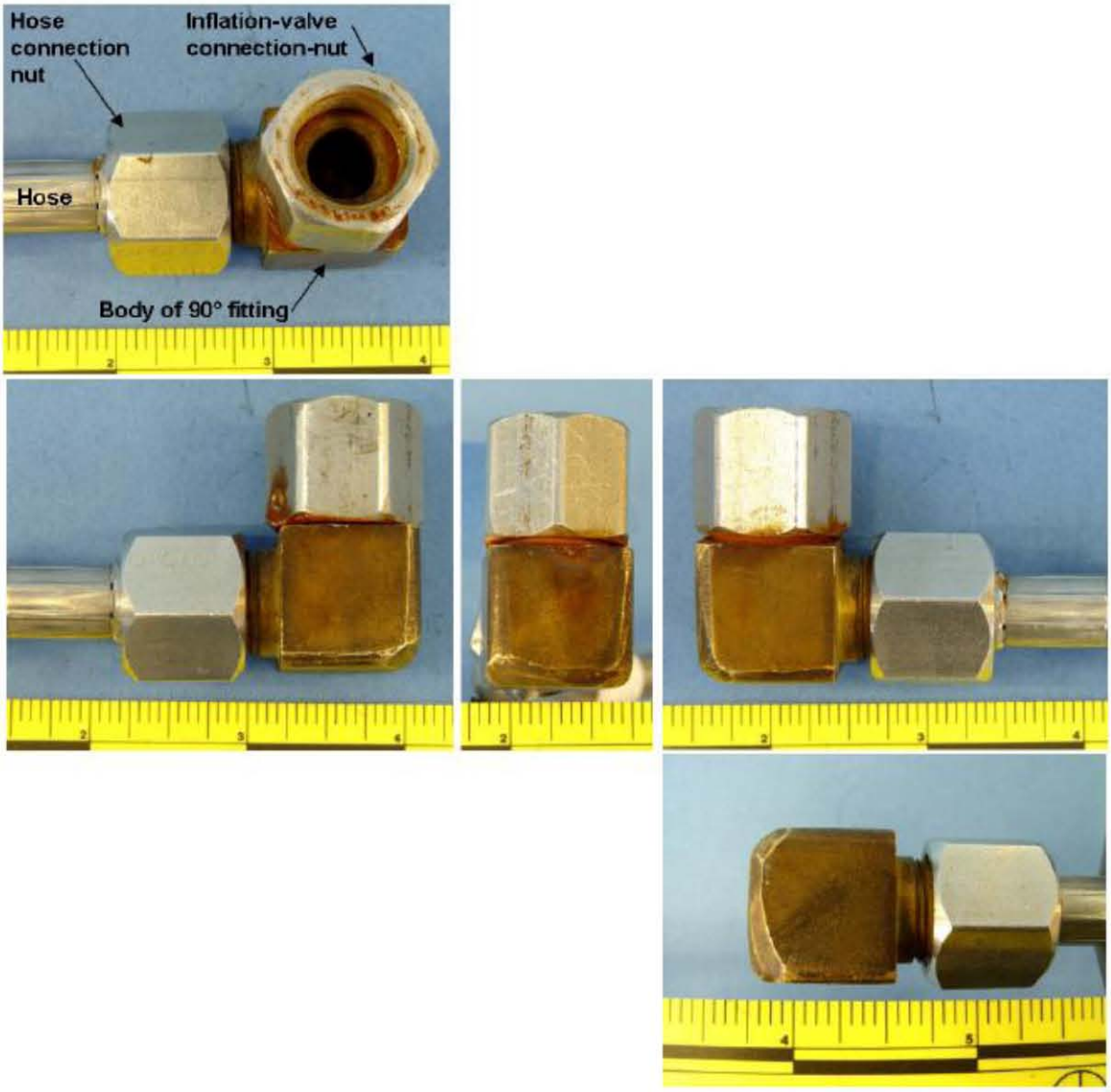


Figure 5. Photomacrographic details of the 90° fitting. Note the brownish-orange deposits at the interface surfaces between the inflation-valve connection-nut and the body of the 90° fitting.

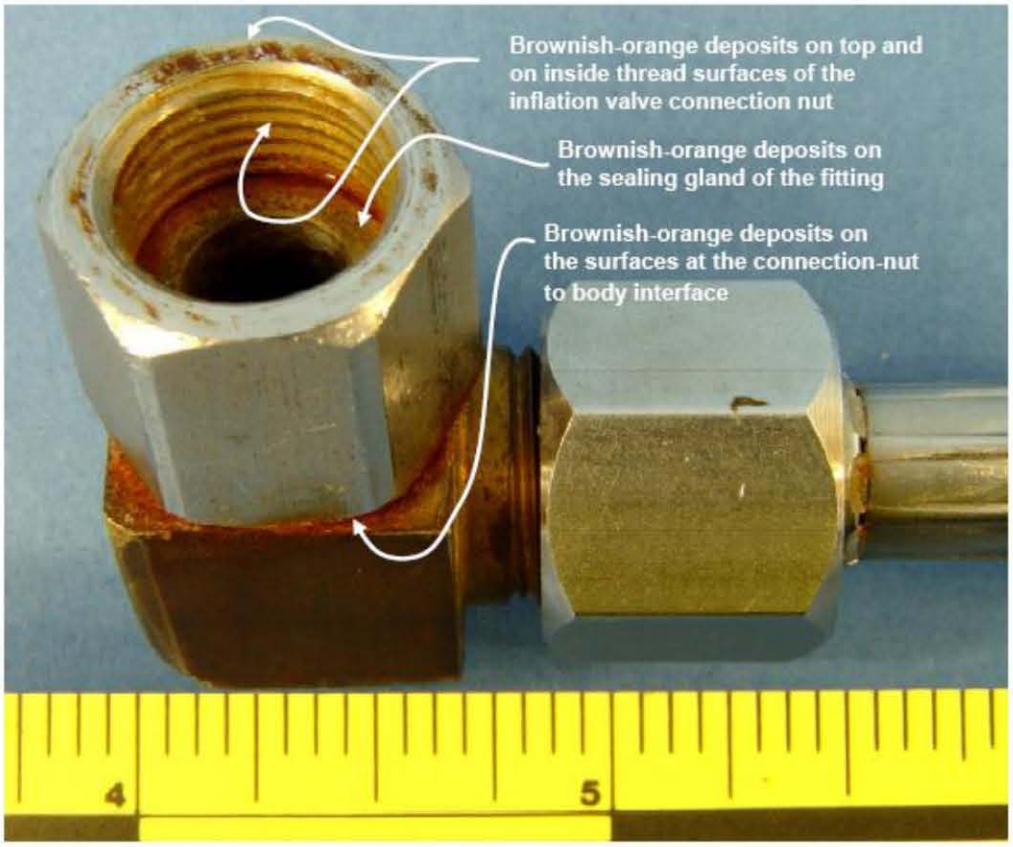
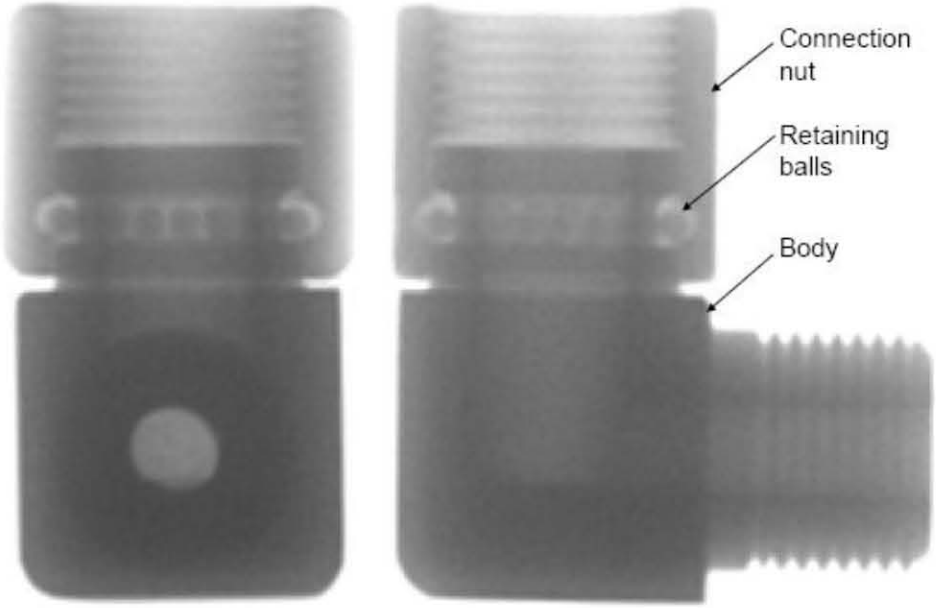


Figure 6. Close-up view of the 90° fitting. Note the brownish-orange deposits on the top and internal thread surfaces of the connection-nut and at the interface between the connection-nut and the body of the fitting.



Radiographic data: Hytec Inc. (Los Alamos, NM) Model FCT-3200, 320kV, 1.75 mA, 1.9 FOC, 3/8" Cu filter, Rh2 source

Figure 7. Radiograph of the 90° fitting showing the internal features. The connection-nut swivels relative to the body through the use of the retaining balls.

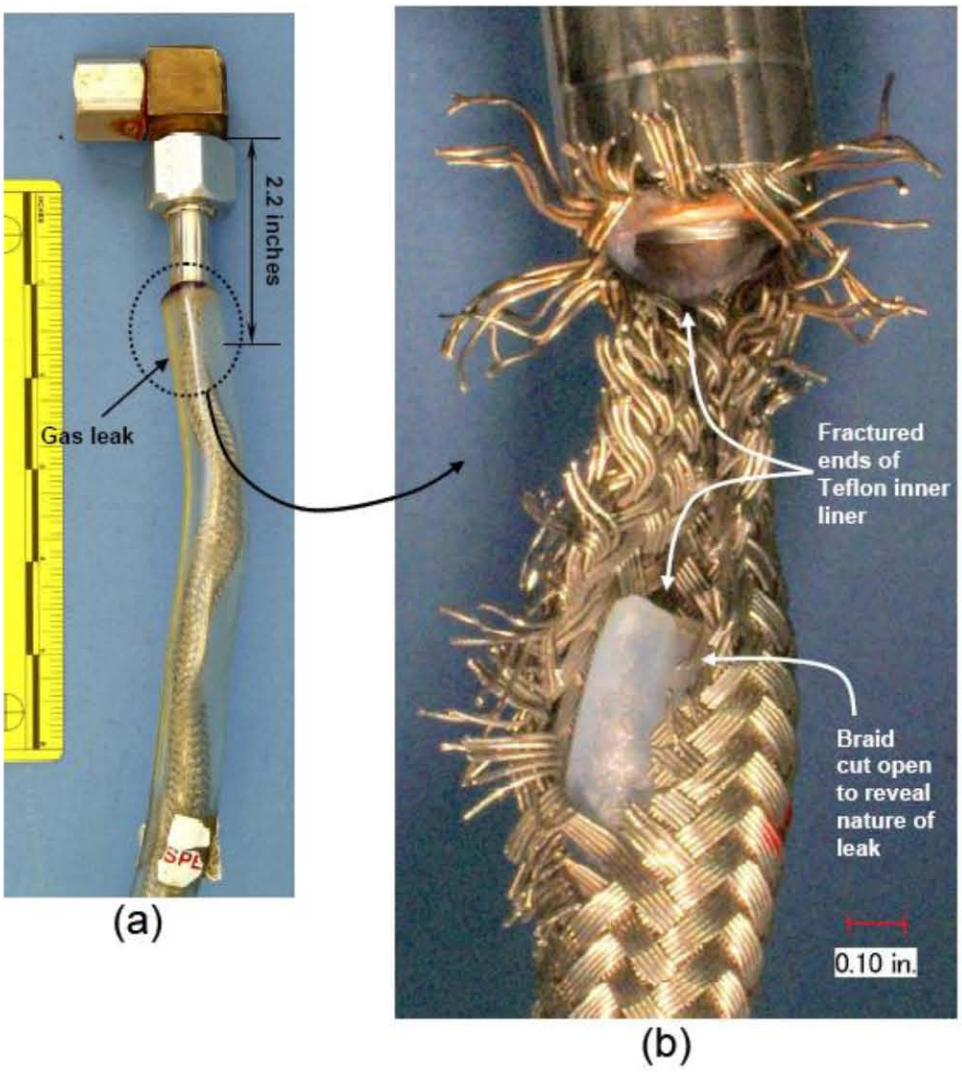


Figure 8. a) External location of the leak in the hose assembly. b) Rupture in the Teflon liner adjacent to the hose connector at the inflation-valve end of the hose.

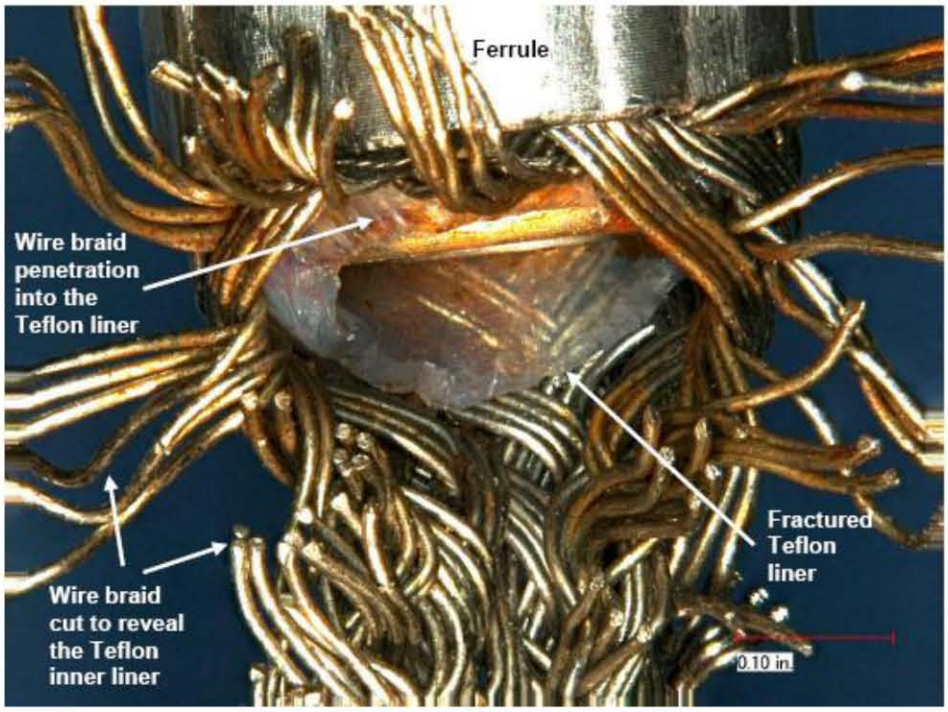


Figure 9. Higher magnification image of the Teflon liner fracture.

Appendix 4: November 7, 2007 Inspection, Valuation and Suitability for Service

M. A. STREAM ASSOCIATES, INC.

Marine Surveyors & Consultants

1411 N, Northlake Way #220 / Seattle, Washington 98103-8920

PHONE: 206-282-1311
FAX: 206-282-1510
Email: streamassociates@yahoo.com

CASE NO. SA 11299 November 7, 2007

FV KATMAI

Inspection - Condition, Valuation and
Suitability for Service

Report of survey made by the undersigned surveyor of M. A. Stream Associates, Inc. on October 19, 2007 at the request of All Alaskan Seafood Ventures, LLC. on the FV KATMAI, 148 Gross Tons, 918779 Official Number, Katmai Fisheries, Inc. Owners and Operator while lying on dock at Northlake Shipyard, Seattle, Washington in order to ascertain the condition, valuation and suitability of the vessel for service.

DIMENSIONS

Length Overall 92.2'
Length 73.3' Breadth 26' Depth 10.1'

DATE & PLACE OF CONSTRUCTION

Vessel built by Patti Shipyard, Pensacola, Florida in 1987.
New pilothouse added in June 1996 at Seattle, WA.

PREVIOUSLY DRY DOCKED

October 16, 2002 at Seattle, Washington.

INTENDED SERVICE

The vessel reportedly is intended to engage in service as a combination catcher/ processor.

CLASSIFICATION & LOAD LINE

The vessel has no load line and is not registered with a classification society.

FLAG & CREW

The vessel is of United States registry. The crew reportedly numbers five (5).

GENERAL DESCRIPTION & ARRANGEMENT

The KATMAI is an all steel single deck, raised forward, twin oil screw typical combination fishing vessel with a raked stem, hard chine hull and square stern. Decks have a pronounced sheer forward and the deckhouse is located well forward of amidships with processing house, freezer hold and trawl gantry aft.

The deckhouse is two levels of steel construction with raised pilothouse, flat forward and divided into pilothouse on the upper deck.

On the second deck forward are crew quarters with eight (8) bunks and two (2) lockers. Aft to port is a crew head with toilet, sink and shower. To starboard are six (6) lockers for storage. At the aft end of the house is an access way to the forecastle head and a thwart ship stairway to the main deckhouse.

The main deck area is divided as follows: all the way forward is the fore peak with a 7 bunk stateroom with port and starboard doors and storage space, next a ladder way to below deck storage and work area with G.E. refrigerator, G.E. washer and dryer, Helisep oily water separator, Alfa Laval water maker, SEA LAND RO desailnator, sewage pump driven by a Baldor 3/4 hp. motor, work bench with vice, fresh and salt water pressure tanks. Aft and above to starboard is the galley area with galley table, two bench seats, Hotpoint refrigerator-freezer, G.E. Spectra range with exhaust hood, Sharp microwave oven, counters, cabinets, double stainless sinks, Toshiba color television/VHS, Bunn coffee maker and Jet Spray juice dispenser.

GENERAL DESCRIPTION & ARRANGEMENT (Cont'd)

The crew head is located to the port of the galley and contains sinks with storage below, shower and toilet. Next aft is an antiway with engine room access and watertight door aft to the enclosed processing area containing two Jackstone Foster plate freezers, four sump pumps, two electric motor driven condenser pumps, access to the freezer hold, chiller tank, boxing table, Marcel M2000 digital scale, double stainless sinks, conveyors, sorting machine, Larkin six fan air conditioning system and Jennair refrigerator/freezer. Aft of this area is a shelter deck.

To port is an Aurora hydraulic deck crane and Copeland refrigeration compressor driven by a 7 1/2 horsepower motor. A trawl gantry is over the top of the shelter deck.

There are six (6) watertight transverse bulkheads which divide the below deck area into forward fuel oil tanks, engine room, freezer hold, fresh water tanks and compressor room.

The vessel is fitted with one steel 'A' frame mast supporting navigation lights, radio antenna, five (5) sodium vapor and four (4) quartz work lights.

A 37" high steel bulwark extends from the stem both port and starboard aft tapering to a three-course pipe rail aft of the pilothouse.

Freeing ports consist of numerous openings at the deck level.

STRUCTURAL DETAILS

Transverse Frames	- 3" x 5" x 1/4" Angle
Deck Beams	- 3" x 5" x 1/4" Angle
Side Shell	- 5/16" Plate
Bottoms	- 5/16" Plate
Bulkheads	- 1/4" Plate

NAVIGATION EQUIPMENT

Skymate VMS System
Furuno 8050D radar
Furuno 810D radar
One Stephens SEA 222 SSB radios
One Stephens SEA 225 SSB radio
Two Standard VHF radios
Furuno CN12-60 color sonar
Furuno LC90 MK II loran C

Two Trimble NT2000 GPS
Simrad TP-C11 color plotter
Harris Electric watch alarm
Seahail loud hailer
SeaNav 1050 navigational computer and monitor
Sea Sat Standard C system
HP desk jet 3650 printer
Alarm panel
Northwest Instruments steering control panel
Three DC power distribution panels
Honeywell thermostat
Panasonic plain paper fax.
One Focus CTV
Two sets of main engine gauges
Three station Micro Commander engine controls
Wood Freeman 500 autopilot
5" Dirigo magnetic compass - last swung on August 18, 2001
Wood Freeman magnetic steering compass
Three Robertson rudder angle indicators
One Robertson AP45 autopilot - last swung August 2, 1996
Three Robertson jog steering units
Two Robertson FU91 lever steers
One Furuno FCV1200B color sounder
One Sperry SR130 gyrocompass
One Horizon LH5 loudhailer
One Furuno 207 weather fax
One NAV5 GMDSS NavTex receiver
One Sailor 2182 watch-keeping receiver
Two navigation light panels
One general alarm system
One Kenwood TKM 407 VHF radio
One Shuttle X DVD, floppy disc unit
One Robertson F200 remote steering unit

Additionally the pilothouse top contains air horn, radar, radio antenna, life raft and two Brian Model 569 BEXD9000 ACAA air conditioning units.

Steering is electric/hydraulic consisting of hoses and valves to two steering pumps driven by 5 horsepower motors to a dual post quadrant with 3" tie bar.

MACHINERY

The main engines are Cummins Model NT855 six cylinder diesel of 300 horsepower each, 1800 rpm, 57.5" diameter 55" pitch driving 4 blade bronze propellers in Kortz nozzles through Twin Disc MG514C clutches and 6:1 reduction gears and 5" stainless steel shafting supported in rubber water lubricated stern bearing. Intermediate shafting is 5" steel.

Engines are controllable from the engine room and three (3) stations in the pilothouse.

The main engines are battery started and the vessel is fitted with a 24-volt battery system and a Curtis 907 air compressor driven by a 2 horsepower motor with a 60 gallon air bottle of welded steel construction and fitted with a relief valve.

The starboard main engine through a Triple gang Bota power take-off drives a Dennison double hydraulic pump - 45 gpm.

The vessel is also equipped with the following:

A Caterpillar Model 3306 auxiliary diesel engine driving a N.C. 165 KW AC generator.

A GMC Model 6-71 diesel engine driving a Lima 75 KW AC generator and through a Twin Disc P.T.O. a Vickers two stage hydraulic pump.

A Cummins 6BT six-cylinder diesel engine driving a Lima 93 KW AC generator.

All the above located in the engine room.

The auxiliary engines are battery started.

Cooling for the main engines is by keel cooler.

The main and auxiliary engines exhaust through dry exhaust lines, each equipped with a silencer, the exhaust terminals being located in the stack.

The exhaust lines are adequately insulated or isolated in way of combustible materials.

MACHINERY (Cont'd)

Additionally the vessel carries the following equipment:

Two Mathers Micro Commander controls

3 horsepower motor driving fuel oil transfer pump.

4" x 3" Vertiflow salt-water circulation pump driven by a Lincoln electric motor.

Two 1 1/2" electric motor driven bilge-fire pumps.

Westfalia fuel oil centrifuge.

Jacuzzi 1/2 horsepower pump for fresh water with Teel expansion tank.

Lincoln 2 horsepower motor drives a hydraulic pilot pump.

Two Rheem 40 gallon hot water tank.

Baldor 25 horsepower motor drives a hydraulic pump for deck equipment.

Two steering motors and pumps.

One Ratelco and one Newmar battery charger.

One Lincoln Inveatec V250-S arc welder.

Lincoln 50 horsepower motor drives hydraulics for the deck crane.

Electric motor driven hydraulic pump for plate freezers.

York heating furnace.

Two Ratelco constavolt battery chargers.

REFRIGERATION EQUPMENT

Two compressors, 4 cylinder "R" line York Mfg., 40 H.P., reconditioned with control panel and motor starters.

One condenser, Standard Mfg., marine type Model MS2005, 25-ton refrigeration capacity.

REFRIGERATION EQUIPMENT (Cont'd)

One low-pressure receiver, size 30" x 66" (for liquid recirculation system).

Two 2 H.P. liquid pumps, Cornell Model CD1.5.

One pump panel with motor starter.

One liquid level control unit.

Two plate freezers, 14 plate, 13 station, Jackstone Mfg, aluminum plate 44" x 76" with split header for 2 section freezing.

One compressor, Carrier Model 5F40, converted for R-22 low temperature use.

One set split headers for plate freezer.

Two new G.E. chest freezers

One Badder Cod header to be placed aboard

ELECTRICAL SYSTEM

Navigation lighting, interior lighting and instrument lighting are all served by the 12-24-120 volt battery and generator system with all electrical conductors of marine neoprene encased armored type with marine fixtures.

A dead front circuit breaker equipped switchboard is located in the engine room. Additional circuit breaker equipped distribution panels are located throughout the vessel.

TANKS (reported)

Five Fuel Oil Tanks	- Total of 14,800 Gallons
Four Fresh Water Tanks	- Total of 8,464 Gallons
One Hydraulic Oil Tank	- 450 Gallons
One Lube Oil Tank	- 150 Gallons

FIRE FIGHTING & LIFE SAVING EQUIPMENT

A fixed CO2 fire extinguishing system consisting of two 100# bottles is located outside the engine room access and serves the engine room.

Portable fire extinguishers of the following types and sizes are located as indicated:

FIREFIGHTING & LIFE SAVING EQUIPMENT (Cont'd)

Three 12# Dry Chemical - Engine Room
One 20# Dry Chemical - Engine Room
One 12# Dry Chemical - Pilothouse
One 12# Dry Chemical - Galley
One 12# Dry Chemical - Crew Quarters
One 20# Dry Chemical - Process Deck

Fire hose with nozzle, fire ax and engine room blower shut down are mounted at the engine room doorway.

One fifteen (15) man B.F. Goodrich inflatable life raft is located atop the pilothouse and are released manually and by hydrostatic release. Next inspection – August 2005.

A McMurdo 406 E.P.I.R.B. is carried aboard - battery good until September 2008.

Two SCBA's are carried with two spare bottles each.

Four 30" life rings are mounted aboard with float lights.

Nine (9) approved survival suits are stowed in crew quarters.

A full set of emergency flares are carried.

DECK MACHINERY

The vessel is equipped with deck machinery of the following types:

One Marco pot hauler.
One Yaquina Boat pot hauler
Two trawl pulleys.
Aurora pedestal mounted 12-ton hydraulic deck crane. SWL 2100# @ maximum reach.
One hydraulic bait chopper

An Aurora hydraulic anchor winch spooling 45 fathoms of 1" chain to 1" HGPS cable line to a 1000 pound Navy anchor is mounted at the bow.

MISCELLANEOUS

A stability test performed by Paul Schwitters, Naval Architect is aboard.

At this last dry-docking the following was accomplished:

Hull was pressure washed

Sea chests were opened and cleaned

New zinc anodes placed on hull and in sea chests

Hull was painted from the water line down

Shaft bearing checked and found satisfactory

GENERAL CONDITION

Interior surfaces are satisfactorily preserved.

Exterior surfaces are satisfactorily painted.

Plating and decks appeared generally well maintained.

Interior of plating and framing could not be examined as vessel is fully ceiled.

VALUATIONS

The date of purchase and the purchase price are unknown.

Estimated Current Market Value----------$1,500,000.00

Estimated Replacement Cost----------$5,000,000.00

RECOMMENDATION

None

As far as may be ascertained from a general examination of the vessel afloat, it is the opinion of the undersigned, as hereinafter qualified, that the vessel will be in satisfactory condition and suitable for operation in the intended service upon compliance with the above recommendation. This examination has been made without making removals, or opening up parts ordinarily concealed, or testing for tightness, or trying out machinery. Further, no determination of intact stability or inherent structural integrity has been made.

The issuance of our Report of Survey is based upon observations and information provided. If the information provided is misleading and/or erroneous our Report of Survey shall be deemed withdrawn.

Survey made without prejudice.

[redacted]

SURVEYOR

Appendix 5: MBI Convening Order

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: CG-545
Phone: (202) 372-1029
Fax: (202) 372-1907

16732

OCT 2 4 2008

MEMOR[redacted]

From: Commandant

To: CDR Malcom R. McLellan, USCG

Thru: Commandant (CG-545)

Subject: MARINE BOARD OF INVESTIGATION CONCERNING THE SINKING OF THE F/V KATMAI (ON 918779) ON THE BERING SEA ON 22 OCTOBER 2008 WITH MULTIPLE LOSS OF LIFE

1. Pursuant to the authority vested in me by 46 USC 6301 and the regulations thereunder, a Marine Board of Investigation consisting of yourself as Chairman [redacted] USCG, Member, and LT [redacted] USCG, Recorder, is hereby ordered to convene as soon as practicable to inquire into all aspects of subject casualty at such times and places as directed by you.

2. The Board will investigate thoroughly the matter hereby submitted to it in accordance with the provisions of 46 USC 6301, et. seq., and the regulations thereunder. Upon completion of its investigation, the Board will report to the Commandant the evidence adduced, the facts established thereby, and its conclusions and recommendations with respect thereto, except that any conclusions or recommendations concerning commendatory actions or misconduct which would warrant further inquiry shall be referred by separate correspondence to the cognizant district commander. A daily summary of significant events shall be transmitted to Commandant (CG-545) while the Board is in formal session.

3. Complete and submit your investigative report to Commandant (CG-545) within six months of the convening date. If this deadline cannot be met, a written explanation for the delay and the expected completion date shall be submitted. You are encouraged to submit interim recommendations intended to prevent similar casualties, if appropriate, early in your investigation.

4. The National Transportation Safety Board (NTSB) is also charged with the responsibility of determining the cause or probable cause of this casualty by the Independent Safety Board Act of 1974 (49 USC 1901, et. seq.) and may designate a representative to participate in this investigation. The NTSB representative may make recommendations regarding the scope of the inquiry, may identify and examine witnesses, and may submit or request additional evidence.

Subject: MARINE BOARD OF INVESTIGATION CONCERNING THE SINKING OF THE F/V KATMAI (ON 918779) ON THE BERING SEA ON 22 OCTOBER 2008 WITH MULTIPLE LOSS OF LIFE

5. The Commandant (CG-545) will furnish such funding and technical assistance as may be required by the Board when deemed appropriate and within the requirements for the scope of this investigation. Commander Seventeenth Coast Guard District will provide such administrative and legal support as may be required.

#

Copy: CG PACAREA (Pp)
CGD SEVENTEEN (dp)
CGD THIRTEEN (dp)
CG SECTOR Anchorage
CG SECTOR Seattle