# UNITED STATES COAST GUARD

# REPORT OF THE MARINE BOARD OF INVESTIGATION INTO THE COMMERCIAL FISHING VESSEL DESTINATION SINKING AND LOSS OF THE VESSEL WITH ALL SIX CREWMEMBERS MISSING AND PRESUMED DECEASED APPROXIMATELY 4.4 NM NORTHWEST OF ST. GEORGE ISLAND, ALASKA ON FEBRUARY 11, 2017

MISLE ACTIVITY NUMBER: 6088430

U.S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

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16732
27 February 2019

**COMMERCIAL FISHING VESSEL DESTINATION (O.N. 632374)
SINKING AND LOSS OF VESSEL
WITH ALL SIX CREMEMBERS MISSING AND PRESUMED DECEASED
APPROXIMATELY 4.4 NM NORTHWEST OF ST. GEORGE ISLAND, ALASKA ON
FEBRUARY 11, 2017**

## ACTION BY THE COMMANDANT

The record and the report of the marine board of investigation designated 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. The report and Findings of Concern will be shared with industry.

## COMMENTS ON THE REPORT

1. The loss of DESTINATION with 6 persons aboard was a tragic and preventable accident. I offer my sincere condolences to the families and friends of the mariners whose lives were lost. The Coast Guard will take appropriate action on all that we have learned from this investigation.

2. I thank the members of the Marine Board of Investigation (MBI) for their exhaustive work and independent recommendations. The MBI conducted much of their investigation in public view providing a high degree of transparency to their proceedings. As a result, other vessel owners and operators were able to apply lessons learned in near real time, enhancing safety of their own operations.

3. While many factors contributed to this marine casualty, the most significant were the vessel's unsafe stability condition due to the combined detrimental effects of carrying heavier crab pots than stability instructions anticipated, carrying additional bait high atop these crab pots, ice accumulation from freezing spray, and downflooding from the open number 3 cargo hatch.

4. Critical to the stability of uninspected fishing vessels is the owner's use of a qualified individual to perform tests or calculations necessary to evaluate the vessel's stability and update onboard stability instructions. This was not done despite several changes made to DESTINATION's characteristics after stability instructions were issued in 1993. In addition, the master did not follow the vessel stability instructions when he allowed number 3 deck hatch to be open, and loaded bait high atop the crab pots. The master also sailed from Dutch Harbor under heavy freezing spray warnings with a fatigued crew unfit to properly remove ice accumulations and perform other emergency actions.

5. This combination of actions and events placed DESTINATION in a very vulnerable condition and compromised the vessel and crew's ability to survive when exposed to wind and waves beyond the lee of St. George Island in the early morning hours of February 11, 2017.

## ACTION ON SAFETY RECOMMENDATIONS

Recommendation 1: Recommend [Thirteenth District] D13 and [Seventeenth District] D17 conduct education and outreach to promote awareness, compliance, and training opportunities with [Commercial Fishing Vessel] CFV stability instructions requirements of 46 CFR 28 Subpart E - Stability. Education and outreach can include developing safety alerts, attending industry workshops or hosting industry days with local CFV owners, captains, operators and naval architects or qualified individuals. The Coast Guard should highlight the owner's responsibilities to select qualified individuals to conduct stability assessments consistent with regulatory requirements, and to provide their captains with accurate stability instructions that reflects vessel alterations, modifications and changes to any new fishing gear, including the weight of crab pots. The Coast Guard should also encourage CFV owners and captains to attend stability training such as those offered by the [North Pacific Fishing Vessel Owners' Association] NPFVOA and [Alaska Marine Safety Education Association] AMSEA. The training should include basic stability principles regarding overloading, alterations and weight creep, watertight integrity, icing, stability risks for the vessel's fishery, and the effective use of stability instructions specific to the vessel. Increasing awareness of stability will promote the importance of maintaining accurate stability instructions and reduce future catastrophic stability casualties.

> Action: I concur with this recommendation. Owners and operators of commercial fishing vessels need accurate stability data and instructions and should be thoroughly familiar with the applicable details. They must understand the importance of safe loading and watertight integrity, as well as the hazards of operating with excessive weight and icing. This should be a focus of Coast Guard outreach. The U.S Coast Guard issued Marine Safety Alert 11-17 on October 6, 2017 to address these stability issues on fishing vessels, providing several online resources, including online stability training. I will forward this recommendation to the Commanders of the Thirteenth and Seventeenth Districts for further action, complementing outreach they have already undertaken since this casualty. With assistance from Coast Guard Headquarters Office of Commercial Vessel Compliance, Fishing Vessel Safety Division (CG-CVC-3), they will prepare and execute an outreach plan to address all topics in this recommendation within their respective areas of responsibility.

Recommendation 2: Recommend D13 and D17, consistent with COMDTINST 16711.13B, conduct a targeted oversight audit on all [Bering Sea and Aleutian Islands] BSAI crabbing vessels operating or home ported in their respective area of responsibility. The oversight audit should focus on efforts to promote the BSAI crabbing fleet's compliance, and documentation of stability instruction requirements as it relates to vessel weight creep modifications, conversions or substantial alterations. This targeted oversight audit will help promote and ensure the accuracy of stability instructions across the BSAI crabbing fleet.

Action: I concur with this recommendation. I will forward this recommendation to the Commanders of the Thirteenth and Seventeenth Districts for action. With assistance from Coast Guard Headquarters Office of Commercial Vessel Compliance, Fishing Vessel Safety Division (CG-CVC-3), a Concentrated Examination Program (CEP) for BSAI crabbing vessels operating in and/or from their respective areas of responsibility will be conducted.

Recommendation 3: Recommend D17 develop policy regarding [Stability and Safety Compliance Check] SSCs and [Alaska Department of Fish & Game] ADF&G 24-hour notice regulations. The policy should address the planning, training, and execution of scheduled SSC operations, the scope and purpose of SSCs, and procedures examiners should follow when conducting and documenting SSCs or receiving ADF&G 24-hour notices. Developing policy regarding SSC and ADF&G 24-hour notices will establish expectations and provide BSAI crabbing fleet operators and Coast Guard examiners with improved procedures to confirm a vessel complies with stability requirements.

Action: I concur with this recommendation. While policy issues for voluntary Stability and Safety Compliance Checks (SSCs) were not a causal factor in this casualty, improved policy and procedures for these checks will benefit Coast Guard examiner consistency and training. This should not be taken to diminish that the responsibility for complying with stability requirements fundamentally lies with vessel operators. The effectiveness of SSCs, in fact, hinges on vessel operator participation, including a discussion of information upon which the Coast Guard may assist with compliance. This responsibility is described in detail in Marine Safety Alert 11-17 and Findings of Concern 006-19.

Recommendation 4: Recommend D13 and D17 CFVEs use direct verification to weigh the vessel's crab pots during dockside safety examinations and SSCs. Examiners should conduct direct verification by actual weight observations of a sample amount of crab pots using a calibrated scale supplied by the Coast Guard. In cases where the weight of the crab pots with its gear is different than the weight used to establish the vessel's stability instructions, the examiner should require the owner to work with a qualified individual to amend the stability instruction's loading tables. This direct verification should help ensure the weight of the crab pots are consistent and in accordance with the weights used to develop the vessel's stability instructions.

Action: I partially concur with this recommendation. While the responsibility for complying with stability requirements lies with vessel operators, spot checks conducted by the Coast Guard may help reduce risks of overloading. Commercial scales that are registered, periodically tested, and decaled through state and industry standards for use in the sale and transport of goods in the aquaculture trades may be used to weigh the crab pots and gear, as well as scales made available by the Coast Guard upon request. I will forward this recommendation to the Commanders of the Thirteenth and Seventeenth Districts for action and direct them to implement a program that spot checks crab pot weights prior to the commencement of crab-fishing seasons.

Recommendation 5: Recommend Commandant conduct a targeted oversight audit on all Commercial Fishing Vessels [CFVs] subject to the stability requirements of 46 CFR, Subpart E. The oversight audit should focus on efforts to promote stability compliance and documentation of stability instruction requirements as it relates to vessel weight creep, modifications, conversions or substantial alterations. The audit should also evaluate the efficiency of examination forms and the CFVE PQS to verify and document CFV stability and freeing port area compliance. This targeted oversight audit will help promote and ensure compliance and the accuracy of CFV stability to required standards.

Action: I do not concur with this recommendation. There is not sufficient evidence in this report to conclude additional oversight is needed across the entire fleet of commercial fishing vessels. The Commanders of the Thirteenth and Seventeenth Districts will address this issue, specifically as it applies to Bering Sea/Aleutian Island (BSAI) crabbing vessels, through the CEP described in my response to Recommendation 2. I will also issue Findings of Concern 006-19 and forward to all Coast Guard Districts to stress the importance of stability compliance and maintenance of accurate stability instructions that account for weight creep, modifications, conversions, or substantial alterations for all commercial fishing vessels subject to the stability requirements of 46 CFR 28, Subpart E.

Recommendation 6: Recommend Commandant amend 46 CFR 28.530 – Stability Instructions, to require owners to ensure the qualified individual includes within the stability instructions the assumed weight of crab pots used within the stability calculations. Requiring stability instructions to indicate the assumed weight of the crab pots will more effectively enable CFV owners to track weight creep and update the stability instructions before it adversely affects the vessel's stability.

Action: I do not concur with this recommendation. The requirements for stability instructions in 46 CFR §28.530 are for all types of uninspected commercial fishing vessels, not just those using crab pots. The general requirement in §28.530(b) states "each vessel must be provided with stability instructions which provide the master or individual in charge of the vessel with loading constraints and operating restrictions which maintain the vessel in a condition that meets the applicable stability requirements of this subpart (46 CFR Part 28)." This is supplemented by the requirements in §28.530(e), which require that stability instructions, "…be developed based on the vessel's individual characteristics." These instructions may include sample loading conditions, any other necessary guidance for maintaining adequate stability under normal and emergency conditions, a general description of the stability criteria that are used in the development of the instructions, and any other information the owner feels is important to the stability and operation of the vessel. The existing regulations require that the weight of the crab pots, as well as other associated factors including the number of pots carried and loading arrangement, be included as part of that vessel's individual characteristics. I will direct the weight and loading arrangement of crab pots and associated impacts on vessel stability be included as part of the outreach plan discussed in my response to Recommendation 1 and the CEP discussed my response to Recommendation 2.

Recommendation 7: Recommend Commandant amend 46 CFR 28.550- Icing, to reflect the intent of the icing regulations as indicated in the preamble to the final rule. The regulations should specifically require the owner to ensure the qualified individual includes within the stability instructions the weight and thickness of assumed ice used within the stability calculations. Further, when vessels operate under NWS freezing spray forecasts, the stability instructions should indicate the vessel may experience icing conditions that exceed the vessel's stability and that captains shall consider delaying departure from port, or if already underway, seek protected waters or take immediate action to minimize ice accumulations. Requiring stability instructions to indicate ice weight and thickness accumulation calculations will more effectively enable CFV captains to anticipate and manage ice accumulations before it adversely affects the vessel's stability.

Action: I do not concur with this recommendation. While 46 CFR §28.550 specifies the values to be used for the assumed weight and thickness of ice used in performing the stability calculations required by 46 CFR Subpart E, it does not include format or content requirements for the stability instructions provided to the master or individual in charge. Those requirements are found in 46 CFR §28.530. As discussed in my response to Recommendation 6, these requirements are general in nature, focusing on the overall ease of understanding and use of the instructions by the master or individual in charge instead of prescribing detailed requirements for their specific content. As explained in the stated intent of the regulations, this is to provide maximum flexibility for owners and qualified individuals to determine how the instructions are conveyed, taking into account the unique issues that apply to an individual vessel, its personnel who will be using the instructions, and its anticipated operating conditions. The stability instructions should include conditions of icing where it is reasonable that it will be encountered. I will direct icing and its impact on vessel stability be included in the outreach plan discussed in my response to Recommendation 1 and the CEP discussed in my response to Recommendation 2.

Recommendation 8: Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFV owners and captains to present evidence of course completion after attending Coast Guard approved stability training. This will ensure owner and captains are aware of stability instructions requirements and procedures to minimize the potential for preventable vessel losses attributed to inaccurate stability instructions or improper loading of fishing vessels.

Action: I partially concur with this recommendation. The 2010 Coast Guard Authorization Act, specifically 46 USC 4502(g)(1) and (2) as amended, includes provisions for individuals in charge of the vessels operating beyond 3 nautical miles to pass a training program covering certain competencies, including stability. While the Coast Guard has not implemented regulations requiring this training, a Coast Guard accepted course has been created by the North Pacific Fishing Vessel Owners Association (NFPVOA) that satisfies some elements of 46 USC 4502(g)(1) and (2). NFPVOA is currently drafting a course that covers stability and they intend to submit to the Coast Guard National Maritime Center for consideration as an accepted course. With this training and adequate stability instructions required by existing regulations in 46 CFR §28.530, vessel owners and operators are able to avoid loading and operating

conditions that exceed vessel stability limitations. To further promote awareness of these issues, I will direct the outreach plan discussed in my response to Recommendation 1 include material from Marine Safety Alert 11-17 and Findings of Concern 006-19.

Recommendation 9: Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFVs owners to notify the Coast Guard when the vessel undergoes modifications, conversions or substantial alterations and if the owner selected a qualified individual to conduct a stability assessment. Such notifications will promote the Coast Guard's ability to obtain and document vessel modifications and to facilitate constructive conversations with the owner to detect and correct inaccurate stability instructions and reduce future catastrophic stability casualties.

Action: I do not concur with this recommendation. Existing regulations are clear and adequate in detailing the vessel owner's responsibility to select a qualified individual to perform the required tests and calculations, to maintain the results of those tests and calculations, and to provide stability instructions that meet the requirements and intent of 46 CFR Part 28, Subpart E. However, to reinforce compliance with the existing requirements related to this topic as it applies to BSAI crabbing vessels, I will direct that the outreach plan described in my action on Recommendation 1 from the Marine Board include a focus on the vessel owner's responsibilities with respect to stability. I will also issue Findings of Concern 006-19 to raise awareness of the impacts of modifications, conversions or substantial alterations on vessel stability.

Recommendation 10: Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFVs owners to maintain an onboard and shore side record of all incremental weight changes to the vessels lightship condition and fishing/cargo gear. Requiring the vessel owner to track weight changes over time will help the owner readily determine if the aggregate total will require a qualified individual to update the vessel's stability instructions, and thus reduce future catastrophic stability casualties.

Action: I do not concur with this recommendation. As an uninspected vessel, 46 CFR §28.501 and §28.530 require owners to be cognizant of how incremental weight changes could adversely affect their vessel's stability over time. The intent of §28.530 is to ensure vessel masters and individuals in charge of vessels are provided with enough stability information to allow them to maintain their vessel in a satisfactory stability condition. This requires owners to be cognizant of how incremental weight changes over time could fall under the definition of "substantial alterations" and adversely affect their vessel's stability. However, to reinforce compliance with existing requirements, I will direct that the outreach plan described in my action to Recommendation 1 include tools for owners to track weight changes.

Recommendation 11: Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFV owners and captains implement shipboard policies to address crew rest, work hours and fatigue. The shipboard policies should reflect the basic principles of the Coast Guard's Crew Endurance Management System (CEMS) used to identify and control crew endurance risk

factors. Requiring owners and captains to implement crew rest policy would give crewmembers the opportunity to reduce their risk of fatigue-related accidents and help prevent casualties.

Action: I do not concur with this recommendation. While implementation of shipboard policies that address crew rest, work hours, and fatigue based on the principles of the Coast Guard's Crew Endurance Management System (CEMS) could benefit the safety of commercial fishing vessels; it is not appropriate to be imposed as a regulatory requirement. However, a voluntary approach similar to that undertaken by some members of the towing vessel industry could benefit the commercial fishing industry. I will direct the Commanders of the Thirteenth and Seventeenth Districts to prepare and implement, with assistance from Commandant (CG-CVC-3), an outreach plan that addresses this topic within their respective areas of responsibility.

**ACTION ON ADMINISTRATIVE RECOMMENDATIONS**

Recommendation 1: Recommend Sector Puget Sound, consistent with MOC Policy Letter 04-07, rescind acceptance of the NAVTECH/USSA third party surveyor who conducted the last dockside safety examination on the DESTINATION in June 2016. This will ensure the third party surveyor does not conduct another dockside safety examination until NAVTECH/USSA has provided the surveyor remedial training on CFV stability compliance verification and has recertified the surveyor to conduct Coast Guard third party examinations.

Action: I concur with the intent of this recommendation. The Coast Guard's Office of Commercial Vessel Compliance, Fishing Vessel Safety Division, Commandant (CG-CVC-3) has oversight responsibility for approval of Third Party Organizations (TPO) that are permitted to conduct commercial fishing vessel examinations on behalf of the Coast Guard. The June 2016 dockside examination form discrepancies and report, as well as surveyor statements made to the Marine Board are of concern. I will direct NAVTECH/USAA to conduct an internal assessment of their Fishing Vessel Safety Examiner program, to include how they qualify and maintain designated examiner competency. NAVTECH/USAA's internal assessment should include how corrective actions and/or remedial training is assigned when non-conformities within their Fishing Vessel Safety Examiner program are discovered. I will also direct CG-CVC-3 to conduct a site-visit to assess this and NAVTECH/ USAA's related inter-company TPO procedures.

Recommendation 2: Recommend Sector Anchorage initiate Civil Penalty proceedings against the owner of the DESTINATION for failing to provide the captain with accurate stability instructions to maintain the vessel in a satisfactory stability condition, as required in 46 CFR 28.530.

Action: I concur with the recommendation. The alleged violations will be referred to the Sector Commander, Anchorage, for further investigation and enforcement action, as appropriate.

Recommendation 3: Recommend District 17, consistent with COMDTINST M16130.2F, conduct a SAR case study, regarding SAR operations for the DESTINATION. The case study should evaluate, but need not be limited to, aircraft readiness launch standards. The case study should also audit the effectiveness of corrective measures established from the February 2017 after action review conducted by District 17's Incident Management Branch staff.

Action: I concur with this recommendation. In accordance with paragraph 3.9.4.1 of COMDTINST M16130.2F, I will direct the Commander, Pacific Area to lead a SAR Case Study and request that it include an assessment of the effectiveness of the corrective measures in District 17's February 2017 After Action Report.

Recommendation 4: Recommend District 17 recognize the captain and crew of the BERING ROSE and SILVER SPRAY for their actions and efforts to deviate course, proceed to the DESTINATION's LKP, and participate as Good Samaritans assisting in SAR operations for the DESTINATION's crew.

Action: I concur with this recommendation. A copy of this report will be forwarded to the Commander, Seventeenth District, for consideration.

J. P. Nadeau
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Prevention Policy

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List of Acronyms

| | |
|---|---|
| AAWPP | Assumed Average Weight per Person |
| ABS | American Bureau of Shipping |
| ACTSUS | Active Search Suspended Pending Further Development |
| ADF&G | Alaska department of Fish & Game |
| AIS | Automated Identification System |
| AKST | Alaska Standard Time |
| AMSEA | Alaska Marine Safety Education Association |
| BSAI | Bering Sea/Aleutian Island |
| CDR | Commander |
| CEMS | Crew Endurance Management System |
| CFR | Code of Federal Regulations |
| CFV | Commercial Fishing Vessel |
| CFVE | Commercial Fishing Vessel Examiner |
| CG | Coast Guard |
| CG-INV | Coast Guard Office of Marine Investigations and Analysis |
| CH | Change |
| COD | Certificate of Documentation |
| COMDT | Commandant |
| COMDTINST | Commandant Instruction |
| CR | Crab Rationalization |
| D | Coast Guard District |
| D17CC | Coast Guard District 17 Command Center |
| DSF | Deployable Specialized Forces |
| EPIRB | Emergency Position Indicating Radio Beacon |
| FOB | Forward Operating Base |
| GM | Metacentric Height |
| GT | Gross Ton (Gross Registered Tons) |

| | |
|---|---|
| HF | High Frequency |
| ICE | Inter-Cooperative Exchange |
| ITC | International Tonnage Convention |
| IFQ | Individual Fishing Quota |
| IPQ | Individual Processing Quota |
| KT | Knots (1 KT = 1.151 mph) |
| LCDR | Lieutenant Commander |
| LKP | Last Know Position |
| MBI | Marine Board of Investigation |
| MHz | Mega Hertz |
| MISLE | Marine Information Safety and Law Enforcement |
| MOC | Office of Commercial Vessel Compliance (COMDT CG-CVC-3) |
| MSC | Marine Safety Center |
| MSD | Marine Safety Detachment |
| MU | Memorial University (MU) of Newfoundland, St. John's, Canada |
| NAVCEN | Coast Guard Navigation Center |
| NIOSH | National Institute of Occupational Safety and Health |
| NM | Nautical Mile |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanographic and Atmospheric Administration |
| NPFVOA | North Pacific Fishing Owner's Association |
| NT | Net Tons |
| NTSB | National Transportation Safety Board |
| NVIC | Navigation and Vessel Inspection Circular |
| NWS | National Weather Service |
| OU | Operations Unit Controller |
| PFD | Personal Floatation Device |
| PII | Party-in-Interest |
| PSDA | Probability of Survival Decision Aid |

| | |
|---|---|
| PQS | Performance and Qualification Standard |
| ROV | Remotely Operated Vehicle |
| SAR | Search and Rescue |
| SAROPS | Search and Rescue Optimal Planning System |
| SC | SAR Coordinator |
| SMC | SAR Mission Coordinator |
| SOG | Speed Over Ground |
| SOLAS | International Convention for Safety of Life at Sea |
| SSB | Single Side Band |
| SSC | Stability and Safety Compliance Check (Safety Spot Check) |
| STCW | Standards of Training, Certification and Watchkeeping for Seafarers |
| TAC | Total Allowable Catch |
| UMIB | Urgent Marine Information Broadcasts |
| USC | United States Code |
| VCG | Vertical Center of Gravity |
| VHF | Very High Frequency |
| VOS | Voluntary Observing Ship |
| YN1 | Yeoman First Class |

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16732
February 15, 2018

**COMMERCIAL FISHING VESSEL DESTINATION (O.N. 632374)
SINKING AND LOSS OF THE VESSEL
WITH ALL SIX CREWMEMBERS MISSING AND PRESUMED DECEASED
APPROXIMATELY 4.4 NM NORTHWEST OF ST. GEORGE ISLAND, ALASKA
ON FEBRUARY 11, 2017**

## EXECUTIVE SUMMARY

On Thursday, February 9, 2017 at approximately 2315, the U.S. flagged Commercial Fishing Vessel (CFV) DESTINATION (O.N. 632374), a Bering Sea/Aleutian Island (BSAI) crabbing vessel, departed Trident Seafoods in Dutch Harbor, Alaska with six crewmembers onboard en route to offload bait at the Trident Seafoods facility in St. Paul, Alaska. From St. Paul, the vessel was to transit west to the opilio crab (snow crab) fishing grounds. Earlier in the day, the National Weather Service (NWS) issued marine forecasts that warned of heavy freezing spray conditions for the region.

During the early morning hours of Saturday, February 11, 2017 from approximately 0500 to 0610, the DESTINATION transited along the western leeward side of St. George Island. At approximately 0610, as the vessel transited approximately 4.4 NM northwest of Dainoi Point located at the northwest side of St. George Island, it slowed its speed and made a hard starboard turn into the seas and northeastern winds. Shortly after the starboard turn, the vessel suddenly lost maneuverability. Its heading pivoted to the west while at the same time it drifted to the north. The vessel started to take boarding seas causing it to flood and eventually sink. At 0614, the vessel's Automated Identification System (AIS) stopped transmitting.

At 0615, the Coast Guard's District 17 (D17) Command Center located in Juneau, Alaska received a 406 MHz Electronic Position Indicating Radio Beacon (EPIRB) distress alert transmitting near St. George Island. After watchstanders confirmed the EPIRB's registration belonged to the DESTINATION and attempts to hail the vessel failed, the Coast Guard launched Search and Rescue (SAR) operations. Multiple Coast Guard aircraft and Good Samaritan vessels participated in SAR operations. By mid-day, Coast Guard aircrews located a debris field in the general area of the EPIRB distress alert, and a Good Samaritan vessel recovered the transmitting EPIRB, a lifering and crab pot buoys belonging to the DESTINATION. SAR operations did not locate any survivors or the vessel's liferaft. After three days of SAR operations, the Coast Guard suspended the search at 1700 on February 14, 2017.

On July 8, 2017, the National Oceanic and Atmospheric Administration (NOAA) research vessel FAIRWEATHER used side-scan sonar and located the DESTINATION in 78 meters (256 feet) of water, approximately 7 nautical miles north of Dainoi Point, St. George Island.

On July 25, 2017 the Coast Guard's Regional Dive Locker West working on the Coast Guard Cutter HEALY deployed a Remotely Operated Vehicle (ROV) over the site to collect imagery of the wreck. Due to strong sub-surface currents, the ROV was unable to collect substantial imagery or locate the liferaft, but was able to confirm the vessel's distinct colors, waterline, draft marks and name. In addition, the HEALY recovered a crab pot belonging to the DESTINATION.

The Coast Guard Marine Board of Investigation (MBI) determined that the initiating event occurred when the DESTINATION transited past the leeward and sheltered side of St. George Island and altered course to starboard into the hazardous seas off Dainoi Point. Subsequent events include the vessel's abrupt loss of speed, maneuverability and heading shift, which allowed boarding seas to flood, capsize and sink the vessel.

The primary causal factors that directly contributed to the casualty include: 1) the vessel's unsafe stability conditions due to the carriage of heavier crab pots that exceeded the weight used in the stability instructions, 2) additional weight and stability stress from bait loaded high on the vessel, and 3) excessive ice accumulations from freezing spray, and 4) downflooding from the open number 3 hold access hatch.

Other causal factors include the captain's failure to: 1) load in accordance with the vessel's stability information book, 2) prevent excessive icing accumulations from the prevailing freezing spray conditions, and 3) secure the number 3 hold access hatch while transiting.

Also contributing to the casualty was the owner's failure to select a qualified individual to perform tests or calculations necessary to evaluate the vessel's stability and update the stability instructions to reflect heavier crab pots and other alterations to the vessel. Accordingly, the owner failed to provide the captain with accurate information to maintain the vessel in a satisfactory stability condition.

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**MARINE BOARD'S REPORT**

## 1. Preliminary Statement

1.1. This marine casualty investigation was conducted and this report was submitted in accordance with Title 46, Code of Federal Regulations (CFR), Subpart 4.09, and under the authority of Title 46, United States Code (USC), Chapter 63. Under Title 46 USC 6308, no part of a report of a marine casualty investigation, including findings of fact, opinions, recommendations, deliberations, or conclusions shall be admissible as evidence or subject to discovery in any civil or administrative proceedings, other than an administrative proceeding initiated by the United States.

1.2. On February 17, 2017, the Assistant Commandant for Prevention Policy (CG-5P) issued the enclosed convening order directing a Formal Marine Board of Investigation (MBI) to thoroughly investigate the February 11, 2017 sinking of the Commercial Fishing Vessel (CFV) DESTINATION and loss of life to all six crewmembers.

1.3. The following personnel participated in the Marine Board of Investigation: Chairman - CDR Scott W. Muller, Chief of Inspections and Investigations Branch, Coast Guard District Five, Member - Mr. [redacted] Coast Guard Investigations National Center of Expertise, Recorder - LCDR [redacted] Coast Guard Office of Marine Investigations and Analysis, Legal Advisor - CDR Tamara S. Wallen, Coast Guard District 17 Legal, Technical Advisors - LCDR [redacted] Coast Guard Investigations National Center of Expertise and Mr. [redacted] Incident Management Division, Coast Guard District 13, Administrative Assistant - YN1 [redacted] Coast Guard District 17 Legal, and Media Liaison - Mrs. [redacted] Coast Guard Office of Public Affairs.

1.4. The MBI designated the vessel's owner, Mr. [redacted] as a Party-In-Interest (PII), represented by the law office of Holmes, Weddle & Barcott.

1.5. The MBI held one public hearing session at the Jackson Federal Building in Seattle, Washington on August 7-17, 2017; 46 witnesses testified in the hearing over a period of nine days. All witnesses appeared as requested, and PII representatives participated throughout the hearing. Witnesses and PII cooperated with all investigation requests.

1.6. The Coast Guard was the lead federal agency for initial evidence collection activities and led all efforts to recover additional evidence at the casualty site. The National Transportation Safety Board (NTSB) participated in all hearing sessions, and the MBI and NTSB shared all evidence and factual material gathered throughout the course of their investigations. However, the MBI and NTSB worked separately during the analysis phase of their respective investigations in order to prepare independent conclusions and recommendations.

1.7. References to time in this report are listed as 24-hour time and reflect Alaska Standard Time (AKST), Coordinated Universal Time, offset of minus nine hours.

1.8. Throughout the investigation, the MBI obtained helpful information from the public using the MBI's email address: FVDestination@uscg.mil.

## 2. Vessel Involved in the Incident


Figure 1. DESTINATION, June 10, 2016 in Seattle, Washington.
Photo provided by third party surveyor.

| | |
|---|---|
| Official Name | DESTINATION (ex COMPASS ROSE) |
| Official Number | 632374 |
| Flag | United States |
| Hailing Port | Sand Point, Alaska |
| Managing Owner | F/V DESTINATION Inc., Seattle, Washington |
| Vessel Service | Fish Catching Vessel |
| Gross Regulatory Tonnage | 196 |
| Regulatory Length | 98.6 feet |
| Regulatory Breadth | 32.2 feet |
| Regulatory Depth | 13.0 feet |
| Year Built (Completed) | 1981 |
| Year Modified | 1993 |

## 3. Record of Missing and Presumed Deceased

3.1. All six crewmembers onboard the DESTINATION at the time of the casualty, listed below, are missing and presumed deceased. Upon concluding the DESTINATION sank and after finding no signs of life, the Coast Guard District 17 Commander suspended search operations at 1700 (sunset) on February 14, 2017.

| Name (First, MI, Last) | Sex | Relationship to Vessel | Age | Status |
|---|---|---|---|---|
| [redacted] | M | Captain | [redacted] | Deceased |
| | M | Engineer | | Deceased |
| | M | Deckhand | | Deceased |
| | M | Deckhand | | Deceased |
| | M | Deckhand | | Deceased |
| | M | Deckhand | | Deceased |

## 4. Findings of Fact

4.1. The Incident

Final Voyage Track

4.1.1. On February 8, 2017, the DESTINATION departed Sand Point, Alaska to transit to its fishing grounds west of St. Paul Island in the Bering Sea. While en route, the vessel made port calls into King Cove and Dutch Harbor, Alaska. Throughout its transit and port calls, the vessel energized its Automatic Identification System (AIS) transponder, which relays vessel location, course and speed information via VHF radio to other vessels and satellite to shore-based stations. Figure 2 is a map illustrating the DESTINATION's AIS track as it transited and made port calls from February 8-11, 2017.

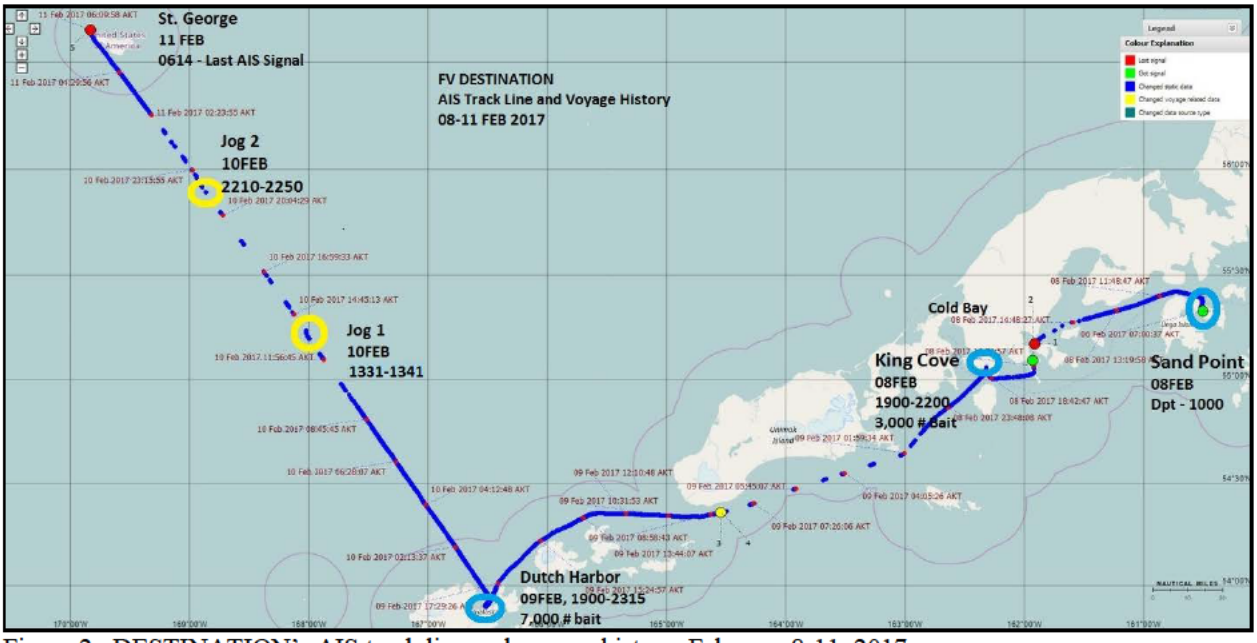



Figure 2. DESTINATION's AIS track line and voyage history, February 8-11, 2017.
AIS track line provided by Alaska Marine Exchange. Illustration produced by the MBI.

February 2-8, 2017 - Sand Point

4.1.2. On or about February 2, 2017, the fleet manager at Trident Seafoods in St. Paul sent an e-mail informing the vessel owner that his facility might not have a large supply of bait for sale. The fleet manager advised the owner to inform the captain to “bring more bait.” The owner relayed this information to the captain via text message.

4.1.3. On February 4, 2017, the DESTINATION returned to Sand Point, Alaska after fishing for cod from January 8 to February 3, 2017 (27 days). According to text and e-mail messages to family, the crewmembers mentioned they were tired, bruised and sore after working “grueling” hours while fishing for cod.

4.1.4. While in Sand Point, the crew began preparing for opilio crab (snow crab) fishing operations, a process that includes switching out the crab pots from cod to opilio gear and openings. At this time, the captain spoke to the owner and explained while en route to the opilio fishing grounds west of St. Paul, he planned to pull into King Cove and Dutch Harbor to load bait and affect repairs to an exhaust leak. In order to repair the leak, the captain needed to obtain a gasket for the main engine flexible connection in the exhaust piping, also known as a "flex" or "wrinkle" belly.

4.1.5. On February 5, 2017, while moored at the Trident Fuel Dock in Sand Point, the DESTINATION loaded 15,228 gallons of diesel fuel, three drums of 15W40 oil, and one drum of hydraulic oil.

4.1.6. On February 6, 2017, the captain and the five crewmembers each signed an employment contract for the 2017 opilio crab season.

4.1.7. On February 8, 2017 at approximately 1000, the DESTINATION departed Sand Point for King Cove.

Wednesday, February 8, 2017 - King Cove

4.1.8. On the evening of February 8, 2017 at approximately 1900, the DESTINATION arrived into King Cove and moored at Peter Pan Seafoods. The crew loaded 3,080 pounds of sardine bait from Peter Pan Seafoods, and completed an Alaska Department of Fish & Game (ADF&G) opilio certification inspection.

4.1.9. As the ADF&G inspector approached the DESTINATION to conduct the inspection, he saw the crew was in the process of loading bait onto the deck. At the conclusion of his inspection, he issued a Shellfish Certificate of Inspection form, listing the vessel as loaded with 200 total pots, 10 outfitted for groundfish (cod). He reminded the captain to contact the Coast Guard with its 24-hour departure from port notice as required by Alaska State Regulation.

4.1.10. On February 8, 2017 at approximately 2200, the DESTINATION departed King Cove for Dutch Harbor.

4.1.11. On the morning of February 9, 2017, a Coast Guard Petty Officer from Marine Safety Detachment (MSD) Dutch Harbor received a phone call from the captain of the DESTINATION. The captain informed the Petty Officer that he was calling with his 24-hour departure notification required by Alaska State Regulation. The Petty Officer asked him if he would like to complete a voluntary Coast Guard Stability and Safety Compliance Check (SSC). The captain responded that he "did not need one, if it wasn't a requirement, then he didn't want one." The Petty Officer asked if he completed a SSC in October 2016, to which he replied that he did. The Petty Officer then asked him if he was carrying more or less pots than he operated with in October 2016, to which he stated that he was carrying less pots. The Petty Officer let him know that it was not a requirement to have the Coast Guard conduct a SSC at this time, but if he wanted one while he was in Dutch Harbor the MSD was more than willing to conduct one. The captain concluded the conversation by stating, "if it is not required, I didn't need it."

4.1.12. According to Coast Guard Marine Information Safety and Law Enforcement (MISLE) database, the Coast Guard did not complete a SSC on the DESTINATION in October 2016. Records indicate the Coast Guard completed SSCs in 2005, 2006, 2007, and 2012.

4.1.13. At approximately 1830, the DESTINATION arrived into Dutch Harbor and moored at the Kloosterboer Cold Storage Facility to load squid bait. The captain of the DESTINATION used squid bait, along with sardines and cod, when fishing for opilio crab. He preferred using squid bait because it holds up better in the fishing grounds that have sand fleas.

4.1.14. During the DESTINATION's transit into Dutch Harbor, the crew of the nearby CFV APRIL LANE noticed the vessel's arrival and proceeded to take a video using a crewmember's cell phone (see Figure 3). The captain of the APRIL LANE asked his deckhand to take the video because he was "alarmed" about the DESTINATION's loaded condition given the National Weather Service (NWS) forecasted freezing spray warnings. The captain of the APRIL LANE did not relay or communicate his observation and concerns to the captain of the DESTINATION.

Figure 3. Still image from video taken by a crewmember onboard the APRIL LANE of the DESTINATION's transit into Dutch Harbor on February 9, 2017, at approximately 1830.

4.1.15. Just prior to the DESTINATION loading the squid bait, a crewmember from the motor vessel OCEAN ROVER, also moored at the Kloosterboer Facility, took two photos of the DESTINATION (see Figures 4 and 5). The crewmember indicated that he took the pictures after he noticed the "enormous" amount of crab pots loaded onboard the DESTINATION.

Figures 4. Photo of the DESTINATION moored at Kloosterboer on February 9, 2017, at approximately 1840.

Figures 5. Photo of the DESTINATION moored at Kloosterboer on February 9, 2017, at approximately 1840.

4.1.16. While moored at the Kloosterboer Cold Storage facility from approximately 1830 to 1900, the DESTINATION's crew loaded four pallets of squid bait weighing a total 7,060 pounds. The bait was loaded four-across on top of the crab pots, amidships, next to two totes and a sorting table. Figures 6, 7, and 8 are screenshots from the facility's security camera taken shortly after the vessel moored and as the vessel's crew loaded bait.

Figures 6. Still image from security camera video provided by Kloosterbor Cold Storage of the DESTINATION loading bait at their facility on February 9, 2017, at approximately 1830-1900.

Figures 7. Still image from security camera video provided by Kloosterbor Cold Storage of the DESTINATION loading bait at their facility on February 9, 2017, at approximately 1830-1900.

Figures 8. Still image from security camera video provided by Kloosterbor Cold Storage of the DESTINATION loading bait at their facility on February 9, 2017, at approximately 1830-1900.

4.1.17. At approximately 1900, the DESTINATION shifted berths to the nearby Trident Seafoods facility. While there, the captain departed the vessel to pick up a gasket to make repairs to the main engine's leaking exhaust. He returned shortly thereafter to start installing the new gasket.

4.1.18. While moored at the Trident Seafoods facility, two former crewmembers of the DESTINATION currently working on the CFV KARI MARIE moored in Dutch Harbor at the time, visited the DESTINATION. After visiting the crew of the DESTINATION, one of the former crewmembers gave the DESTINATION's crew a ride to a nearby bar/restaurant where the captain of the DESTINATION bought the group dinner.

4.1.19. Shortly after arriving to the bar/restaurant, the captain directed the engineer to return to the DESTINATION to work on the stuffing box to the propeller shaft. During conversations with the former crewmember, the engineer mentioned that he was dealing with the leaking stuffing box during the whole cod season. The engineer explained the stuffing box leak required him to pump the engine room bilge out every couple of hours.

4.1.20. In addition to the leaking stuffing box, some of the other DESTINATION's crewmembers complained to the former crewmember that during cod season, harvested fish from the holds clogged the seawater pumps in the engine room. This required the crew to work over 40 hours to repair.

4.1.21. Immediately following dinner, at approximately 2300, the crew departed the bar/restaurant and headed back to the DESTINATION.

4.1.22. The former crewmember stated that the "boys were pretty beat down. It was a pretty grueling cod season. They were running 24 hour shifts with [a crewmember acting] as the relief captain. I believe they were doing four or six-hour rotations, sleep turns. They were pretty haggard. I worked with those guys a long time, and yeah, they were pretty beat down... A table of long faces."

4.1.23. At approximately 2315, the DESTINATION departed Dutch Harbor for St. Paul to store and pre-stage extra bait prior to proceeding to its fishing grounds west of St. Paul Island.

Friday, February 10, 2017 - Bering Sea

4.1.24. During the voyage between Dutch Harbor and St. Paul, the captain had numerous conversations via satellite phone with the captain of the CFV ALEUTIAN LADY. The nature and content of these conversations were mostly about formulating a fishing "game plan" - how the fishing was going in certain areas.

4.1.25. The captain of the ALEUTIAN LADY explained, "none of us were really happy about the lack of bait or the fact that we had to bring out a lot of extra bait, because they were -- at least we were told there was not enough at the island [St. Paul]. [fleet manager at Trident Seafood in St. Paul] felt that Trident would run out before the fleet was done. I, like [the captain of the DESTINATION], brought out a lot of extra bait."

4.1.26. At approximately 1330, the fleet manager at Trident Seafoods in St. Paul received a satellite phone call from the captain of the DESTINATION. The fleet manager explained that the captain informed him that the DESTINATION was going to drop off five to six pallets of bait at the Trident facility in St. Paul for storage. The captain stated the DESTINATION was about 14 hours away from St. George Island and would be in St. Paul on either Saturday, February 11 or Sunday, February 12, 2017.

4.1.27. The DESTINATION's AIS track indicates, on two separate occasions during the voyage to St. Paul, the vessel "jogged" into the seas (headed into the wind and/or slowed down). The first occasion was on February 10, 2017 from approximately 1331 to 1341 (10 minutes). The second jog occurred when the vessel reduced its speed from 6.5 knots down to 1.5 knots from approximately 2210 to 2250 (40 minutes). Figure 9 indicates the approximate locations and times of these jogs. Figures 10 and 11 provide more detailed AIS data of each jog.

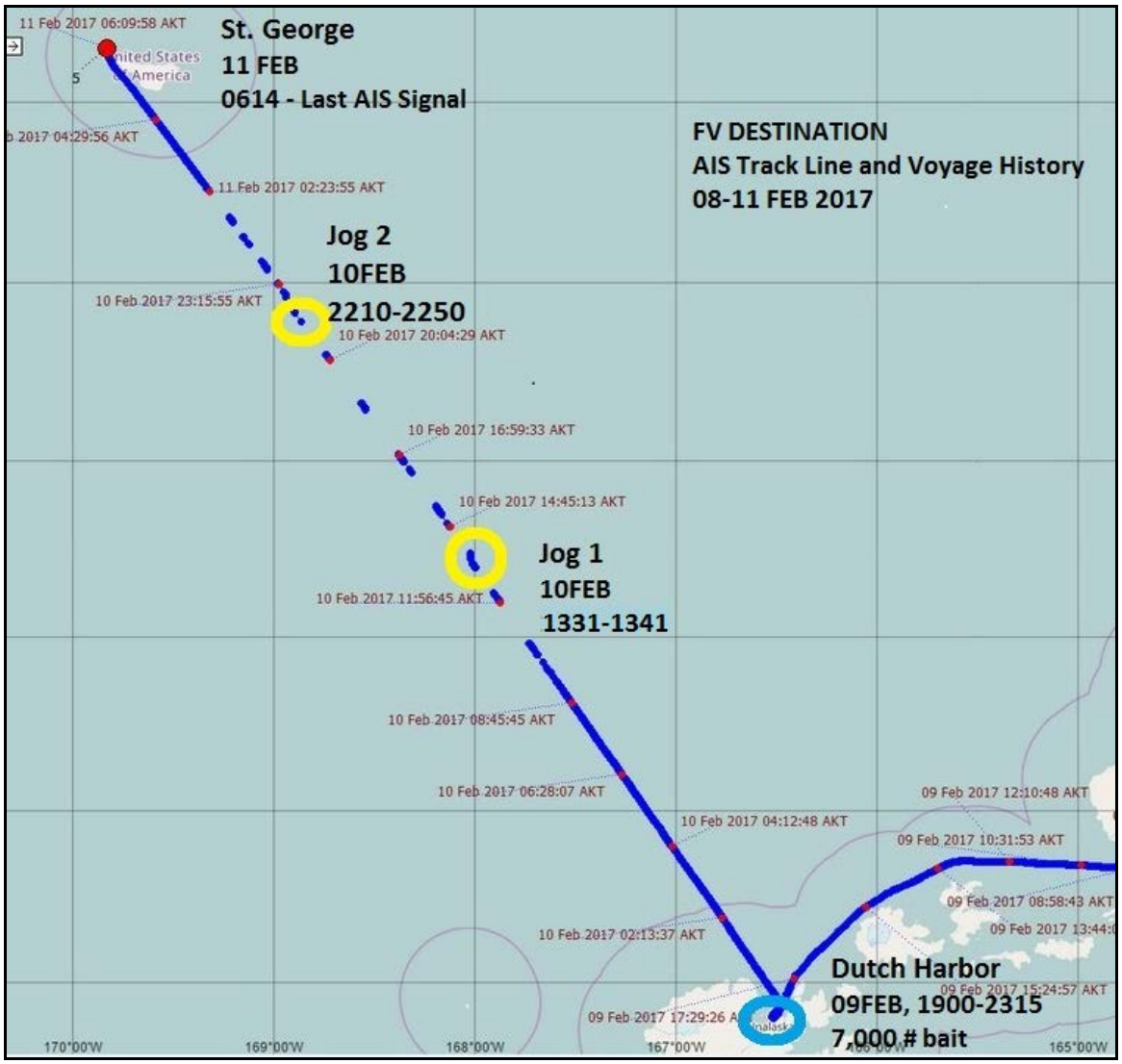


Figure 9. AIS track line indicating the locations and times the DESTINATION conducted two jogs while en route to St. Paul. AIS track line provided by Alaska Marine Exchange. Illustration produced by the MBI.

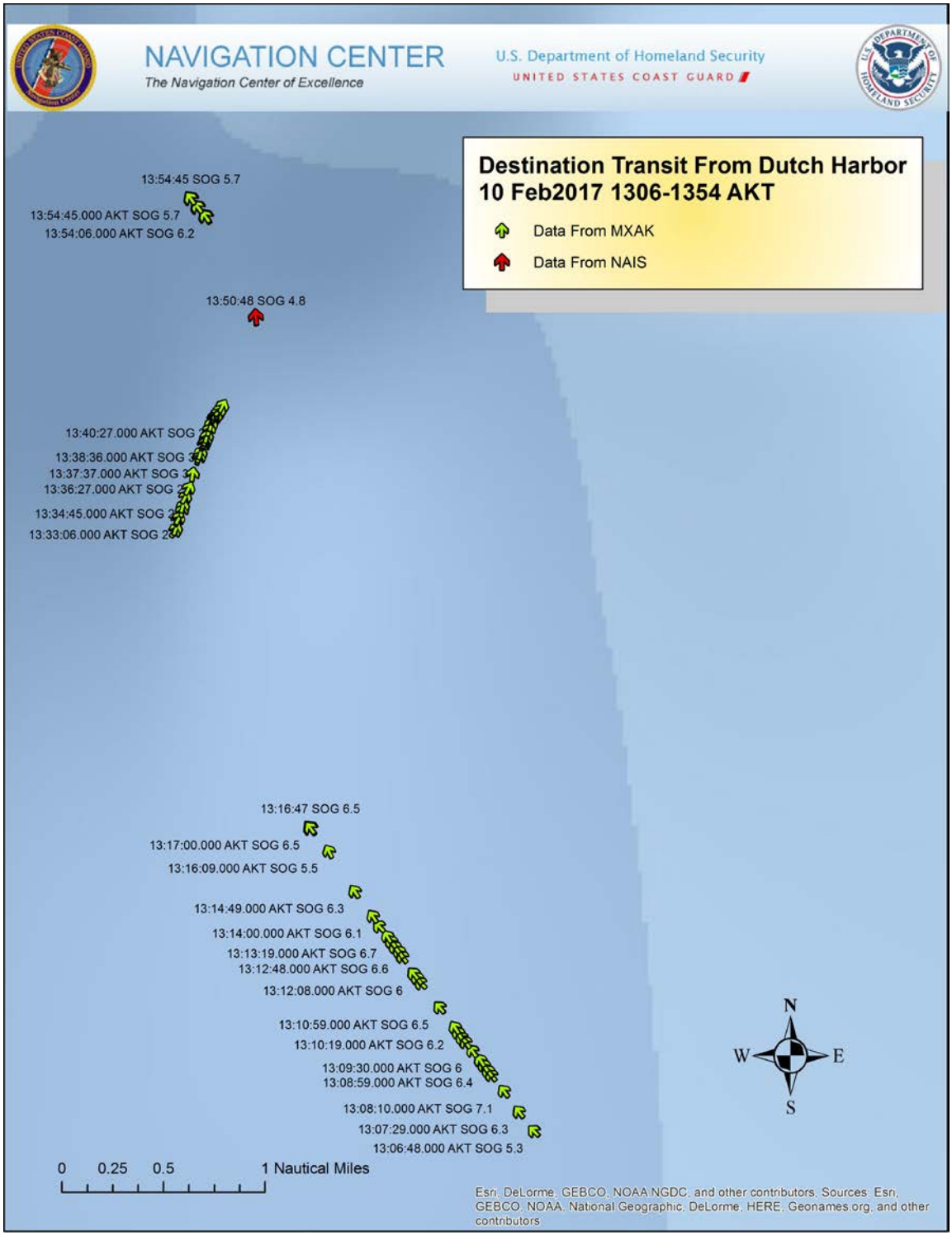



Figure 10. AIS track of the DESTINATION's first jog while en route to St. Paul.
Provided by Coast Guard Navigation Center.

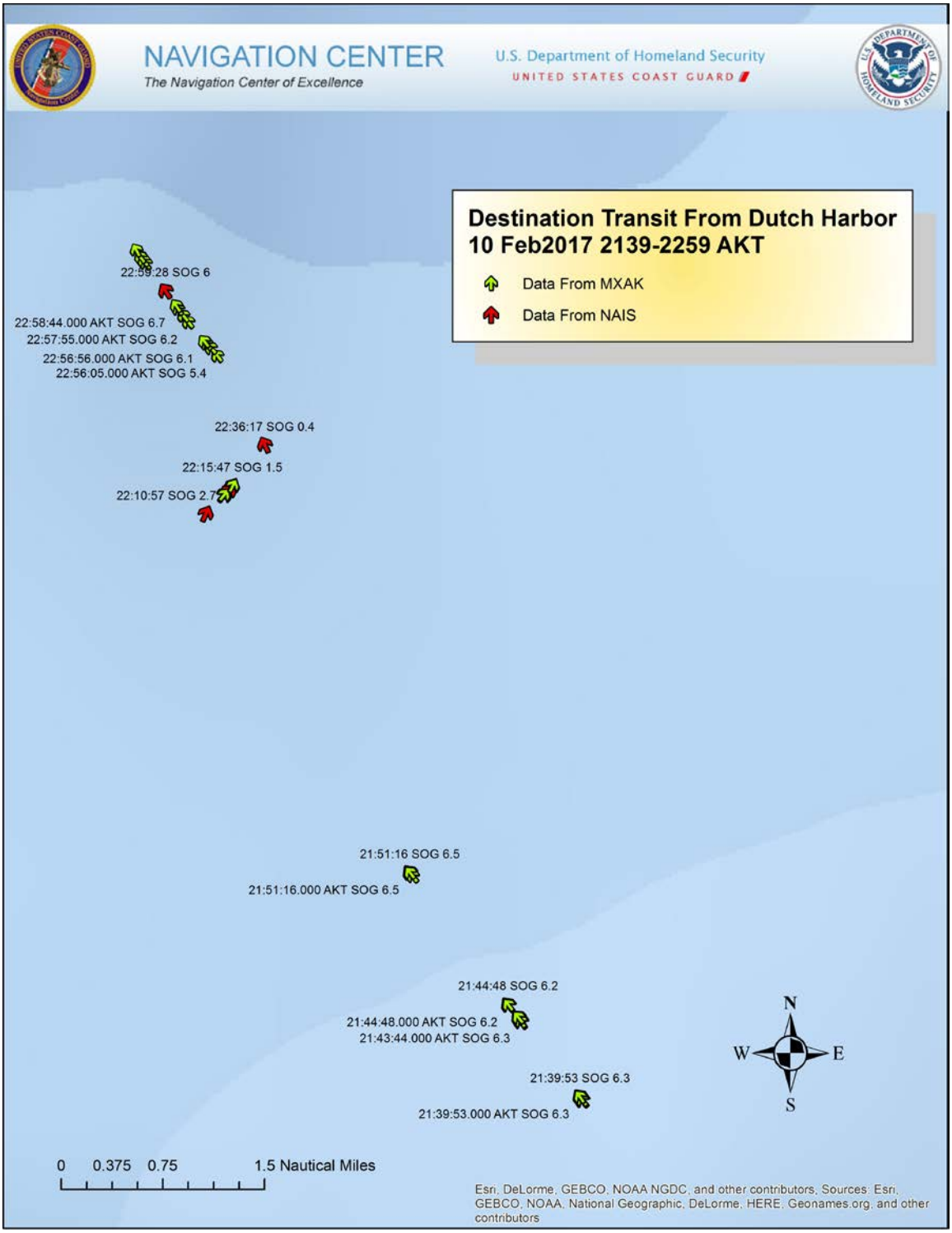



Figure 11. AIS track of the DESTINATION's second jog while en route to St. Paul. Provided by Coast Guard Navigation Center.

4.1.28. On February 11, 2017 at approximately 0500, the DESTINATION crossed the southwestern side of St. George Island. The vessel continued its course, transiting between 1.5 to 3.5 NM distance from the western coast, increasing its speed over ground from 7.8 knots to 9 knots. At approximately 0555, the vessel crossed Dainoi Point, the northwestern tip of St. George Island. Illustrated in Figure 12 is the vessel's AIS track as it approached and past St. George Island.

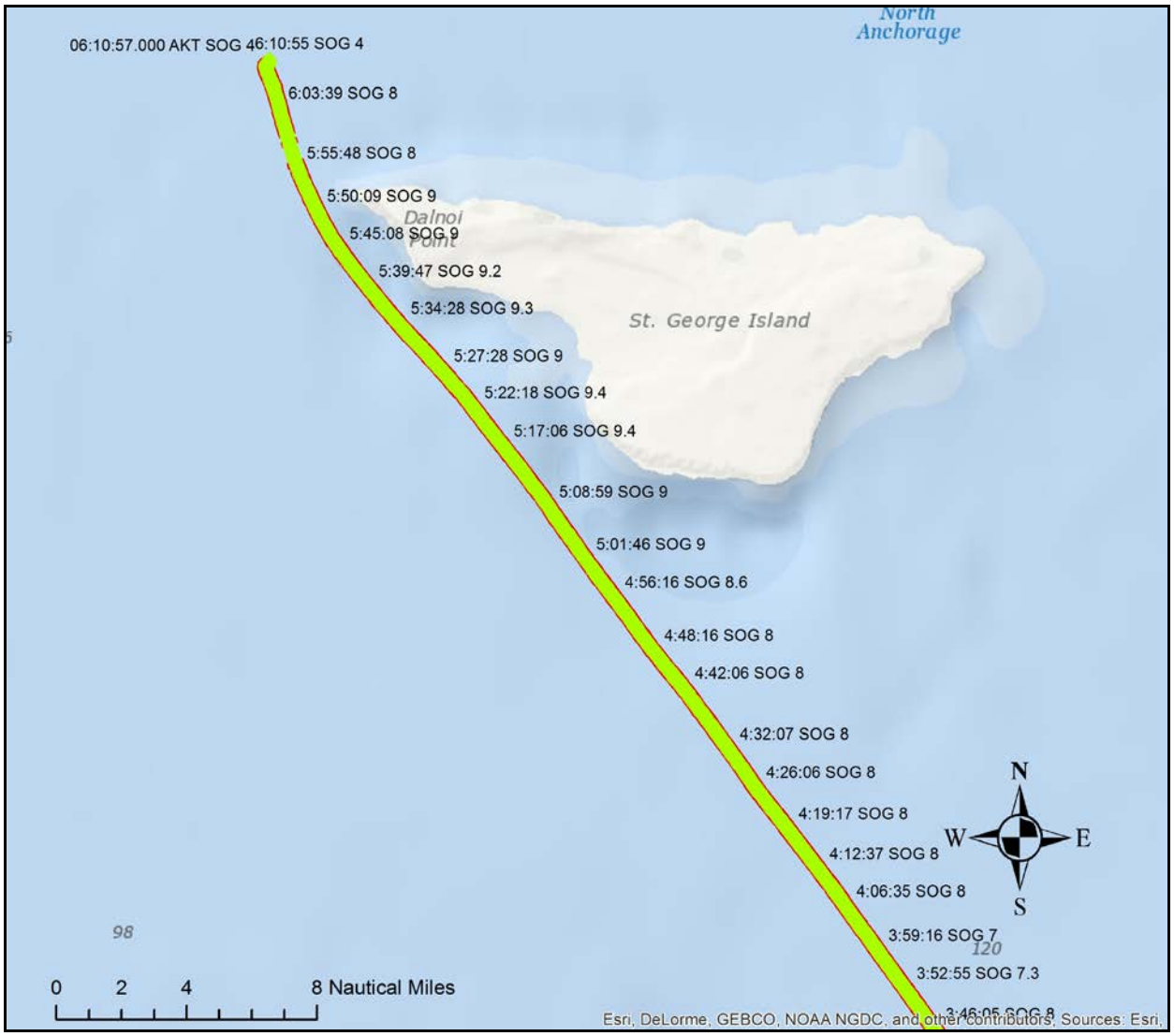



Figure 12. DESTINATION's AIS track along St. George Island.
Image developed by Coast Guard Navigation Center.

4.1.29. During the morning of February 11, 2017, the CFV CLIPPER SURPRISE was the closest vessel operating near the DESTINATION (see Figure 13). The CLIPPER SURPRISE was fishing between 6 to 15 NM west of St. George Island, taking advantage of the island's shelter to avoid ice buildup from the prevailing freezing spray.

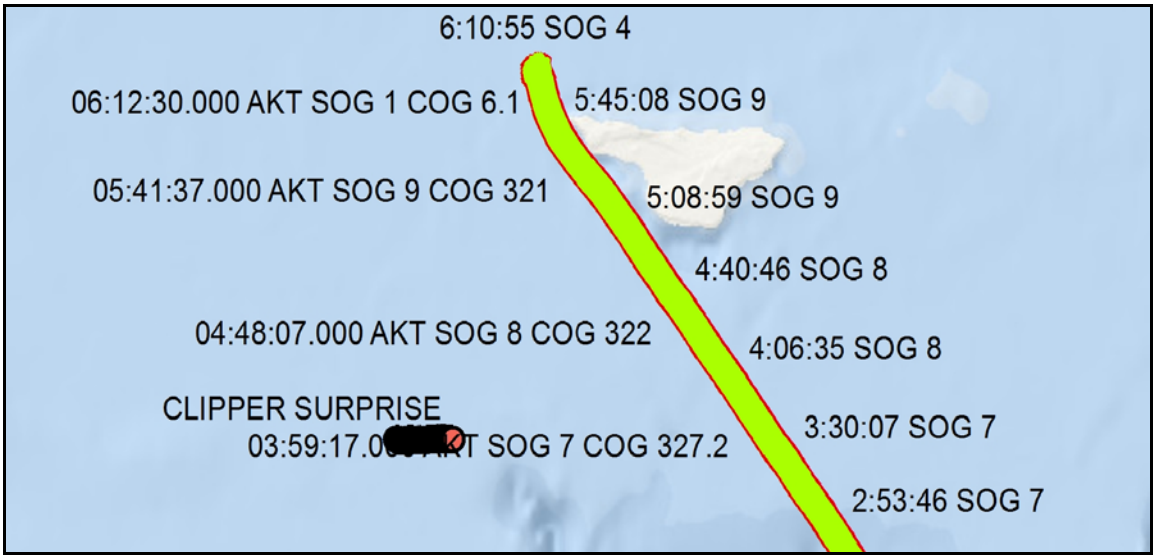



Figure 13. AIS location of CLIPPER SURPRISE in relation to the DESTINATION. Image developed by Coast Guard Navigation Center.

4.1.30. The captain of the CLIPPER SURPRISE observed several vessels in Zapadni Bay "hiding out from the weather" closer to the shore. He observed the DESTINATION on AIS as it transited about a mile off the west coast of St. George Island.

4.1.31. At 0610, approximately 4.4 NM northwest of Dainoi Point, the DESTINATION deviated from its course, turned to starboard and reduced speed. Specifically, the vessel's heading turned to starboard from 330° to 090°. This resulted in a shift in its course over ground (COG) from 340° to 050°, and its speed over ground (SOG) from 7 knots to below 3 knots.

4.1.32. At approximately 0612, the vessel abruptly reduced speed from 1.5 knots to 0.9 knots.

4.1.33. From approximately 0612 to 0614, the vessel's heading shifted to starboard from 090° to 270°. At the same time, the vessel's COG continued to the north at a SOG between 1-2 knots. Figures 14, 15 and 16 provide the vessel's AIS track which indicates the changes in heading, COG and SOG.

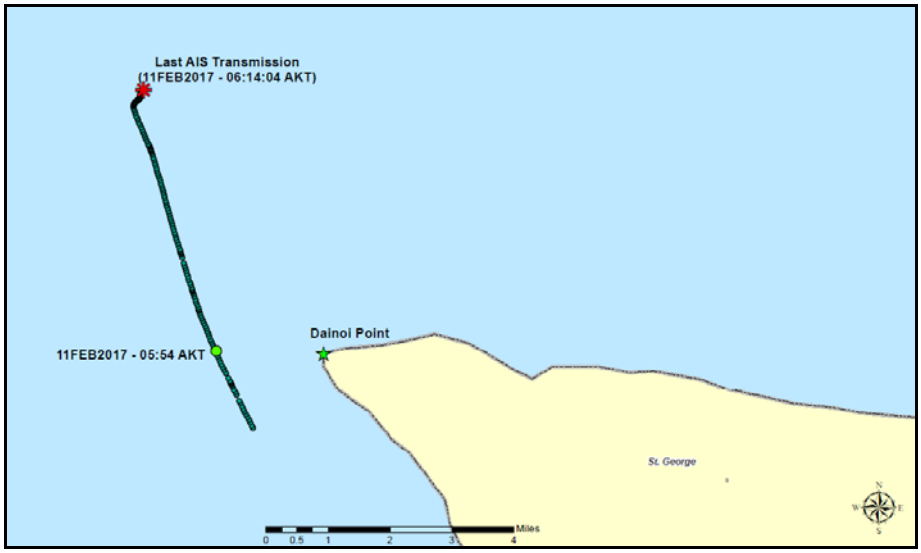



Figure 14. DESTINATION's AIS as it made its starboard turn on February 11, 2017 between 0554-0614. Image developed by MBI.

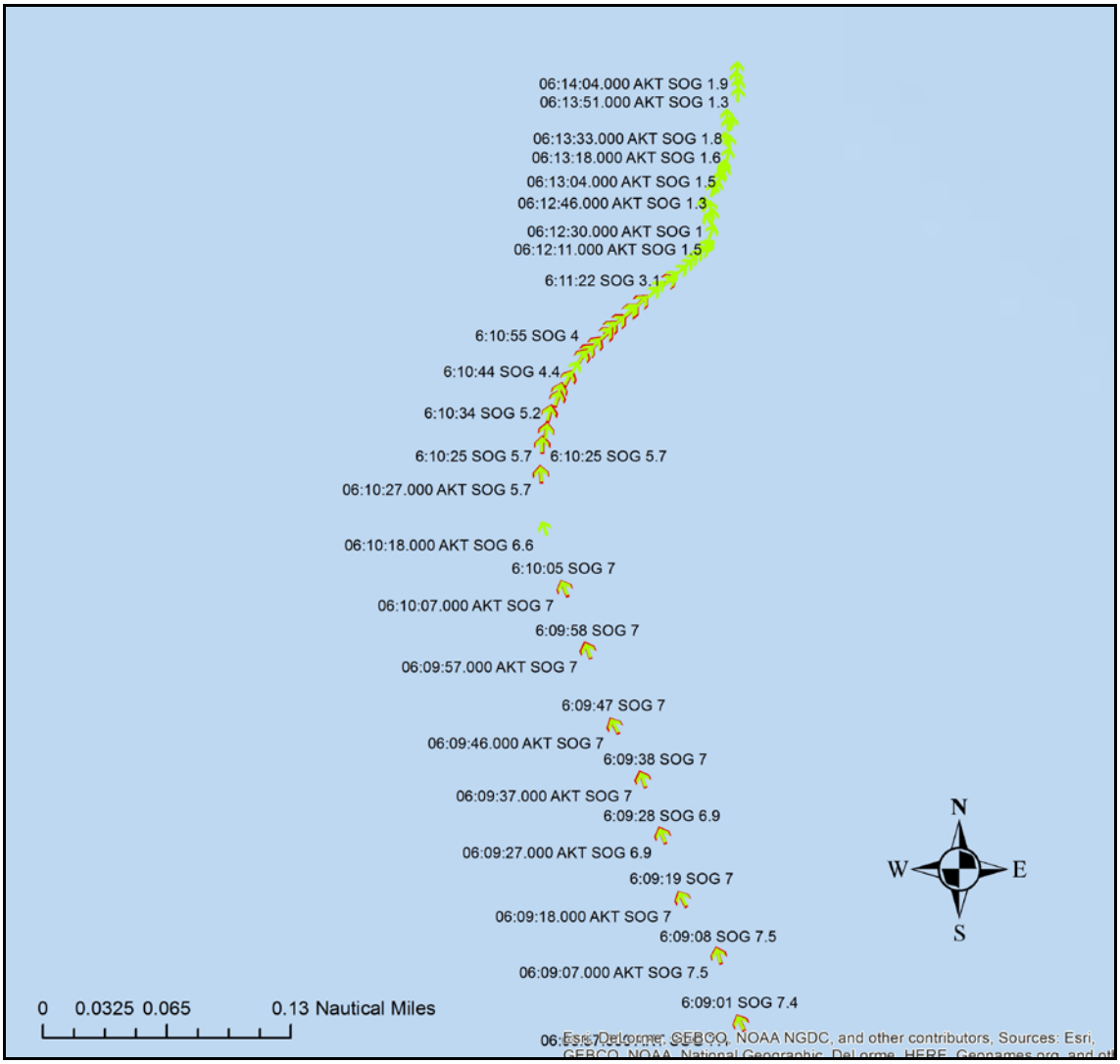



Figure 15. DESTINATION's AIS as it made its starboard turn on February 11, 2017 between 0609-0614. Image developed by Coast Guard Navigation Center.

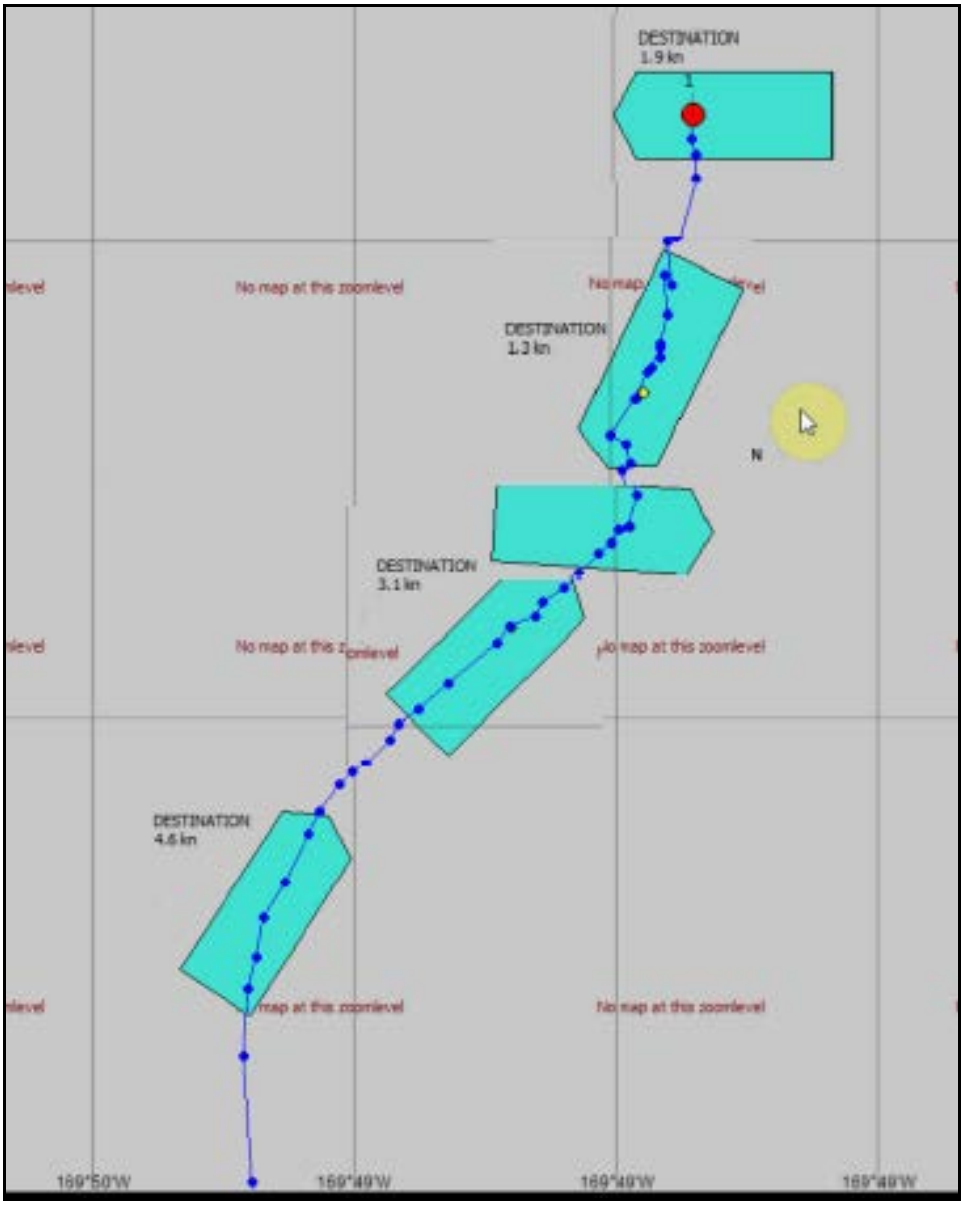



Figure 16. AIS track information indicating changes to the DESTINATION's heading and COG on February 11, 2017, between 0610-0614. AIS track information provided by Alaska Marine Exchange and image developed by MBI.

4.1.34. At 0613, the DESTINATION's EPIRB transmitted its initial satellite distress alert.

4.1.35. At 0614, the vessel's AIS stopped transmitting, with its last transmission indicated a position of 56°39.02 N and 169° 49.92 W, with a heading of 270°, SOG of 1.9 knots, and COG to the north.

4.1.36. At 0615, the Coast Guard's District 17 Command Center (D17 CC) received the EPIRB distress alert.

4.1.37. The Coast Guard and other vessels operating near the DESTINATION did not hear or receive any mayday calls from the DESTINATION.

## 4.2. Weather and Environmental Information

### National Weather Service (NWS) Marine Weather Forecasting

4.2.1. The NWS transmits its weather forecasts on the NOAA weather radio via VHF high site radio transmission towers on shore, marine radio fax systems and internet web pages. The NWS collaborates with the Coast Guard to transmit the weather forecasts on available VHF high sites, low watt transmitters along the coast that help increase the density of transmissions.

4.2.2. The Voluntary Observing Ship (VOS) program helps promote mariner feedback. The NWS visits ships to provide weather forecasting education, calibrate barometers, and instruct the crew on how to take marine observations. The VOS program collects observed weather information from mariners, including freezing spray conditions, to help verify accuracy of issued forecasts.

4.2.3. The NWS generates marine forecasts using computer algorithm software to simulate various environmental factors. Forecasters then analyze this information to create text and graphical information for geographic forecasts, including air temperature, wind and wave, and freezing spray type conditions.

4.2.4. The NWS issues weather forecasts across the Bering Sea and Aleutian Islands twice a day, generally around 0400 and 1600.

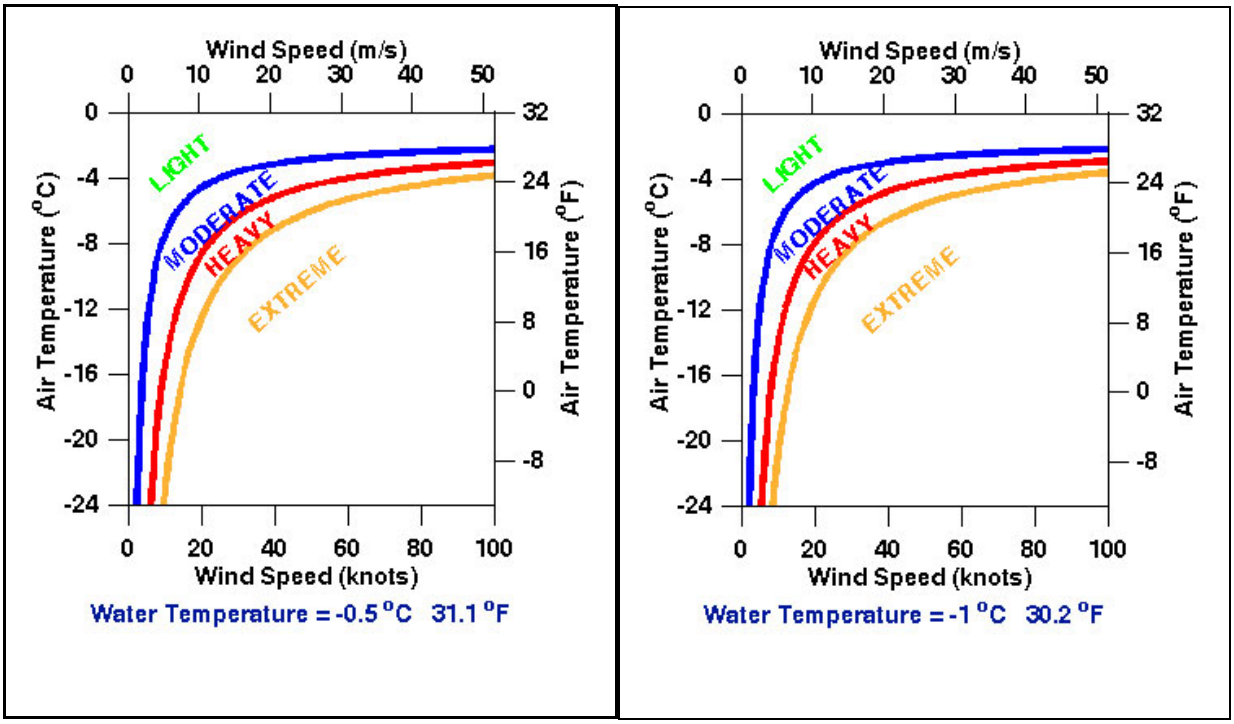
### Prediction of Vessel Sea Spray Icing

4.2.5. The NWS issues freezing spray warnings several days in advance (48-72 hours) of predicted conditions, understanding mariners use this information to make pre-planning voyage decisions.

4.2.6. The NWS determines freezing spray warnings using equations from the Overland Method. Initially established in 1980 at the University of Alaska, Fairbanks, the method includes the applications of several graphs that contain parameters for wind, air temperature, and sea surface temperature to determine the conditions of light, moderate, heavy and extreme freezing spray ice accumulation.

4.2.7. The NWS forecasts two ice accumulation categories - freezing or heavy freezing spray. Freezing spray equates to the Overland Method light condition, and heavy freezing spray includes Overland Method moderate, heavy and extreme conditions.

4.2.8. The Overland Method established sea spray ice accumulation graphs for vessels between 20 and 70 meters in length. Figures 17 and 18 provide examples of Overland Method graphs for water temperatures at various air temperatures and wind speeds.




Figures 17 and 18. Example Overland Method graphs. Provided by NTSB.

4.2.9. An icing predictor algorithm, developed at the University of Alaska, Fairbanks, helps predict sea spray ice accumulation rates for vessels. As illustrated in Figure 19, the icing predictor rate is a function of variables including wind speed, freezing point of seawater, air temperature and sea temperature. These icing rates are only a guide, as actual rates depend on ship characteristics, cold soaking and exposure to sea spray. NOAA's Mariners Weather Log of December 2005 found at http://www.vos.noaa.gov/MWL provides further information on vessel icing and the icing predictor.

Icing Predictor Algorithm

$$PPR = \frac{V_a(T_f - T_a)}{1 + 0.3\,(T_w - T_f)}$$

PPR = Icing Predictor
Va = Wind Speed (m s-1)
Tf = Freezing point of seawater (usually -1.7 °C or -1.8 °C)
Ta = Air Temperature (°C)
Tw = Sea Temperature (°C)

Icing Class and Rate

| PPR | <0 | 0-22.4 | 22.4-53.3 | 53.3-83.0 | >83.0 |
|---|---|---|---|---|---|
| Icing Class | None | Light | Moderate | Heavy | Extreme |
| Icing Rates (cm/hour) (inches/hour) | 0 | <0.7 <0.3 | 0.7-2.0 0.3-0.8 | 2.0-4.0 0.8-1.6 | >4.0 >1.6 |

Figure 19. Icing Predictor Algorithm and Rate from NOAA's Mariners Weather Log, December 2005.

National Weather Service (NWS) Area Forecast Discussion

4.2.10. At 0457 on February 11, 2017, the NWS Office in Anchorage, Alaska, made available on their web site its Area Forecast Discussion, indicating the northerly surface wind flow would continue with small craft advisory level wind conditions and freezing spray continuing through the weekend. The discussion stated:

> "SHORT TERM FORECAST BERING SEA/ALEUTIANS (Days 1 and 2)...
> Cold northerly flow on the western periphery of the longwave trough will maintain a regime of scattered snow showers accompanied by widespread Small Craft Advisory conditions and freezing spray through the weekend. A weak disturbance dropping through the Central Bering will possibly serve to enhance shower activity over the Pribilof Islands late tonight into Sunday. The deep North Pacific low then begins to approach the Alaska Peninsula on Sunday bringing an increase in northeasterly winds…Will continue to monitor this system for changes."

National Weather Service (NWS) Marine Forecast Products

4.2.11. Figure 20 shows the three NWS Marine Forecast zones for the Bering Sea along the DESTINATION's intended transit from Dutch Harbor to St. Paul: PKZ170 - Cape Sarichef to Nikolski Bering Side; PKZ414 - Bering Sea offshore east of 171W; and PKZ179 - Pribilof Islands near shore waters.

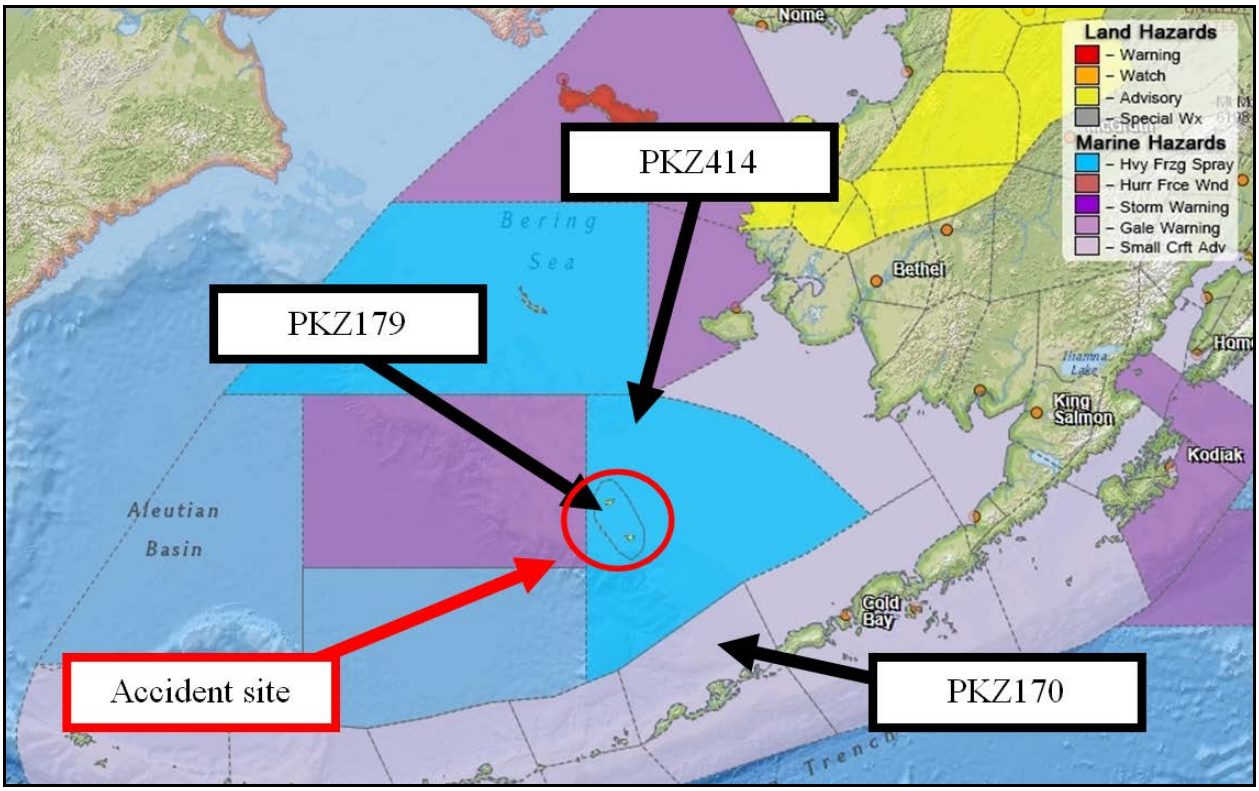


Figure 20. NWS Marine Forecast zones. Provided by NTSB.

4.2.12. From February 9-11, 2017, the NWS office in Anchorage, Alaska, issued the following official Marine Forecasts Products (MFP) for the Bering Sea:

| PKZ 170 - Cape Sarichef to Nikolski Bering Side<br>Issued 1515 Thursday, February 9, 2017 |
|---|
| GALE WARNING FRIDAY AND FRIDAY NIGHT...<br>HEAVY FREEZING SPRAY WARNING FRIDAY NIGHT...<br><br>.TONIGHT...NE WIND 20 KT INCREASING TO 30 KT AFTER MIDNIGHT.<br>SEAS 7 FT. FREEZING SPRAY.<br>.FRI...NE WIND 35 KT. SEAS 12 FT. FREEZING SPRAY.<br>.FRI NIGHT...NE WIND 35 KT. SEAS 13 FT. HEAVY FREEZING SPRAY E OF NAK.<br>.SAT...NE WIND 30 KT. SEAS 12 FT.<br>.SAT NIGHT...NE WIND 25 KT. SEAS 9 FT.<br>.SUN THROUGH MON...N WIND 30 KT. SEAS 12 FT.<br>.TUE...N WIND 25 KT. SEAS 10 FT. |

| PKZ 414 - PKZ414 - Bering Sea offshore east of 171W<br>Issued 1515 Thursday, February 9, 2017 |
|---|
| ...HEAVY FREEZING SPRAY WARNING THROUGH FRIDAY NIGHT...<br><br>.TONIGHT...NE WIND 15 TO 25 KT. SEAS 7 FT. HEAVY FREEZING SPRAY.<br>.FRI...NE WIND 30 KT. SEAS 7 TO 10 FT. HEAVY FREEZING SPRAY.<br>.FRI NIGHT...NE WIND 20 TO 30 KT. SEAS 7 TO 12 FT. HEAVY FREEZING SPRAY.<br>.SAT...NE WIND 15 TO 25 KT. SEAS 5 TO 10 FT.<br>.SAT NIGHT...NE WIND 15 TO 25 KT. SEAS 3 TO 8 FT.<br>.SUN THROUGH TUE...N WIND 15 TO 30 KT. SEAS 6 TO 11 FT. |

| PKZ 179 - Pribilof Islands near shore waters<br>Issued 1515 Thursday, February 9, 2017 |
|---|
| ...HEAVY FREEZING SPRAY WARNING THROUGH FRIDAY NIGHT...<br>...SMALL CRAFT ADVISORY THROUGH FRIDAY NIGHT...<br><br>.TONIGHT...NE WIND 15 KT INCREASING TO 25 KT AFTER MIDNIGHT.<br>SEAS 7 FT. HEAVY FREEZING SPRAY.<br>.FRI...NE WIND 30 KT. SEAS 9 FT. HEAVY FREEZING SPRAY.<br>.FRI NIGHT...NE WIND 30 KT. SEAS 9 FT. HEAVY FREEZING SPRAY.<br>.SAT...NE WIND 25 KT. SEAS 9 FT.<br>.SAT NIGHT...NE WIND 20 KT. SEAS 6 FT.<br>.SUN THROUGH TUE...N WIND 25 KT. SEAS 10 FT. |

PKZ 170 - Cape Sarichef to Nikolski Bering Side
Issued 0344 Friday, February 10, 2017

...GALE WARNING THROUGH TONIGHT...
...HEAVY FREEZING SPRAY TONIGHT...

.TODAY...NE WIND 35 KT. SEAS 12 FT. FREEZING SPRAY.
.TONIGHT...NE WIND 35 KT. SEAS 13 FT. HEAVY FREEZING SPRAY E OF UNAK.
.SAT...NE WIND 30 KT. SEAS 13 FT. FREEZING SPRAY.
.SAT NIGHT...NE WIND 25 KT. SEAS 9 FT.
.SUN...NE WIND 30 KT. SEAS 12 FT.
.MON...N WIND 35 KT. SEAS 13 FT.
.TUE...N WIND 30 KT. SEAS 10 FT.

PKZ 414 - PKZ414 - Bering Sea offshore east of 171W
Issued 0344 Friday, February 10, 2017

...HEAVY FREEZING SPRAY WARNING THROUGH SATURDAY...

.TODAY...NE WIND 30 KT. SEAS 7 TO 11 FT. HEAVY FREEZING SPRAY.
.TONIGHT...NE WIND 20 TO 30 KT. SEAS 7 TO 12 FT. HEAVY FREEZING SPRAY.
.SAT...NE WIND 15 TO 25 KT. SEAS 6 TO 11 FT. HEAVY FREEZING SPRAY.
.SAT NIGHT...NE WIND 15 TO 25 KT. SEAS 3 TO 8 FT.
.SUN...NE WIND 15 TO 30 KT. SEAS 5 TO 10 FT.
.MON THROUGH TUE...N WIND 35 KT. SEAS 7 TO 12 FT

PKZ 179 - Pribilof Islands near shore waters
Issued 0344 Friday, February 10, 2017

...HEAVY FREEZING SPRAY WARNING THROUGH SATURDAY...
...SMALL CRAFT ADVISORY THROUGH SATURDAY...

.TODAY...NE WIND 30 KT. SEAS 9 FT. HEAVY FREEZING SPRAY.
.TONIGHT...NE WIND 30 KT. SEAS 10 FT. HEAVY FREEZING SPRAY.
.SAT...NE WIND 25 KT. SEAS 9 FT. HEAVY FREEZING SPRAY.
.SAT NIGHT...NE WIND 20 KT. SEAS 6 FT.
.SUN THROUGH TUE...N WIND 30 KT. SEAS 10 FT.

PKZ 170 - Cape Sarichef to Nikolski Bering Side
Issued 1732 Friday, February 10, 2017

...GALE WARNING TONIGHT...

.TONIGHT...NE WIND 35 KT. SEAS 14 FT. FREEZING SPRAY.
.SAT...NE WIND 30 KT. SEAS 13 FT. FREEZING SPRAY.
.SAT NIGHT...NE WIND 25 KT. SEAS 9 FT. FREEZING SPRAY.
.SUN AND SUN NIGHT...N WIND 30 KT. SEAS 10 FT.
.MON THROUGH WED...NW WIND 30 KT. SEAS 11 FT.

PKZ 414 - PKZ414 - Bering Sea offshore east of 171W
Issued 1731 Friday, February 10, 2017

...HEAVY FREEZING SPRAY WARNING THROUGH SATURDAY NIGHT...

.TONIGHT...NE WIND 20 TO 30 KT. SEAS 7 TO 12 FT. HEAVY FREEZING SPRAY.
.SAT...NE WIND 15 TO 25 KT. SEAS 5 TO 10 FT. HEAVY FREEZING SPRAY.
.SAT NIGHT...NE WIND 10 TO 20 KT. SEAS 3 TO 7 FT. HEAVY FREEZING SPRAY.
.SUN...NE WIND 10 TO 25 KT. SEAS 3 TO 7 FT.
.SUN NIGHT...N WIND 20 TO 30 KT. SEAS 5 TO 10 FT.
.MON THROUGH WED...N WIND 20 TO 30 KT. SEAS 6 TO 11 FT

PKZ 179 - Pribilof Islands near shore waters
Issued 1732 Friday, February 10, 2017

...HEAVY FREEZING SPRAY WARNING THROUGH SATURDAY...
...SMALL CRAFT ADVISORY THROUGH SATURDAY...

.TONIGHT...NE WIND 25 KT. GUSTS TO 35 KT. SEAS 10 FT. HEAVY FREEZING SPRAY.
.SAT...NE WIND 20 KT. SEAS 8 FT. HEAVY FREEZING SPRAY.
.SAT NIGHT...NE WIND 15 KT. SEAS 6 FT. FREEZING SPRAY.
.SUN...NE WIND 20 KT. SEAS 4 FT.
.SUN NIGHT...NE WIND 30 KT. SEAS 8 FT.
.MON THROUGH WED...N WIND 30 KT. SEAS 10 FT.

PKZ 170 - Cape Sarichef to Nikolski Bering Side
Issued 0353 Saturday, February 11, 2017

...HEAVY FREEZING SPRAY WARNING TODAY...
...SMALL CRAFT ADVISORY THROUGH SUNDAY...

.TODAY...NE WIND 30 KT. SEAS 13 FT. HEAVY FREEZING SPRAY IN THE MORNING FROM UNAK E.
.TONIGHT...NE WIND 25 KT. SEAS 9 FT. FREEZING SPRAY.
.SUN...NE WIND 30 KT. SEAS 9 FT. FREEZING SPRAY.
.SUN NIGHT...N WIND 30 KT. SEAS 11 FT.
.MON...N WIND 30 KT. SEAS 11 FT.
.TUE...N WIND 40 KT. SEAS 13 FT.
.WED...N WIND 30 KT. SEAS 14 FT.

PKZ 414 - PKZ414 - Bering Sea offshore east of 171W
Issued 0345 Saturday, February 11, 2017

...HEAVY FREEZING SPRAY WARNING THROUGH FRIDAY NIGHT...

.TONIGHT...NE WIND 15 TO 25 KT. SEAS 7 FT. HEAVY FREEZING SPRAY.
.FRI...NE WIND 30 KT. SEAS 7 TO 10 FT. HEAVY FREEZING SPRAY.
.FRI NIGHT...NE WIND 20 TO 30 KT. SEAS 7 TO 12 FT. HEAVY FREEZING SPRAY.
.SAT...NE WIND 15 TO 25 KT. SEAS 5 TO 10 FT.
.SAT NIGHT...NE WIND 15 TO 25 KT. SEAS 3 TO 8 FT.
.SUN THROUGH TUE...N WIND 15 TO 30 KT. SEAS 6 TO 11 FT.

PKZ 179 - Pribilof Islands near shore waters
Issued 0353 Saturday, February 11, 2017

...SMALL CRAFT ADVISORY TODAY...

.TODAY...NE WIND 25 KT. SEAS 8 FT. FREEZING SPRAY.
.TONIGHT...NE WIND 20 KT. SEAS 6 FT. FREEZING SPRAY.
.SUN...NE WIND 20 KT. SEAS 4 FT. FREEZING SPRAY.
.SUN NIGHT...NE WIND 25 KT. SEAS 8 FT.
.MON...N WIND 35 KT. SEAS 11 FT.
.TUE...N WIND 40 KT. SEAS 13 FT.
.WED...N WIND 35 KT. SEAS 14 FT.

National Weather Service (NWS) On-Scene Weather and Sea State Observations

4.2.13. The NWS collects and documents weather observations using official weather stations that typically are weather buoys or fixed installations, which contain instrumentation to monitor and transmit real time weather data. Figure 21 is a map indicating local weather observation sites near the Pribilof Islands.

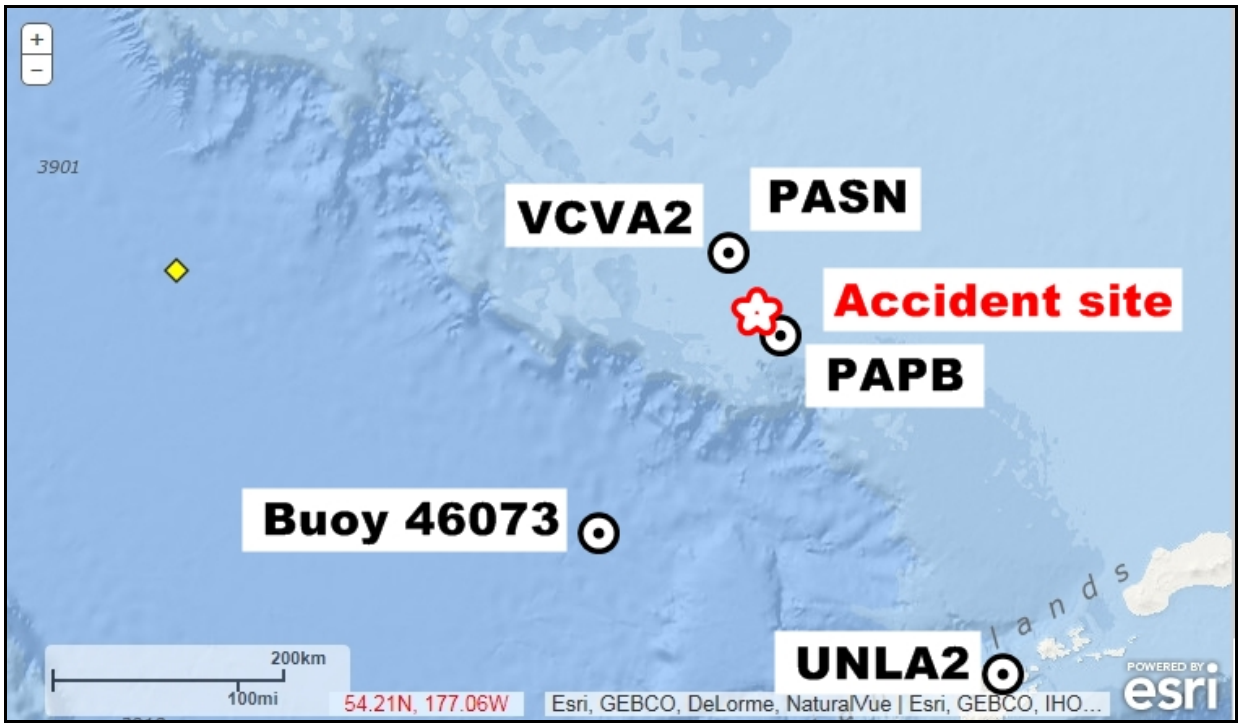



Figure 21. NWS weather observation sites near the Pribilof Islands. Provided by NTSB.

4.2.14. St. George Airport (PAPB) is a surface weather station located 7 miles southeast of the accident site, at an elevation of 128 feet. At 0553, PAPB reported winds from northeast at 23 knots with gusts to 31 knots, 9-mile visibility, light snow, and temperature of -8° C (17.6° F).

4.2.15. St. Paul Island Airport (PASN) is a surface weather station located 34 miles north-northwest of the accident site, at an elevation of 66 feet. At 0553, PASN reported winds from the northeast at 14 knots, 9-mile visibility, light snow, and temperature of -10° C (14° F).

4.2.16. Marine weather station VCVA2 was located 32 miles north-northwest of the accident site. From 0612 to 0624, VCVA2 reported winds from the northeast between 15.9 and 18.1 knots with gusts to 22.9 knots, air temperatures of -8.6° C (16.5° F), and water temperatures of -0.65° C (30.8° F).

4.2.17. Marine weather buoy 46073 was located 121 miles southwest of the accident site. At 0550, buoy 46073 reported winds from the northeast at 9.7 knots with gusts to 25.3 knots, significant wave heights between 12.1 and 14.1 feet, a mean wave direction from the northeast, and a dominant wave period of 9 to 10 seconds.

## Surface Water Currents

4.2.18. Figure 22 provides compiled surface sea current data for the waters surrounding St. George Island at 0600, February 11, 2017. The image indicates the waters closest to shore flowed faster than offshore waters. Off Dainoi Point, the currents flowed due North between 0.44-0.67 knots.

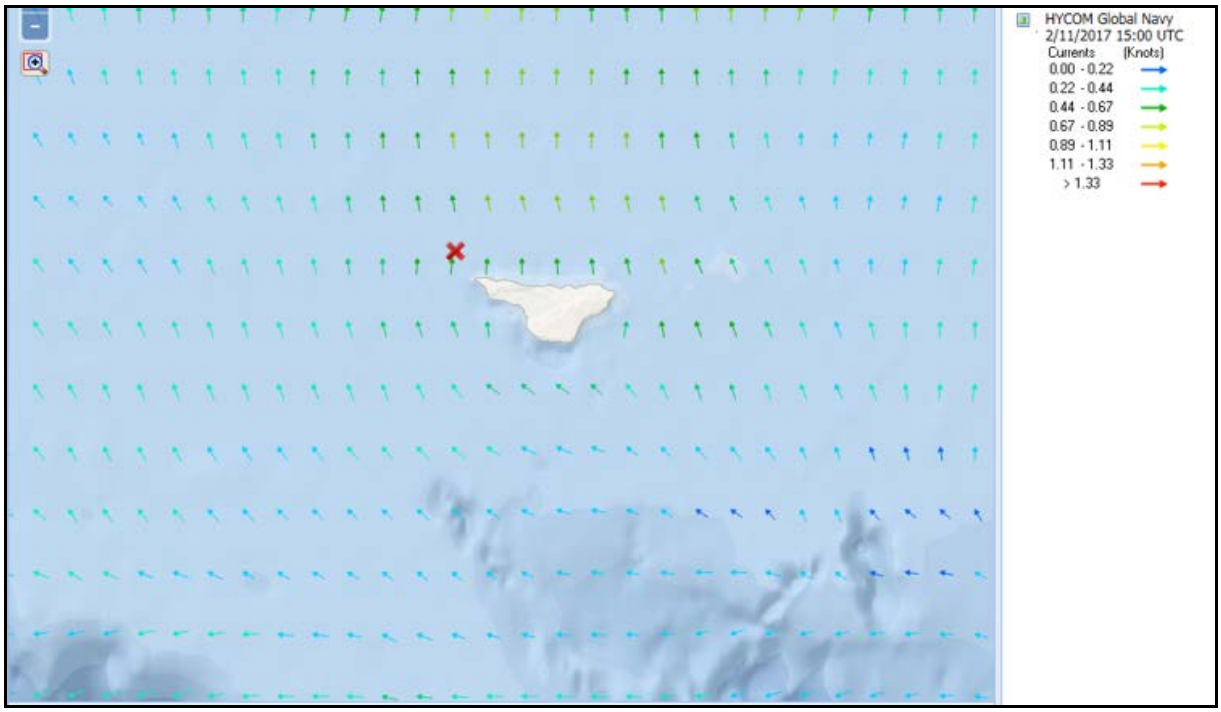



Figure 22. Currents surrounding St. George Island on February 11, 2017, 0600. Provided by NTSB.

4.3. Nearby Vessel Operations and Weather Observations

Vessel Locations

4.3.1. On the morning of February 11, 2017, a number of fishing vessels operated within 50 NM off the Pribilof Islands of St. George and St. Paul. Figure 23 shows the approximate locations and headings of some of these vessels.

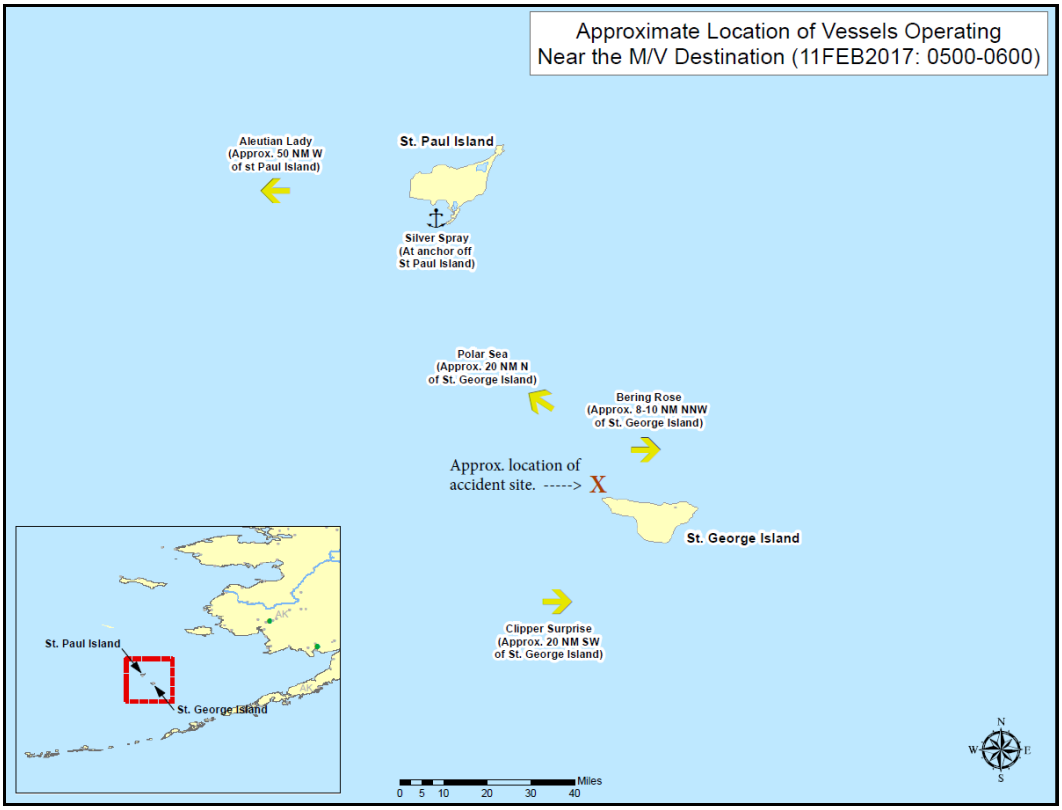



Figure 23. Approximate locations of vessels operating near St. George Island. Produced by MBI.

4.3.2. The ALEUTIAN LADY, a 154-foot house forward crabbing vessel, was fishing for crab approximately 50 miles west of St. Paul Island.

4.3.3. The CLIPPER SURPRISE, a 130-foot longliner vessel, was fishing approximately 10-15 miles southwest of St. George Island.

4.3.4. The POLAR SEA, a 105-foot house forward crabbing vessel, was transiting towards St. Paul with no crab pots onboard approximately 20 miles north of St. George Island.

4.3.5. The BERING ROSE, a 125-foot trawler, was fishing approximately 10 miles north of St. George Island.

4.3.6. The SILVER SPRAY, a 116-foot house forward crabbing vessel, was anchored overnight in St. Paul and was in the process of departing.

## Ice Accumulations from Freezing Spray

4.3.7. The captains of the ALEUTIAN LADY, CLIPPER SURPRISE, POLAR SEA, BERING ROSE and SILVER SPRAY stated that they monitor freezing spray forecasts and take certain precautions to prevent ice accumulations.

4.3.8. During February 8 through the morning of February 11, 2017, the ALEUTIAN LADY, CLIPPER SURPRISE, POLAR SEA, and BERING ROSE each accumulated ice of various amounts from freezing spray conditions. Because the SILVER SPRAY was anchored in St. Paul and not underway, it did not accumulate ice.

4.3.9. While in St. Paul on February 10, 2017, the captain of the SILVER SPRAY noted the forecasts called for heavy freezing spray conditions. He decided to remain anchored in St. Paul and delay his departure for the fishing grounds until the morning of February 11, 2017.

4.3.10. On February 10, 2017, the captain of the ALEUTIAN LADY stated his vessel experienced steady northeast winds of 35 knots, with temperatures dropping to the lower 20's. He directed his crew to stop fishing and break ice off the decks.

4.3.11. The captain of the CLIPPER SURPRISE was aware of the freezing spray warnings "days in advance" and noted the weather forecast on February 10, 2017 called for heavy freezing spray warnings and small craft advisories. Noting these conditions, the captain of the CLIPPER SURPRISE decided to conduct fishing operations to the west of St. George Island. He stated, "fishing in the shelter of the lee of that island [St. George]… the seas weren't too bad in there, and we were fairly well protected from the brunt of the weather. … we weren't steaming in it, but it was just accumulating on the boat, it was cold." The CLIPPER SURPRISE accumulated four inches of ice from freezing spray.

4.3.12. The captain of the BERING ROSE stated when his vessel was operating around St. George Island, it experienced weather "out of the northeast, 35, 40, heavy freezing spray" and 15-foot seas. The vessel had ice accumulations of "over a quarter of an inch per hour." Figure 24 is a photo taken by a crewmember onboard the BERING ROSE of the ice accumulation on the deck aft of the wheelhouse during the early morning hours of February 11, 2017.

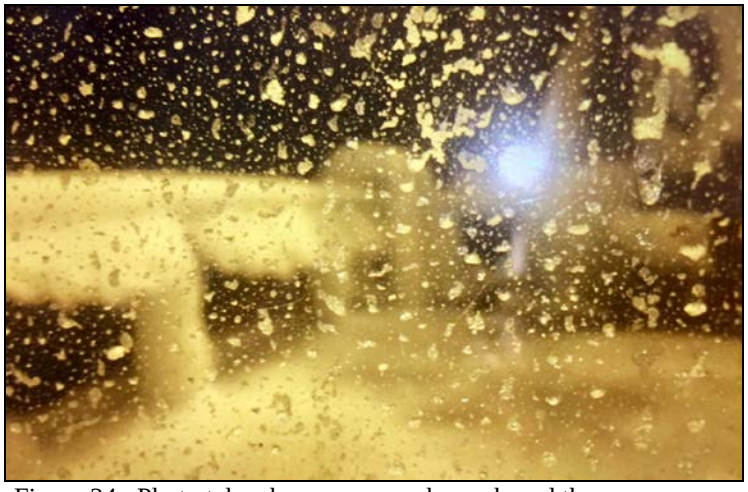


Figure 24. Photo taken by a crewmember onboard the BERING ROSE on the morning of February 11, 2017.

4.3.13. The captain of the POLAR SEA stated during the transit towards St. Paul Island on February 10, 2017, his vessel experienced "wind at about 35, 35 to 40 and I would say about a 15-foot sea." The vessel accumulated ice from freezing spray, requiring his crew to break ice off the decks. The captain stated that he stopped transiting four times on February 10, 2017 so his crew could work breaking off the ice, with each evolution lasting about five hours each. Figures 25-28 are pictures taken by the captain of ice accumulations on the POLAR SEA.


Figure 25

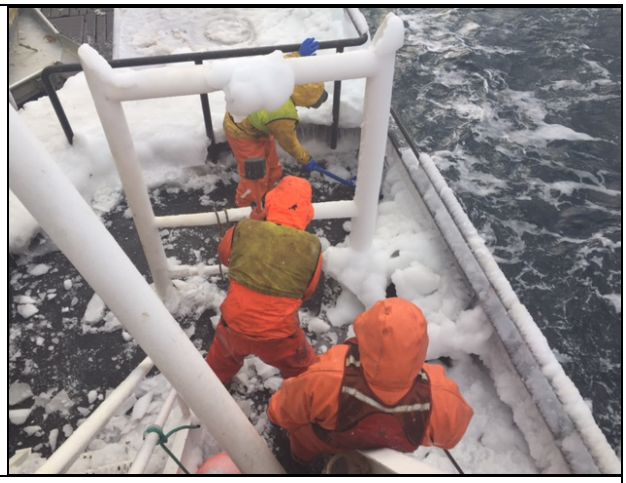


Figure 26

Figure 27

Figure 28

Figures 25-28. Photos taken by the captain of the POLAR SEA of ice accumulations during its transit towards St. Paul Island on February 10, 2017.

4.3.14. The captain of the POLAR SEA stated that on the morning of February 11, 2017 he could not assist with the search for the DESTINATION because of safety reasons. He had to take into account the heavy ice that accumulated onboard his vessel and the prevailing freezing spray conditions.

Precautions to Prevent Ice Accumulations

4.3.15. The captain of the ALEUTIAN LADY stated he generally would reduce the number of pots loaded on deck prior to leaving port when the weather forecasts indicate heavy freezing spray.

4.3.16. The captain of the BERING ROSE stated because it takes many hours for the crew to clear ice off the deck, its best to "slow down, go slower or don't leave the dock."

4.3.17. The captain of the SILVER SPRAY stated that, in his experience, he does not care to travel late in the evening because ice tends to build-up more during the late evening hours than during the daylight hours.

4.3.18. The captain of the CLIPPER SURPRISE stated during a Nor'easter or steady northerly winds during the winter, vessels can run up into Zapadni Bay on the west side of St. George Island to anchor or "jog around" for protection and wait for the weather to clear. During the evening of February 10, 2017, the captain stated that he observed several vessels in Zapadni Bay "hiding out from the weather."

4.3.19. The captain of the POLAR SEA stated that he always evaluates weather conditions, obtaining weather forecasts and reports numerous times a day from web pages and e-mails using the onboard computer. He also receives weather information by communicating with other vessels and from nearby processing facilities.

Known Sea State Conditions Surrounding St. George Island

4.3.20. The captains of the ALEUTIAN LADY, CLIPPER SURPRISE, BERING ROSE and SILVER SPRAY stated that the waters around St. George Island are hazardous.

4.3.21. The captain of the ALEUTIAN LADY described the waters near St. George Island as generally shallow, which creates fast currents, and thus requires caution in foul weather. The islands offer protection from the prevailing winds and seas, especially winds coming from the east or northeast.

4.3.22. The captain of the CLIPPER SURPRISE stated vessels use Zapadni Bay on the west side of St. George Island to wait out heavy weather.

4.3.23. The captain of the BERING ROSE stated the waters around St. George Island, especially the northwestern side [Dainoi Point], are notorious for its "nasty" sea state and winds. Conditions are worse when the winds are from the northeast, and especially when the winds are going in the opposite direction or against the tide.

4.3.24. The captain of the SILVER SPRAY stated there is a lot of current around St. George and when it goes against the wind, it can cause greater seas with chop forming closer together.

4.4. Regulatory Framework

Laws and Regulations

4.4.1. The DESTINATION operated as a CFV, primarily engaged in harvesting crab in the Bering Sea/Aleutian Islands (BSAI). The vessel also fished for cod and operated part-time in the summer months as a fish tender vessel that commercially supplies, stores, refrigerates, or transports fish.

4.4.2. The DESTINATION held a valid Coast Guard Certificate of Documentation (COD) issued on December 15, 2016 in accordance with 46 CFR 67 – Documentation. The COD listed the following operational endorsements: Fishery, Registry, and Coastwise.

4.4.3. As a fishing vessel of less than 200 Gross Tons (GT), the DESTINATION was not subject to Coast Guard inspection and certification or manning and licensing requirements. Title 46 USC 3301 and 3302 exempts fishing vessels, including a vessel chartered part-time as a fish tender from inspection and certification requirements. Title 46 USC 8304 does require operators of documented CFVs less than 200 GT to hold a Coast Guard issued license.

4.4.4. As a CFV engaged in catching and tendering operations, the DESTINATION is subject to federal regulatory requirements of Title 46 CFR Subchapter C – Uninspected Vessels, Part 28 – Requirements for CFV Industry Vessels.

4.4.5. Title 46 CFR 28 final rule became effective on September 15, 1991. The Coast Guard issued the regulations for U.S. documented or state numbered uninspected fishing, fish processing, and fish tender vessels to implement provisions of the Commercial Fishing Industry Vessel Safety Act of 1988, codified in 46 USC 4501- 4508. The intent of these regulations is to improve the overall safety of commercial fishing industry vessels, and to reduce CFV fatalities and losses. They provide requirements for the equipment, design, and operations of vessels, and include provisions for lifesaving, firefighting, navigation, communication, emergency instructions, and stability which includes righting energy criteria and freeing port clearing area.

4.4.6. When additional or clarifying information is necessary, the Coast Guard provides industry guidance in various forms to help assist and inform CFV operators and examiners. Guidance includes Coast Guard Navigation and Vessel Inspection Circulars (NVICs), Policy Letters, Voluntary Safety Initiative and Good Marine Practices, Safety Flyers, Safety Alerts and Regulatory Reference Guides.

4.4.7. Coast Guard guidance covers a broad range of topics, including rules of the road, safety equipment and stability. The Coast Guard posted these documents on various Coast Guard web pages, including www.homeport.uscg.mil, www.dco.uscg.mil, and www.fishsafewest.info.

4.4.8. Coast Guard program managers and vessel examiners often distribute Coast Guard guidance information while attending industry association meetings, outreach events, and during dockside safety exams.

4.4.9. The Fishing Vessel Safety Program Manager of the Coast Guard's Fishing Vessel Division of the Office of Commercial Vessel Compliance (COMDT CG-CVC-3) at Coast Guard Headquarters manages the Coast Guard's Fishing Vessel Safety Program.

4.4.10. The Fishing Vessel Safety Program Manager stated the mission and goal of the program is to enhance safety within the commercial fishing fleet and reduce casualties associated with that industry. The program develops or initiates regulations to implement laws, as well as drafting and issuing guidance regarding current compliance standards for both Coast Guard and industry personnel. The program also promotes awareness and training for safety initiatives, including working with the CFV Federal Advisory Committee and other industry partners at conferences and industry association meetings. The program works with NOAA and National Marine Fisheries Service (NMFS) regarding fisheries permitting and National Institute for Occupational Safety and Health (NIOSH) to share and analyze casualty data and implement safety initiatives or recommendations. COMDT CVC-3 provides program oversight and guidance, interacting with all Coast Guard District Fishing Vessel Safety Coordinators and on occasion with the field examiners including Auxiliary personnel who are qualified to conduct dockside safety exams.

4.4.11. The Coast Guard verifies CFV compliance with regulatory standards through enforcement and dockside safety exams. The Coast Guard conducts enforcement during Coast Guard at-sea patrols where boarding officers evaluate operating CFVs compliance with fisheries and safety requirements.

4.4.12. Commandant Instruction (COMDTINST) 16711.13B – Implementation of the CFV Regulations (August 1995), establishes the Coast Guard's CFV Safety Program.

4.4.13. Coast Guard dockside safety examinations are voluntary, no-fault and non-adversarial in nature. They serve as an information resource, encourage compliance with the CFV regulations of 46 CFR Subchapter C, and discourage unsafe operations. Upon successful completion of a dockside exam, the examiner issues an examination decal, valid for 2 years (see Figure 29).

Figure 29. Example dockside exam decal.

4.4.14. The Coast Guard Authorization Act of 2010 and the Coast Guard and Maritime Transportation Act of 2012 both amended 46 USC Chapter 45 – Uninspected Commercial Fishing Industry Vessels. In particular, it amended 46 USC 4502(f) to direct both State-registered and federally-documented vessels that operate beyond 3 nautical miles from shore to complete a Coast Guard dockside safety examination no later than October 15, 2015. These vessels will need to complete this safety examination at least once every 5 years thereafter.

4.4.15. COMDTINST 16711.13B directs dockside safety examiners to use the CFV Safety Examination Booklet, CG-5587. This booklet assists examiners to document exams by providing a comprehensive listing of regulations in a simple checklist format. The instruction indicates the booklet is self-explanatory and lets the examiner and fishing vessel operator know exactly which regulations are applicable, complied with, and whether there are any deficiencies.

4.4.16. The CFV Safety Examination Booklet, CG-5587, under certain checklist items, references and directs dockside safety examiners to utilize the supplement, CG-5587B. The supplement provides additional checklist items, including requirements based on tonnage, operating area, alteration or conversion date, and pollution prevention requirements.

4.4.17. When the examiner notes deficiencies during the exam, they shall advise the operator of the deficiency and document it in writing using the examination form, and encourage the operator to correct all deficiencies as soon as possible. The examiner is not to issue monetary citations for outstanding items listed on the examination booklet. Coast Guard examiners document the results of the dockside safety exam into the Coast Guard MISLE database, under a fishing vessel examination activity.

## Coast Guard Program Oversight

4.4.18. COMDTINST 16711.13B directs Coast Guard districts to conduct annual audits and oversight of their respective CFV Safety Program. After conducting a review of data within the Coast Guard's MISLE database, this oversight process measures the effectiveness of the program and allows managers to better identify both program strengths as well as weaknesses and enhance efforts to improve the programs management.

## Examiner Training and Qualification

4.4.19. COMDTINST 16711.14 - Commercial Fishing Industry Vessel Safety Training and Qualification (March 1993), establishes the training and qualification process for Coast Guard personnel performing dockside examinations. The intent of the training is to provide the examiner with additional technical skills and specific knowledge of current policies, regulations, and implementation.

4.4.20. Enclosure (1) to COMDTINST 16711.14 provides a qualification checklist and certification of completed training, and enclosure (2) provides an Instructor's Guide to ensure consistent and adequate levels of training. The qualification checklist covers requirements for existing CFVs only. Qualification for examination of new vessels, those constructed or undergoing major conversion on or after September 15, 1991, or those that were substantially altered, were not covered in the 1993 edition of the checklist. These topics require additional advanced training normally provided only to marine safety personnel during inspection department course training.

4.4.21. The CFV Examiner (CFVE) Performance and Qualification Standard (PQS), revision February 5, 2016, is the Coast Guard's workbook for On the Job Training (OJT) performance checklist for certification as a CFVE. The PQS includes performance criteria for the trainee to demonstrate the ability to review safety requirements and stability instructions while validating the vessel's logs and manuals during a dockside safety exam. The PQS requires the trainee to verify the vessel has the required stability instructions, that it was prepared by a qualified individual, and that it is specific to the vessel type and service.

Third Party Examination Program

4.4.22. Coast Guard regulations contained within 46 CFR 28.73 and 28.76 and policies detailed in NVIC 13-91, NVIC 13-91, CH-1, and MOC Policy Letter 04-07 establish the Third Party Examiner Program. Under the program, designated third party examiners (third party surveyor) are authorized to conduct periodic voluntary dockside safety examinations upon the request of the vessel owners. Accepted organizations or similarly qualified organizations request designation from Coast Guard Commandant to carry out dockside safety examinations.

4.4.23. Title 46 CFR 28.73 states, when submitting an application to the Coast Guard for authorization as an accepted organization, the organization must verify that its surveyors are familiar with CFV requirements, operations and equipment. The organization must also verify that it is an organization with a Code of Ethics, whose only interest in the fishing vessel industry is in ensuring the safety and surveying of CFVs, has procedures for accepting and terminating membership, has minimum professional qualifications for surveyors, and maintains a roster of present and former accepted members and surveyors.

4.4.24. Coast Guard MOC Policy Letter 04-07 states accepted third parties must maintain a list of surveyors for the past five years. Newly qualified examiners are supposed to notify district coordinators prior to conducting examinations within their area. In addition, the policy authorizes an Officer in Charge Marine Inspection to remove an examiner from the list for cause.

4.4.25. COMDT CG-CVC-3 maintains a list of accepted organizations. Currently, the list includes the National Association of Marine Surveyors Inc. (NAMS), NAVTECH/U.S. Surveyors Association (NAVTECH/USSA), Bowditch Marine, Inc. and Society of Accredited Marine Surveyors (SAMS).

4.4.26. COMDT CG-CVC-3 first accepted NAVTECH as a designated third party organization in a letter dated July 27, 1992. In a letter dated August 22, 2017, CG-CVC-3 acknowledged NAVTECH/USSA continuation as a designated organization.

4.4.27. In August of 2014 and August 28, 2017, COMDT CG-CVC-3 conducted an audit on NAVTECH/USSA's Third Party Examination program.

4.4.28. NAVTECH/USSA maintains a Fishing Vessel Examiner Qualification Process for its member surveyors to issue reports and Coast Guard examination decals. NAVTECH/USSA maintains a roster of their accepted surveyors on their webpage at www.navsurvey.com.

DESTINATION's Coast Guard and Third Party Dockside Safety Exams

4.4.29. The DESTINATION participated in the Dockside Safety Examination Program since 1997, consistently completing an exam and receiving a valid safety examination decal at least once every two years.

4.4.30. Between 1997 and 2014, Coast Guard CFVEs conducted dockside safety examinations on the DESTINATION and issued examination decals (years '97, 99, 01, 03, 05, 06, 08, 10, 12, and 14). A third party surveyor from NAVTECH/USSA, an accepted organization, conducted the last dockside safety examination on June 10, 2016.

4.4.31. In 1993, the DESTINATION completed a major conversion. Because this major conversion occurred after September 15, 1991, the vessel was subject to the requirements of 46 CFR 28.500 – Stability. The 2012 examination utilized a Coast Guard District 13 generated examination form, which was void of any stability checklist items to verify compliance with 46 CFR 28.500. The remaining examinations utilized the standard Coast Guard Headquarters generated form CG-5587. In each case, the examiners entered "No" to the checklist section of the examination form corresponding to Stability - 46 CFR 28.500. In addition, none of the examination forms included the referenced Supplement 2, Subpart E. Figures 30-33 are copies of the examination forms for the 2014 and 2016 dockside examinations, respectively.

# USCG COMMERCIAL FISHING VESSEL SAFETY EXAMINATION

| | | |
|---|---|---|
| **Vessel Name:** DESTINATION | **I.D. Number:** 8853116 | |
| **Call Sign:** WCJ3842 | **Other Identifier:** 632374 | |
| **Hull Color:** BLUE | **Trim Color:** WHITE | **Superstructure Color:** WHITE |
| **Vessel Length:** 98.6 | **Gross Tonnage:** 252 ITC/196 GRT | **Maximum POB:** 6 |
| **Hull Type:** ☐ Wood ☐ Aluminum ☐ Fiberglass ☑ Steel ☐ Other *(specify)*: | **Vessel Type:** ☒ Fishing Vessel ☒ Fish Tender ☐ Fish Processing Vessel | |
| **Year Built:** 1981 | **Year Converted:** N/A | |
| **Propulsion:** ☒ Outboard ☐ Inboard ☐ Inboard/Outboard | **Horsepower:** 940 | **Number of Shafts:** 1 |
| **Decal Info:** ☐ Initial Issue ☒ Renewal<br>If a renewal, date last decal issued: 186828 | **Fishing Equipment:** ☐ Long Line ☐ Multi-Rig ☐ Troll ☐ Gill Net ☒ Tender ☐ Trawl ☐ Purse Seine ☒ Trap ☐ Bottom ☐ Other *(specify)*: | |
| **Fuel:** ☐ Gas ☒ Diesel ☐ Portable ☐ Fixed (vented) | **Number of Fuel Tanks:** 12 | |
| **Lube Oil Capacity (gal):** 500 | **Hydraulic Oil Capacity (gal):** 500 | **Fuel Capacity (gal):** 35450 |
| **Route:** ☐ Inland ☐ Waters Inside Coastal Waters ☐ Coastal Waters<br>**Boundary Line:** ☐ Inside ☒ Outside ☐ <3nm ☐ <12nm ☐ <20nm ☐ <50nm ☐ >50nm ☒ >100nm<br>**Applicable Waters:** ☐ Warm ☒ Cold | | |
| **Owner:** F/V DESTINATION INC | **Contact Person:** [redacted] | |
| **Owner Address:** [redacted] | **Contact Address:** [redacted] | |
| **Owner Phone:** | **Contact Phone:** [redacted] | |
| **Exam Requested Due To:** ☐ 4100 Boarding ☒ Owner ☐ Family Member ☐ Observer Coverage ☐ Exemption ☐ Other *(specify)*: | | |
| **How did requester hear about program?** | | |

A voluntary dockside examination has been completed on this vessel but a Commercial Fishing Vessel Safety Decal cannot be issued due to the deficiencies listed below and on the Continuation Sheet. *(Deficiencies are listed by citation number with an explanation of the item(s) not in compliance, or identification of any particularly hazardous condition(s)):*

FCC SHIP STATION LICENSE EXPIRED
NAME MISSING FROM RING LIFE BUOYS
* EPIRB HYDROSTATIC RELEASE WILL EXPIRE OCT 2014
CURRENT LIGHT LIST, COAST PILOT, TIDE/CURRENT TABLES

When these deficiencies are corrected, please call _____ to schedule a re-examination.

| | |
|---|---|
| Examiner's Name: [redacted] | Examiner's Unit: SECTOR ANCHORAGE |
| Date of this Exam: 16 SEP 2014 | Location: SAND POINT, AK |

***CONGRATULATIONS!*** *Your vessel has been examined and is in compliance with all applicable safety regulations. Commercial Fishing Vessel Safety Decal Number* 219164 *has been issued. The decal is valid until the date indicated on the Decal provided the vessel safety equipment remains serviceable and the operating conditions described above are not exceeded. The Decal is to be removed from the vessel if the vessel is sold.*

***This form should be kept on board your vessel so it can be shown to the Coast Guard if your vessel is boarded.***

| | |
|---|---|
| Issuing Examiner's Signature: [redacted] | Date Issued: 16Sep14 |
| Vessel Representative's Signature: [redacted] | |

Figure 30. Cover page to the DESTINATION's 2014 dockside examination form.

# ADDITIONAL REQUIREMENTS FOR DOCUMENTED VESSELS OPERATING BEYOND THE BOUNDARY LINE OR WITH MORE THAN 16 PEOPLE ON BOARD

Vessel Name: DESTINATION | I.D. Number: 885316

| | | |
|---|---|---|
| | ***LIFESAVING*** | |
| 46 CFR 28.205 | **Fireman's Outfits** (if more than 49 POB):<br>☐ SCBA (Two 30 minute SCBAs) ☐ Boots (2 sets)<br>☐ SCBA Spare Bottles (Two 30 minute bottles) ☐ Gloves (2 sets)<br>☐ Fire Axe (2 axes)<br>☐ Lifeline (2 lines) ☐ Protective Clothing (2 sets)<br>☐ Rigid Helmut (2 helmets) ☐ Flashlight (2 lights) | O Yes O No ✓ N/A |
| 46 CFR 28.205 | **SCBAs** (required only if vessel equipped with ammonia refrigerant)<br>☐ SCBA (Two 30 minute SCBAs)<br>☐ SCBA Spare Bottles (Two 30 minute bottles) | O Yes O No ✓ N/A |
| | ***ENGINE ROOM*** | |
| 46 CFR 28.215 | **Guards for Exposed Hazards** | ✓ Yes O No O N/A |
| 46 CFR 28.255 | **Bilge Pump, Piping & Dewatering Systems** | ✓ Yes O No O N/A |
| | ***MISCELLANEOUS*** | |
| 47 CFR Subchapter W | **GMDSS** (Vessels ≥ 300 Gross Tons; see NVIC 3-99 for exemptions)<br>☐ Radio Operators License ☐ DSC equipped VHF, MF, & HF radios<br>☐ SART (Search & Rescue Transponder) ☐ NAVTEX receiver<br>☐ 406 MHz EPIRB (in addition to requirement in 46 CFR 28.150) | O Yes O No ✓ N/A |
| | **DSC** (For any vessel with a DSC-capable radio, verify the MMSI is properly programmed); MMSI (9 characters) is: \|_\|_\|_\|_\|_\|_\|_\|_\|_\| | O Yes O No ✓ N/A |
| 33 CFR 161.12<br>33 CFR 164.46 | **AIS** (Fish Tenders & Fish Processors ≥ 65 feet operating within a VTS or on an international voyage) | O Yes O No ✓ N/A |
| 50 CFR 600.730 | **Safe Boarding Ladder** (Vessels with more than 4 feet of freeboard) | ✓ Yes O No O N/A |
| 46 CFR 28.300<br>46 CFR 28.400 | **Vessel Constructed Or Had A Major Conversion After 15 Sep 91 & Carry More Than 16 POB** (If YES, use Supplement 2; CG-5587B) | O Yes ✓ No |
| 46 CFR 28.500 | **Vessel ≥ 79' Not Required Load Lines & Constructed Or Had A Major Conversion/Alteration To Fishing/Processing Equipment After 15 Sep 91** (If YES, use Supplement 2, Subpart E; CG-5587B) | O Yes ✓ No |
| | **Vessel Has Capacity To Carry ≥ 10,500 gallons (250 BBL) Of Oil Or Hazardous Materials** (If YES, use Supplement 3; CG-5587B) | ✓ Yes O No |
| 46 CFR 28.700<br>46 CFR 28.720 | **Fish Processor**<br>☐ Must have a Certificate of Compliance*<br>☐ If built or converted after 27 Jul 90 must be classed*<br>* From ABS, DNV, or approved 3rd Party, Not Coast Guard | O Yes O No ✓ N/A |
| | **STCW Requirements** (Fish Processors more than 200 Gross Tons) | O Yes O No ✓ N/A |

Figure 31. DESTINATION's 2014 dockside examination form with line item 46 CFR 28.500.

# USCG COMMERCIAL FISHING VESSEL SAFETY EXAMINATION

| | | | |
|---|---|---|---|
| **Vessel Name:** DESTINATION | | **I.D. Number:** 632374 | |
| **Call Sign:** WCJ3842 | **Other Identifier:** IMO 8853116 | | |
| **Hull Color:** Blue | **Trim Color:** White/Blue | **Superstructure Color:** White | |
| **Vessel Length:** 98.6" | **Gross Tonnage:** 196 | **Maximum POB:** 6 | |

**Hull Type:** ☐ Wood ☐ Aluminum ☐ Fiberglass ☒ Steel ☐ Other *(specify)*:

**Vessel Type:** ☒ Fishing Vessel ☐ Fish Tender ☐ Fish Processing Vessel

**Year Built:** 1981 **Year Converted:** 1993

**Propulsion:** ☐ Outboard ☒ Inboard ☐ Inboard/Outboard **Horsepower:** 940 **Number of Shafts:** 1

**Decal Info:** ☐ Initial Issue ☒ Renewal
If a renewal, date last decal issued: June 2016

**Fishing Equipment:** ☐ Long Line ☐ Multi-Rig ☐ Troll ☐ Gill Net ☐ Tender ☐ Trawl ☐ Purse Seine ☒ Trap ☐ Bottom ☐ Other *(specify)*: Crab (Pot)

**Fuel:** ☐ Gas ☒ Diesel ☐ Portable ☐ Fixed (vented) **Number of Fuel Tanks:** 11

| | | |
|---|---|---|
| **Lube Oil Capacity (gal):** 500 | **Hydraulic Oil Capacity (gal):** 500 | **Fuel Capacity (gal):** 35,456 |

**Route:** ☐ Inland ☐ Waters Inside Coastal Waters ☐ Coastal Waters
**Boundary Line:** ☐ Inside ☐ Outside ☐ <3nm ☐ <12nm ☐ <20nm ☐ <50nm ☐ >50nm ☒ >100nm
**Applicable Waters:** ☐ Warm ☒ Cold

| | |
|---|---|
| **Owner:** DESTINATION INC. | **Contact Person:** [redacted] |
| **Owner Address:** [redacted] | **Contact Address:** [redacted] |
| **Owner Phone:** | **Contact Phone:** |

**Exam Requested Due To:** ☐ 4100 Boarding ☐ Owner ☐ Family Member ☐ Observer Coverage ☐ Exemption ☒ Other *(specify)*: Renewal

**How did requester hear about program?** Renewal

A voluntary dockside examination has been completed on this vessel but a Commercial Fishing Vessel Safety Decal cannot be issued due to the deficiencies listed below and on the Continuation Sheet. *(Deficiencies are listed by citation number with an explanation of the item(s) not in compliance, or identification of any particularly hazardous condition(s))*:

No Deficiencies Noted.

When these deficiencies are corrected, please call _____ to schedule a re-examination.

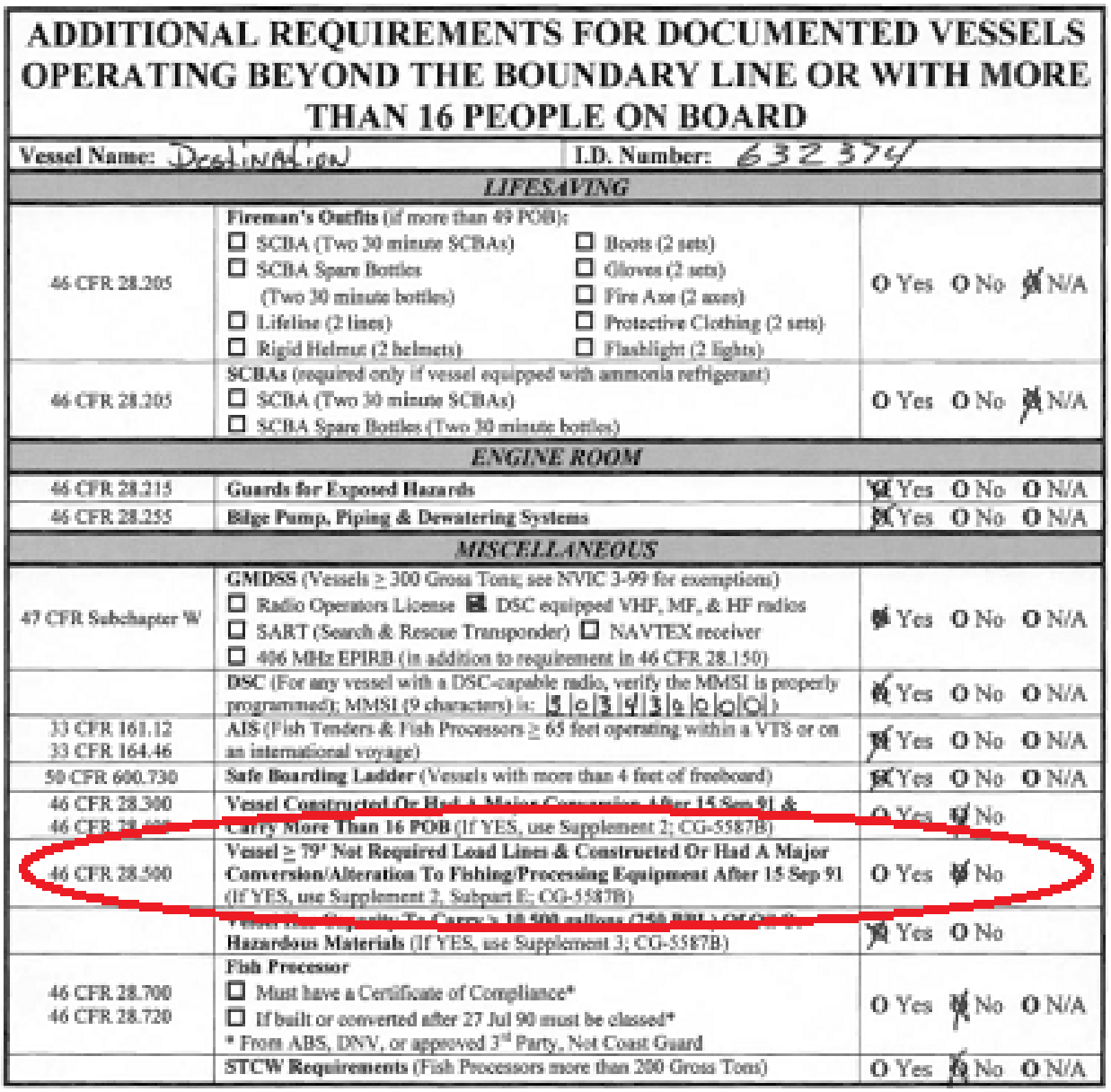
| | |
|---|---|
| Examiner's Name: [redacted] | Examiner's Unit: [redacted] |
| Date of this Exam: 6-10-2016 | Location: Seattle, WA. |

***CONGRATULATIONS!*** *Your vessel has been examined and is in compliance with all applicable safety regulations. Commercial Fishing Vessel Safety Decal Number* 238751 *has been issued. The decal is valid until the date indicated on the Decal provided the vessel safety equipment remains serviceable and the operating conditions described above are not exceeded. The Decal is to be removed from the vessel if the vessel is sold.*

***This form should be kept on board your vessel so it can be shown to the Coast Guard if your vessel is boarded.***

| | |
|---|---|
| Issuing Examiner's Signature: [redacted] | Date Issued: 6-10-2016 |
| Vessel Representative's Signature: [redacted] | |

Figure 32. Cover page to the DESTINATION's 2016 dockside examination form.



**ADDITIONAL REQUIREMENTS FOR DOCUMENTED VESSELS OPERATING BEYOND THE BOUNDARY LINE OR WITH MORE THAN 16 PEOPLE ON BOARD**

Vessel Name: DESTINATION I.D. Number: 632374

| | | |
|---|---|---|
| | ***LIFESAVING*** | |
| 46 CFR 28.205 | **Fireman's Outfits** (if more than 49 POB):<br>☐ SCBA (Two 30 minute SCBAs) ☐ Boots (2 sets)<br>☐ SCBA Spare Bottles (Two 30 minute bottles) ☐ Gloves (2 sets)<br>☐ Lifeline (2 lines) ☐ Fire Axe (2 axes)<br>☐ Rigid Helmet (2 helmets) ☐ Protective Clothing (2 sets)<br>☐ Flashlight (2 lights) | O Yes O No ☒ N/A |
| 46 CFR 28.205 | **SCBAs** (required only if vessel equipped with ammonia refrigerant)<br>☐ SCBA (Two 30 minute SCBAs)<br>☐ SCBA Spare Bottles (Two 30 minute bottles) | O Yes O No ☒ N/A |
| | ***ENGINE ROOM*** | |
| 46 CFR 28.215 | **Guards for Exposed Hazards** | ☒ Yes O No O N/A |
| 46 CFR 28.255 | **Bilge Pump, Piping & Dewatering Systems** | ☒ Yes O No O N/A |
| | ***MISCELLANEOUS*** | |
| 47 CFR Subchapter W | **GMDSS** (Vessels ≥ 300 Gross Tons; see NVIC 3-99 for exemptions)<br>☐ Radio Operators License ☒ DSC equipped VHF, MF, & HF radios<br>☐ SART (Search & Rescue Transponder) ☐ NAVTEX receiver<br>☐ 406 MHz EPIRB (in addition to requirement in 46 CFR 28.150) | ☒ Yes O No O N/A |
| | **DSC** (For any vessel with a DSC-capable radio, verify the MMSI is properly programmed); MMSI (9 characters) is: 5 3 6 3 4 3 0 0 0 | ☒ Yes O No O N/A |
| 33 CFR 161.12<br>33 CFR 164.46 | **AIS** (Fish Tenders & Fish Processors ≥ 65 feet operating within a VTS or on an international voyage) | ☒ Yes O No O N/A |
| 50 CFR 600.730 | **Safe Boarding Ladder** (Vessels with more than 4 feet of freeboard) | ☒ Yes O No O N/A |
| 46 CFR 28.300<br>46 CFR 28.[illegible] | **Vessel Constructed Or Had A Major Conversion After 15 Sep 91 & Carry More Than 16 POB** (If YES, use Supplement 2; CG-5587B) | O Yes ☒ No |
| 46 CFR 28.500 | **Vessel ≥ 79' Not Required Lead Lines & Constructed Or Had A Major Conversion/Alteration To Fishing/Processing Equipment After 15 Sep 91** (If YES, use Supplement 2, Subpart E; CG-5587B) | O Yes ☒ No |
| | **Vessel Has Capacity To Carry ≥ 18,500 gallons (70,000 L) Of Oil &/Or Hazardous Materials** (If YES, use Supplement 3; CG-5587B) | ☒ Yes O No |
| 46 CFR 28.700<br>46 CFR 28.720 | **Fish Processor**<br>☐ Must have a Certificate of Compliance*<br>☐ If built or converted after 27 Jul 90 must be classed*<br>* From ABS, DNV, or approved 3rd Party, Not Coast Guard | O Yes ☒ No O N/A |
| | **STCW Requirements** (Fish Processors more than 200 Gross Tons) | O Yes ☒ No O N/A |

Figure 33. DESTINATION's 2016 dockside examination form with line item 46 CFR 28.500.

CFV Safety Program Oversight on DESTINATION's Dockside Examination

4.4.32. Upon completion of the June 10, 2016 dockside safety examination, the third party examiner provided his accepted organization association with a copy of his examination log and examination form.

4.4.33. On September 12, 2016, after receiving a copy of the dockside safety examination from the accepted organization, the commercial vessel safety coordinator at Coast Guard Pacific Area, generated a MISLE Activity (No. 5999154) to document the third party's June 10, 2016 dockside safety examination.

## Stability and Safety Compliance Check (SSC)

4.4.34. Developed in 1999, the Coast Guard initiated dockside SSC to assist in reducing fatalities and vessel loss within the BSAI crab fleet. In particular, the goal of SSCs was to deter vessels from overloading with crab pots. Coast Guard District's 13 and 17 collaborated with the Alaska Crab Coalition, NIOSH, ADF&G, and the North Pacific Fishing Vessel Owner's Association (NPFVOA) to develop the SSC.

4.4.35. SSCs, as envisioned and initially executed, involved collaborative dockside vessel visits using Coast Guard CFVEs and ADF&G personnel. Examiners typically completed SSCs in the fall, a few weeks in advance of the upcoming king crab season. While ADF&G personnel conducted crab fisheries tank and pot checks, the Coast Guard would work with the vessel's captain to examine suitability of lifesaving equipment and compliance with the vessel's stability instructions to check for overloading. The Coast Guard did not weigh the crab pots. If the Coast Guard found vessels overloaded or without required stability instructions, they would issue the vessel a Captain of the Port Order requiring the vessel to remain at the dock until the vessel corrected the safety deficiencies.

4.4.36. Currently, the Coast Guard conducts SSCs independently from ADF&G personnel and only after a vessel volunteers to participate. Coast Guard District 17 does not have policy guidance regarding SSCs.

4.4.37. During SSCs, Coast Guard CFVEs document their exams on a safety spot check form that has been updated and produced by various Coast Guard offices. The form includes information such as pots allowed, pots loaded, stability book onboard and issue date, in addition to information on safety equipment. The form also includes a space to document noted deficiencies and when they are corrected.

4.4.38. Coast Guard CFVEs conducted five SSCs on the DESTINATION (years '05, 06, 07, 10, and 12) and documented the SSC activity within the Coast Guard's MISLE database. None of the SSCs forms noted violations or non-compliance with safety or stability requirements.

## Alaska 24-hour Notice Regulations

4.4.39. ADF&G regulations require BSAI vessels to contact the Coast Guard 24-hours prior to departing port with pots loaded onboard. The regulation does not require any specific action on the part of the Coast Guard and the Coast Guard does not have regulations or policies that address the ADF&G 24-notice requirement.

4.4.40. Upon ADF&G completing a vessel's fisheries permit certification inspection, they remind the vessel's captain to provide the 24-hour notice to the Coast Guard. When the Coast Guard office receives these phone calls, the Coast Guard's practice is to ask the vessel captain if they would like to voluntarily participate and receive a SSC at that time.

4.5. Construction, Modifications, Repairs and Stability Assessments

Initial Construction (1981)

4.5.1. J&S Marine Services, Inc. in Brazoria, Texas built the DESTINATION in 1981, and originally named it the COMPASS ROSE. The vessel was constructed as a house forward vessel with three holds. Its original dimensions included the following: length 81.8 feet; breadth 26 feet; depth 12.4 feet; GT 198; Net Tons (NT) 134.

4.5.2. J&S Marine Services, Inc. constructed the COMPASS ROSE using plans drawn by B. F. Jensen & Associates (now Jensen Maritime Consultants, Inc.). Its design was based on the 92 foot CFV JUDI B with some modifications.

4.5.3. The COMPASS ROSE plans included typical amidships sections, outboard profile, general arrangements, hold overflow and seawater circulation system (see Figures 34-37).

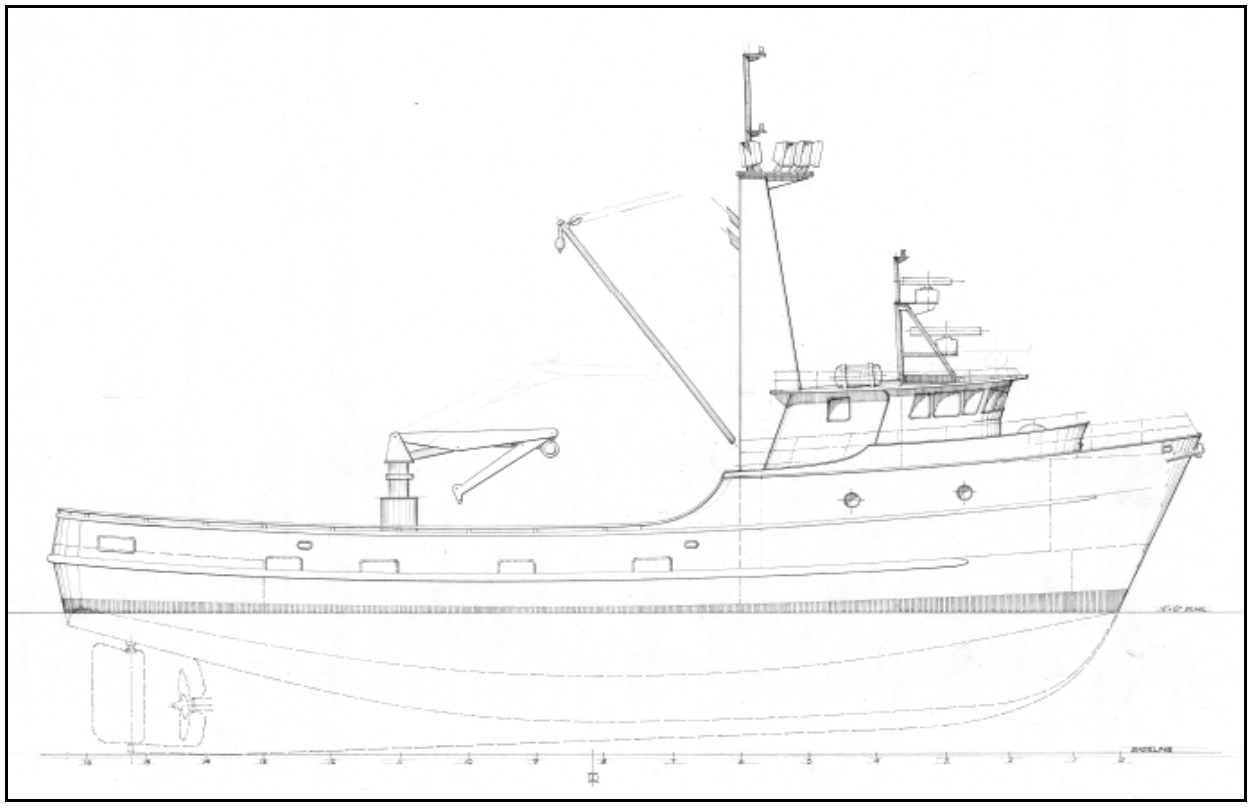


Figure 34. Outboard profile for the COMPASS ROSE (1981).
Plans provided by Jensen Maritime Consultants, Inc.

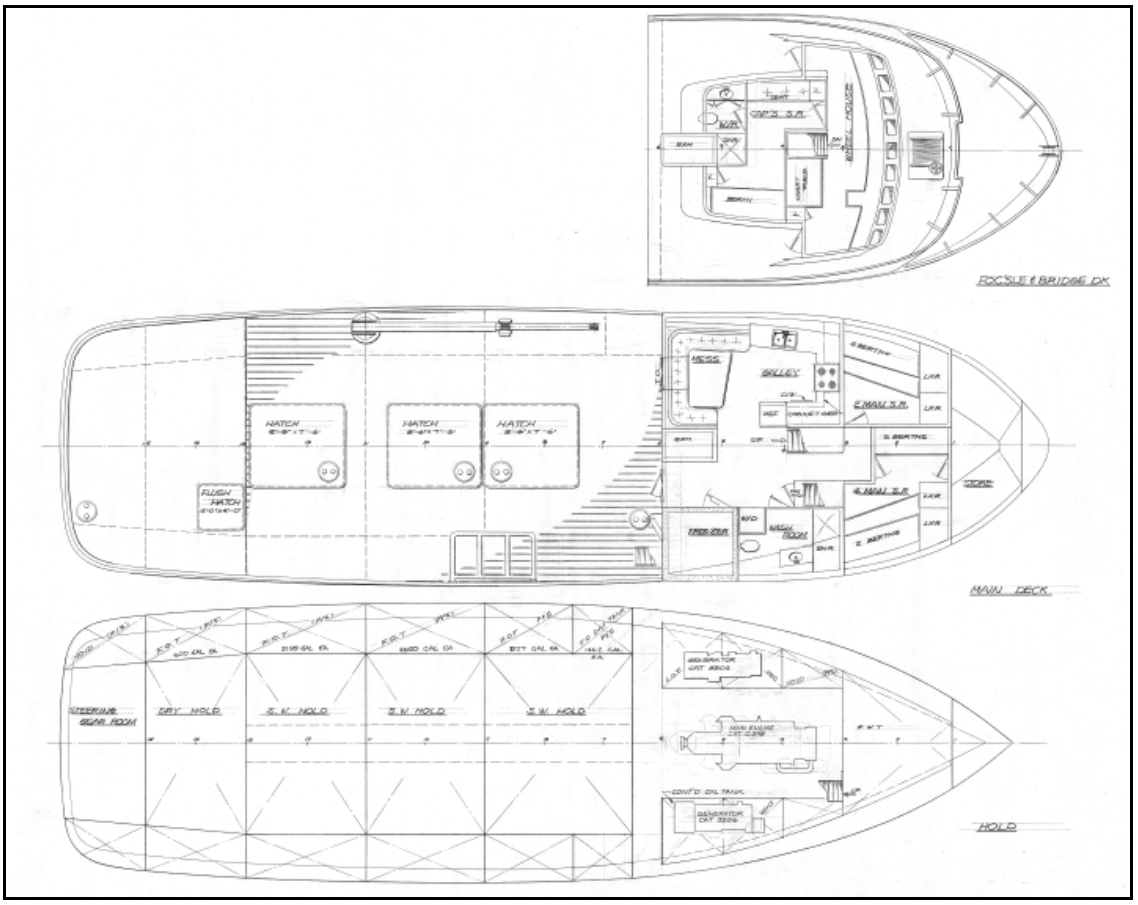


Figure 35. General arrangements for the COMPASS ROSE (1981).
Plans provided by Jensen Maritime Consultants, Inc.

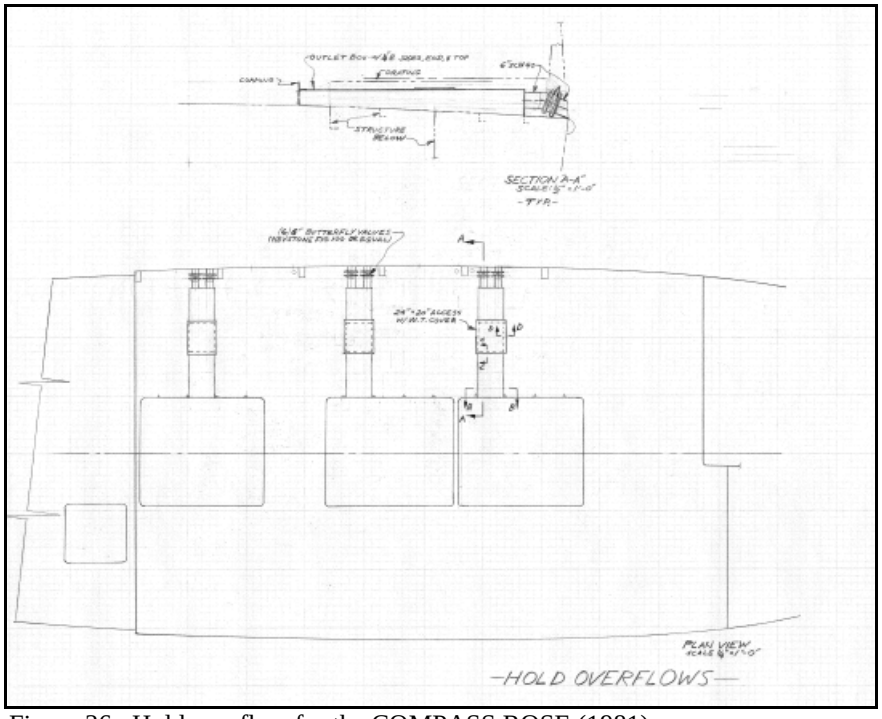


Figure 36. Hold overflow for the COMPASS ROSE (1981).
Plans provided by Jensen Maritime Consultants, Inc.

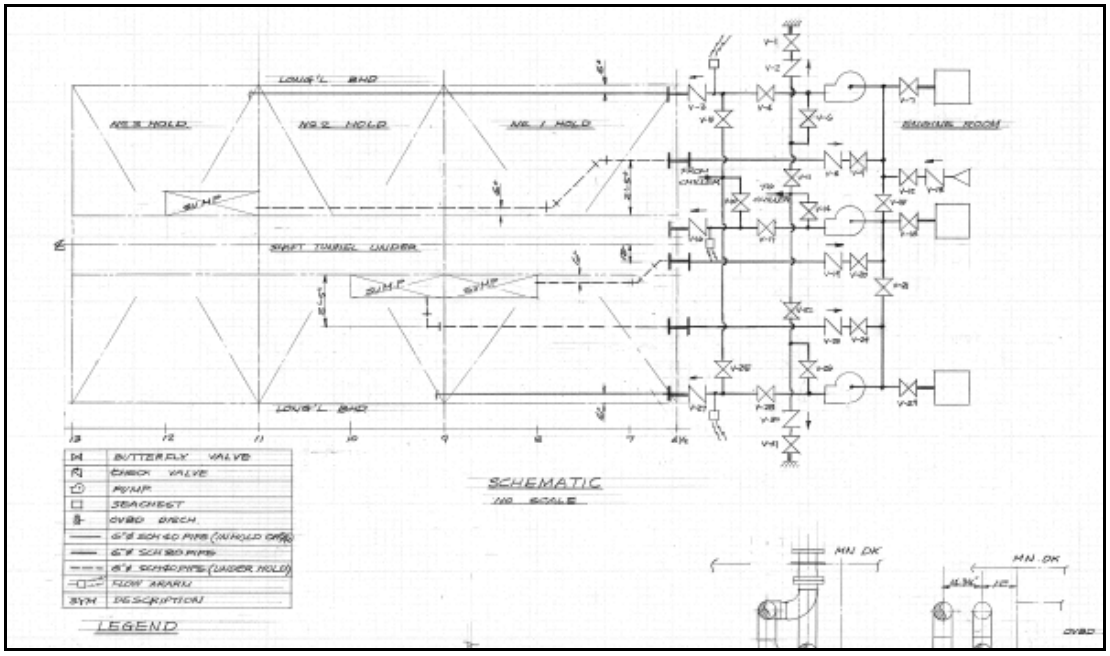



Figure 37. Seawater circulation system plans for the COMPASS ROSE (1981).
Plans provided by Jensen Maritime Consultants, Inc.

4.5.4. The COMPASS ROSE plans included a crab pot loading table. As illustrated in Figure 38, the loading table indicated the vessel could operate with a maximum of 95 pots at 3 tiers, with each pot measuring 6.5 x 6.5 feet and weighing 700 pounds each.

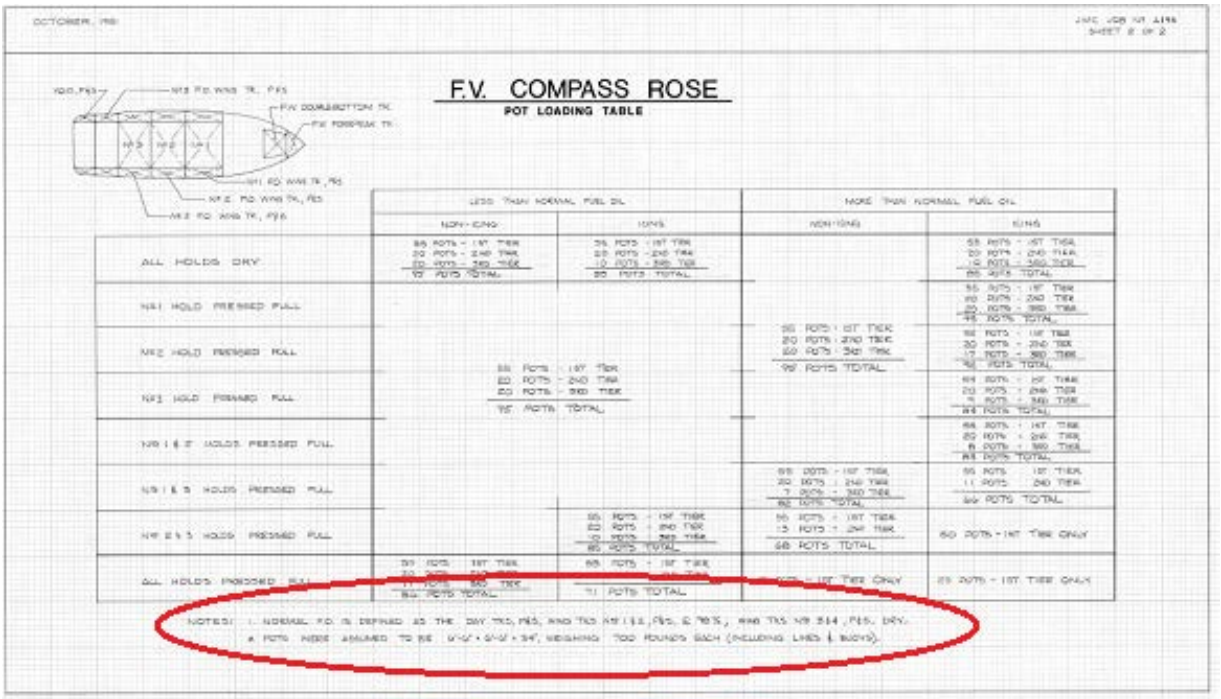



Figure 38. Crab pot loading table for the COMPASS ROSE (1981).
Plans provided by Jensen Maritime Consultants, Inc.

## Modification (1993)

4.5.5. In 1985, the owner purchased the COMPASS ROSE and renamed it the DESTINATION.

4.5.6. In 1992, the owner contracted Tim Alls Shipbuilding in Seattle, Washington to lengthen and widen (sponson) the DESTINATION. With this modification, a new pre-fabricated section including new holds and piping replaced the entire hull section aft of the engine room bulkhead. The wheelhouse was also renewed and raised approximately 3 feet. The resulting modifications increased the length to 98.6 feet, breadth to 32.2 feet.

4.5.7. During the modifications, the shipyard and the owner did not produce or maintain formalized construction or arrangement plans reflecting these modifications.

4.5.8. According to the DESTINATION's drawings and plans, as originally constructed as the COMPASS ROSE, the tank overflow arrangement provided three separate and independent overflows, one per tank. A former crewmember stated the current configuration consolidated the overflows for number 1 and 2 holds. The number 3 tank overflow does not include a channel, but rather the overflow "free floats under the deck onto the false deck and exits through the scuppers on either side."

4.5.9. Prior to completion of the modifications, in October 1992 the owner selected a naval architect as a qualified individual to advise on stability and tonnage requirements related to the modifications on the DESTINATION.

## Stability Information (1993)

4.5.10. Because the DESTINATION did not have plans reflecting the modification, on November 16, 1992 the qualified individual produced vessel drawings reflecting the modifications in order to conduct a stability test and produce a Trim and Stability Report. These drawings included profile and plan views of the general arrangements, hull form lines and offsets.

4.5.11. On January 10, 1993, the qualified individual drew a tonnage plan calculating the vessel's new tonnage at 196 GT.

4.5.12. On January 16, 1993, the qualified individual generated a Booklet of Calculations. This booklet included arrangement plans after modifications (see Figure 39), principal particulars, weight estimates, hydrostatic properties, tonnage estimates, tank capacities, and preliminary trim and stability calculations. He completed the inclining test on October 17, 1993 and used the results to generate a Stability Letter and Trim and Stability Report (stability instructions).

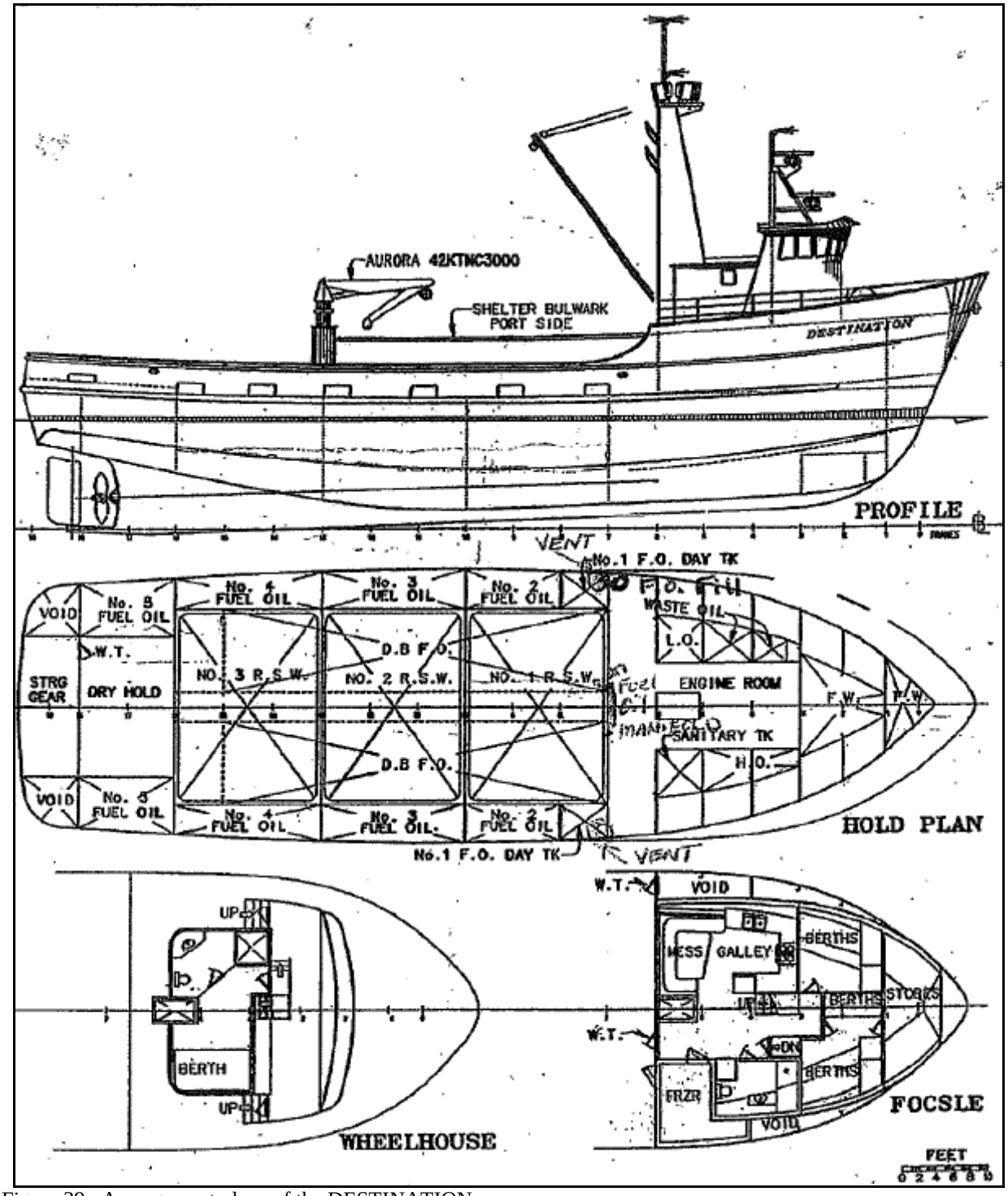
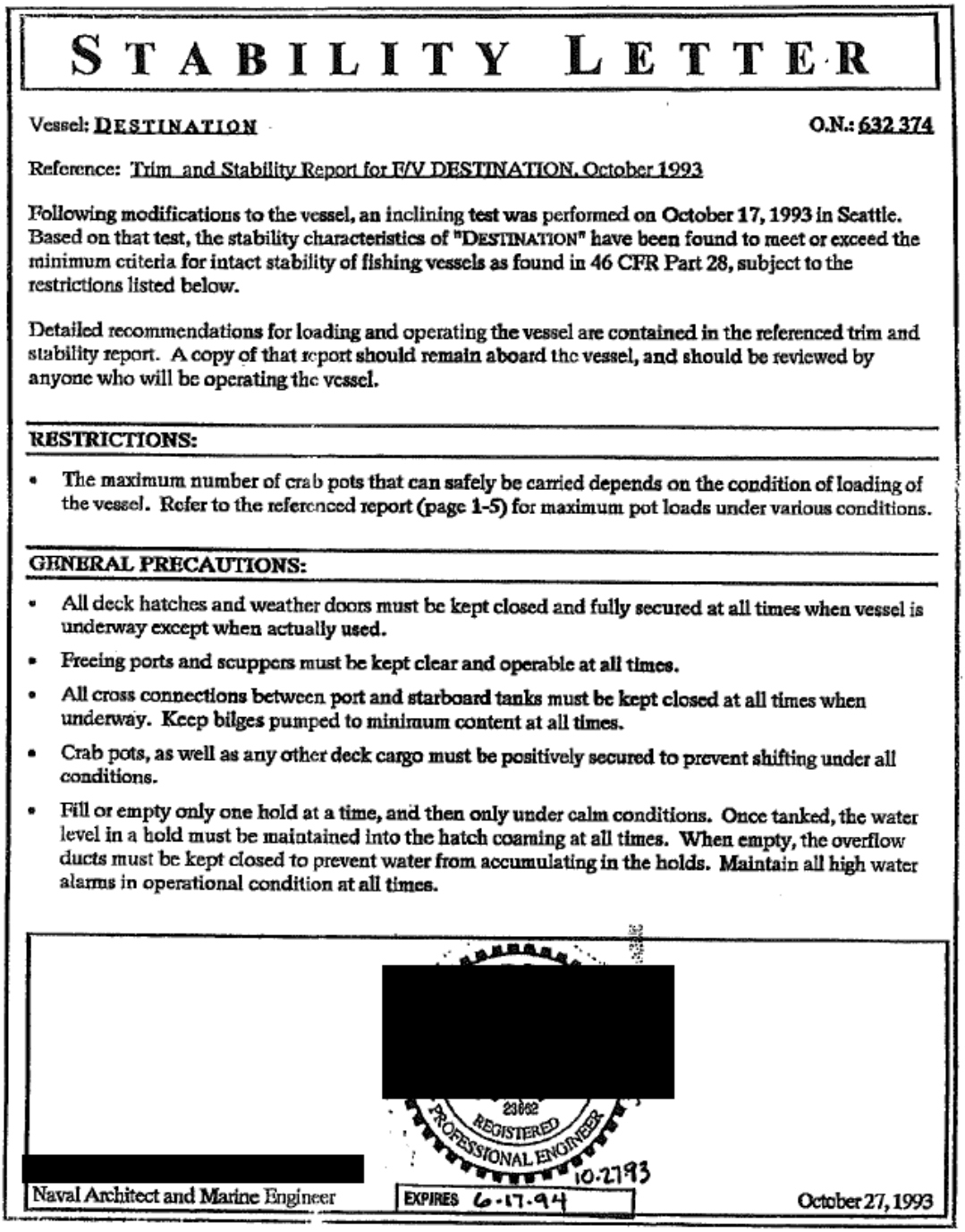


Figure 39. Arrangement plans of the DESTINATION.
Produced by the qualified individual after its 1993 modification.

4.5.13. On October 27, 1993, the qualified individual provided the owner a copy of the stability instructions and the associated Stability Letter for the DESTINATION. Figure 40 is a copy of the Stability Letter.

4.5.14. The Stability Letter stated the vessel's stability characteristics "have been found to meet or exceed the minimum criteria for intact stability of fishing vessels as found in 46 CFR Part 28." The letter also referenced the stability instructions, restrictions and general precautions.



# STABILITY LETTER

Vessel: DESTINATION O.N.: 632 374

Reference: Trim and Stability Report for F/V DESTINATION, October 1993

Following modifications to the vessel, an inclining test was performed on October 17, 1993 in Seattle. Based on that test, the stability characteristics of "DESTINATION" have been found to meet or exceed the minimum criteria for intact stability of fishing vessels as found in 46 CFR Part 28, subject to the restrictions listed below.

Detailed recommendations for loading and operating the vessel are contained in the referenced trim and stability report. A copy of that report should remain aboard the vessel, and should be reviewed by anyone who will be operating the vessel.

**RESTRICTIONS:**

- The maximum number of crab pots that can safely be carried depends on the condition of loading of the vessel. Refer to the referenced report (page 1-5) for maximum pot loads under various conditions.

**GENERAL PRECAUTIONS:**

- All deck hatches and weather doors must be kept closed and fully secured at all times when vessel is underway except when actually used.
- Freeing ports and scuppers must be kept clear and operable at all times.
- All cross connections between port and starboard tanks must be kept closed at all times when underway. Keep bilges pumped to minimum content at all times.
- Crab pots, as well as any other deck cargo must be positively secured to prevent shifting under all conditions.
- Fill or empty only one hold at a time, and then only under calm conditions. Once tanked, the water level in a hold must be maintained into the hatch coaming at all times. When empty, the overflow ducts must be kept closed to prevent water from accumulating in the holds. Maintain all high water alarms in operational condition at all times.

[redacted]

23662 REGISTERED PROFESSIONAL ENGINEER 10-27-93

[redacted]
Naval Architect and Marine Engineer

EXPIRES 6-17-94

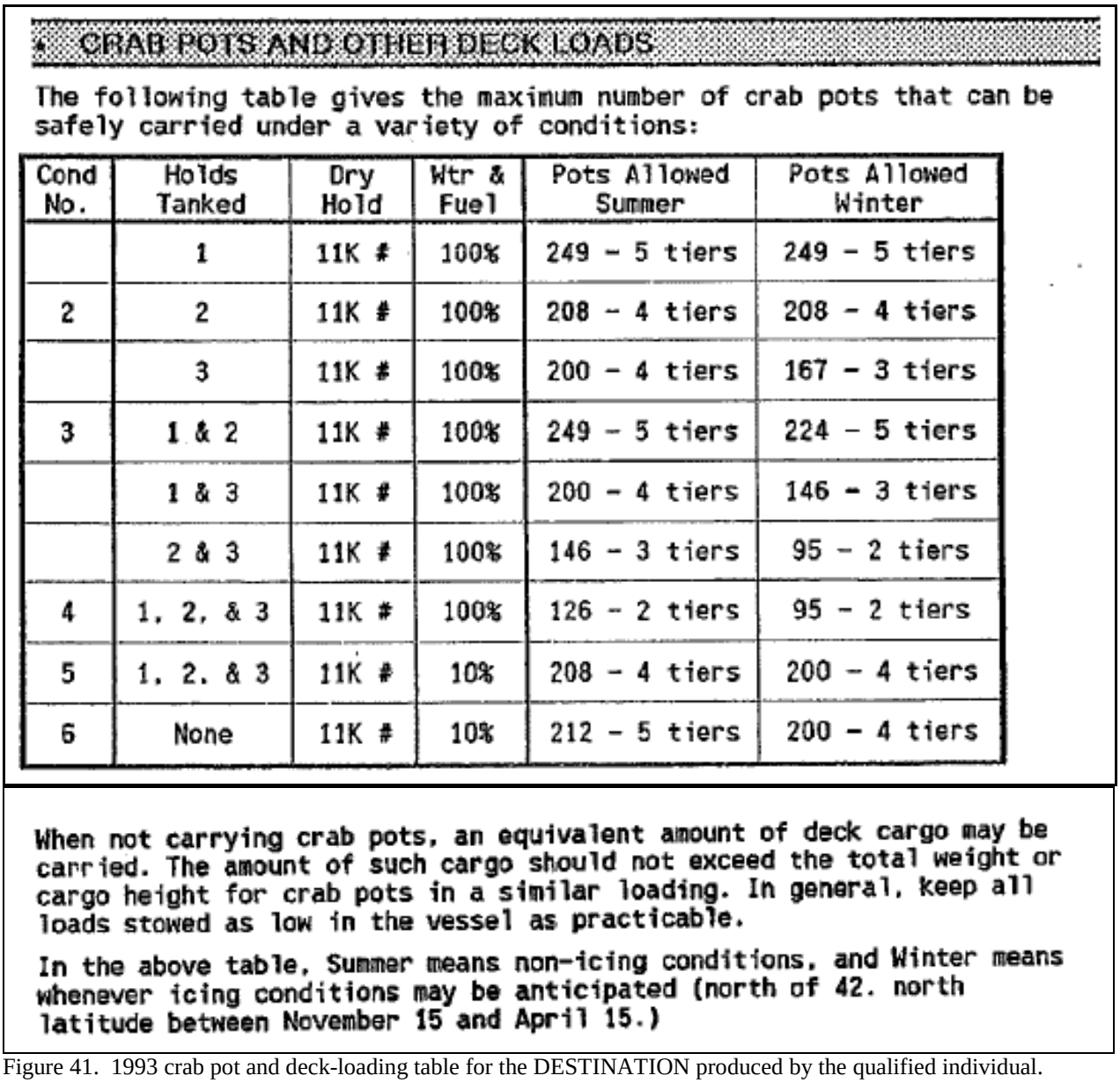
October 27, 1993

Figure 40. 1993 Stability Letter for the DESTINATION produced by the qualified individual.

4.5.15. The stability instructions contained information divided into six main sections: (1) discussion, (2) loading examples, (3) inclining test data and light ship condition, (4) supporting data, (5) stability of fishing vessels, and (6) stability letter.

4.5.16. Section 1 of the stability instructions included a crab pot and deck-loading table (see Figure 41). This table gave the maximum number of crab pots the vessel can safely carry under a variety of conditions including: number of holds tanked (filled with seawater), weight stored in dry hold, percentage of water and fuel, and pots allowed under summer and winter conditions.

4.5.17. Provided below the crab-pot and deck-loading table is information regarding amount of deck cargo and definitions of "summer" and "winter" conditions.



CRAB POTS AND OTHER DECK LOADS

The following table gives the maximum number of crab pots that can be safely carried under a variety of conditions:

| Cond No. | Holds Tanked | Dry Hold | Wtr & Fuel | Pots Allowed Summer | Pots Allowed Winter |
|---|---|---|---|---|---|
| | 1 | 11K # | 100% | 249 - 5 tiers | 249 - 5 tiers |
| 2 | 2 | 11K # | 100% | 208 - 4 tiers | 208 - 4 tiers |
| | 3 | 11K # | 100% | 200 - 4 tiers | 167 - 3 tiers |
| 3 | 1 & 2 | 11K # | 100% | 249 - 5 tiers | 224 - 5 tiers |
| | 1 & 3 | 11K # | 100% | 200 - 4 tiers | 146 - 3 tiers |
| | 2 & 3 | 11K # | 100% | 146 - 3 tiers | 95 - 2 tiers |
| 4 | 1, 2, & 3 | 11K # | 100% | 126 - 2 tiers | 95 - 2 tiers |
| 5 | 1, 2, & 3 | 11K # | 10% | 208 - 4 tiers | 200 - 4 tiers |
| 6 | None | 11K # | 10% | 212 - 5 tiers | 200 - 4 tiers |

When not carrying crab pots, an equivalent amount of deck cargo may be carried. The amount of such cargo should not exceed the total weight or cargo height for crab pots in a similar loading. In general, keep all loads stowed as low in the vessel as practicable.

In the above table, Summer means non-icing conditions, and Winter means whenever icing conditions may be anticipated (north of 42. north latitude between November 15 and April 15.)

Figure 41. 1993 crab pot and deck-loading table for the DESTINATION produced by the qualified individual.

4.5.18. Section 1 of the stability instructions also included information regarding water on deck. In this section, the qualified individual explained water on deck has detrimental effects on stability, and it is important to keep all freeing ports clear and operable at all times. Further, this section indicated the DESTINATION met freeing port and bulwark requirements of 46 CFR 28, Subpart E – Stability.

4.5.19. The Stability Letter and the stability instructions did not provide the dimensions or weight of the crab pots. The qualified individual stated the captain of the DESTINATION, onboard at the time of the stability test, told him each pot weighed 700 pounds. The pots weighed 650 pounds and the gear stored inside weighed 50 pounds. The qualified individual did not verify those weights using direct observation or by weighing the pots.

4.5.20. On January 14, 1994, the American Bureau of Shipping (ABS) issued the DESTINATION a U.S. Tonnage Certificate. This Certificate documented the vessel's regulatory tonnages as 196.09 GT and 133 NT, and registered tonnages as 252 Gross International Tonnage Convention (GT ITC) and 78 NT ITC. The Certificate of Documentation issued by the Coast Guard's National Documentation Center on January 19, 1994 reflected these ITC tonnages.

4.5.21. Title 46 CFR 28.505 – Vessel owner's responsibility, requires the owner to maintain test results and calculations of stability evaluations. At the time of the incident, the owner did not have a copy of the stability instructions, since it was located onboard the vessel. At the request of the MBI, the owner obtained a copy on March 15, 2017 from the qualified individual.

Ice Damage Repairs and Bulbous Bow Installation (2012)

4.5.22. During the fall of 2012 crabbing season, the DESTINATION sustained hull damage while operating in sea ice conditions. In November 2012, the vessel entered the dry dock at Pacific Fisherman Inc., Seattle, Washington. A surveyor from Waypoint Marine Surveyors evaluated the damage and completed a report of survey to document the hull damage. The report stated there was moderate to heavy indents to the port and starboard side sheer strake from the bow stem to approximately No. 6 frame aft; main deck edge down to below the waterline, transom stern plating from deck edge to chine, and indents to the bow wrapper plate.

4.5.23. Around the end of January 2013, Pacific Fisherman Inc. completed the repairs to the DESTINATION's damaged hull. Coastal Fluid Power, Inc. completed removal and replacement of the hydraulic system in way of the repairs. Further, at the request of the owner, Pacific Fisherman Inc. completed the installation of a bulbous bow. The owner stated he installed the bulbous bow after learning bulbous bows reduced and slowed vessel pitching and increased fuel economy. Because piping connects the bulbous bow into the forward fresh water tanks, it enabled the crew to flood the bulbous bow for trim and ship handling adjustments.

Bulbous Bow Installation Stability Assessment

4.5.24. During a meeting at Pacific Fisherman Inc., the owner hired a naval architect from KraftMar Design Services to design a bulbous bow for the DESTINATION. On October 3, 2012, the naval architect developed construction plans for the bulbous bow.

4.5.25. The naval architect stated Pacific Fisherman Inc. sent him an e-mail towards the end of the bulbous bow installation, asking him to conduct a stability assessment.

4.5.26. On January 28, 2013, the naval architect provided the owner with a letter documenting his stability assessment, confirming the DESTINATION is safe to conduct crab-fishing operations in the Bering Sea. The assessment referenced the 1993 stability instructions and stated the bulbous bow had a "negligible" reduction to the vessel's Metacentric Height (GM) of only about 2 inches.

4.5.27. The stability assessment for the bulbous bow was limited to the bulbous bow installation and hull steel repairs, and did not include any other weight changes to the vessel. The owner did not hold discussions with the naval architect regarding changes in sizes and weights of the crab pots used on the DESTINATION. The owner "assumed nothing changed on the stability report."

4.5.28. The naval architect stated that when assessing a vessel's stability, his calculations only include changes to the vessel's lightweight (lightship) conditions. He did not deviate from this practice when completing his assessment on the DESTINATION.

Dry-dock/Yard Periods and Mechanical Repairs

4.5.29. The owner stated that the DESTINATION was dry-docked every two years. He planned to conduct the next regular dry-dock period after the 2017 opilio crab season.

4.5.30. The DESTINATION completed the following dry-dock periods in Seattle, Washington: May 2011 at Marine Fluid Systems Inc., November 2012 through January 2013 at Pacific Fisherman, Inc., and in May 2015 at Marine Fluid Systems, Inc.

4.5.31. Figure 42 is a picture of the DESTINATION during a July 6, 2009 Report of Survey. Figure 43 is a picture of the vessel during its June 7, 2016 Valuation and Survey of Condition. These pictures illustrate a solid bulwark was installed between the 2009 and 2016 surveys.


Figure 42


Figure 43

Figures 42 and 43. Pictures of the DESTINATION taken by the Marine Surveyors during valuation surveys conducted in July 2009 and June 2016, respectively. Circled in red is the new bulwark installed in May 2011.

4.5.32. During the May 2011 dry-dock at Marine Fluid Systems Inc., the owner installed a new bulwark on the forecastle deck at the bow. A Marine Fluid Systems Inc. invoice dated May 9, 2011 described the installation as "bow additions/caprail" consisting of 264 square feet of 5/16-inch plate. Figure 43 illustrates the new bulwark.

4.5.33. Title 46 CFR 28.501 requires a qualified individual to determine if modifications to a vessel constitute a substantial alteration that would adversely affect a vessel's stability. Title 46 CFR 28.501(d)(4) addresses increases in free surface effects associated with any increases in length or height of bulwarks. The MBI was not provided documentation indicating that a qualified individual conducted a stability assessment of this new bulwark installation.

Steering Repairs

4.5.34. In May 2011, Hydro-Pro located in Dutch Harbor, Alaska completed a steering system overhaul. The associated invoice stated "Labor – install lock valves on cylinders to correct leak. Install ball valves, install selector valve. Repair Steering Problem."

4.5.35. In January 2013, while the vessel was undergoing repairs to hull damage at the Pacific Fisherman, Inc. dry-dock, Coastal Fluid Power, Inc. worked on the steering system. The associated invoice stated "Steering hydro line replacement, materials, and repair to reinstall mechanical systems in engine room to fit around new steel work."

4.5.36. In June 2015, Coastal Fluid Power, Inc. welded a crack on the steering system's hydraulic holding tank to correct a leak. The president and owner of Coast Fluid Power explained that after his mechanics re-welded the crack to correct the leak, they refilled the steering system with hydraulic fluid, purged the system, and tested the system to ensure it was working properly without any air in the system.

4.5.37. On October 16, 2015, the captain sent a text to the owner via satellite communicator regarding a steering failure incident. He sent the following: "Both steering pumps are sticking again randomly. I can unstuck them with the jogstick by switching pumps back and forth and hitting jog stick."

4.5.38. From April thru July 2016, while moored at Marine Fluid Systems, Inc. located in Seattle, Washington, Coastal Fluid Power, Inc. overhauled the steering system. The president and owner of Coastal Fluid Power stated this repair was "a complete tear down and rebuild of the steering system. Fabricated a new hydraulic tank and went through all the components." The crew of DESTINATION explained to him "there was a case where the steering had got stuck hard over, for some reason, and they [the crew] were able to turn on to the auxiliary system and continue to steer the boat."

4.5.39. Noting this was an "obvious" problem with the steering system, the president and owner of Coastal Fluid Power had his mechanics dismantle the system to identify and investigate the probable cause. The mechanics systematically started taking components apart and inspecting them until they discovered contamination in the system. The mechanics found contamination particulates (very small solid particulate, such as old sandblasting media) in the hydraulic spool valve that would have caused that valve to stick. Working to identify the only source for the contaminate, they found it came from the hard line hydraulic piping between the lazarette and the control valve, as it is the only part of the hydraulic steering system that does not contain a filter to catch those contaminates. They determined the integrity of the pipe was fine, as far as the wall thickness and the pressure. To address the issue, they believed the system required a high velocity flush to clean the system.

4.5.40. To remove the contamination within the hydraulic piping system, the mechanics first air tested the lines to ensure that there were no leaks within the system. Then, over a course of a week, they flushed the system with high velocity oil using a high velocity pump, looping the lines into an external filter. They then checked the filters for contaminate and exchanged them on a regular basis, until the filters no longer captured contaminate, indicating a clear system.

4.5.41. After completing the high velocity flush to remove contaminate, the mechanics replaced components such as solenoids and control valves. They then retested the system during sea trials with the electronics technician to make sure the autopilot was interfacing properly with the actual mechanical steering system in the engine room. Results of the sea trials proved positive, that the steering system was operational.

Marine Surveyor Valuation and Survey of Condition (2016)

4.5.42. On June 7, 2016, a surveyor from Waypoint Marine Surveyors conducted a valuation and survey of condition on the DESTINATION and generated the associated report of inspection. As stated on the report's cover sheet, the inspection was:

> "made at the request of [the owner], representing vessel owners. The inspection was conducted while the vessel lay afloat at Marine Fluid Systems in Seattle, Washington. The inspection was conducted in order to ascertain the condition and valuation for insurance only." and "the attending surveyor and this office do not express an opinion relative to the stability of this vessel." Under "conditions and comments", the surveyor listed the vessel's general condition as "appears to be a sound vessel, well maintained and upgraded. The vessel is in good condition with normal wear for the age of the vessel. The vessel appears properly laid out and equipped for her service area." Under "recommendations", he stated, "There were no found discrepancies noted prior to the completion of this survey."

4.5.43. The surveyor stated the intent of the introduction paragraph of the report of inspection was to "state what I was instructed to do. I also have the fact that I did it in the water. That I did not look at the vessel's bottom at that time. I do not comment on anything about stability, as I am not certified to do so. And there is just some legal disclaimers that I was advised to put into my report."

4.5.44. The surveyor stated he was not "certified to formulate stability formulations. I've never been trained to do so… the only thing I know how to do is load a deck. I don't, I've never, I know how to read a stability report but I, I've never commented on stability as a surveyor." He stated that he was familiar with stability instructions books, was trained to review them and was familiar with requirements for CFVs. He stated, "I am... I have reviewed that they have them, yes. I don't review them for accuracy though… I can't comment on pot size, pot load because I am not familiar with the formulations, I didn't, I am not a -- I'm just a surveyor, I am not an architect... So that's above my abilities."

## 4.6. Crab Pot Information

### History, Replacement and Repairs

4.6.1. The DESTINATION, when originally constructed as the COMPASS ROSE, used crab pots that weighed 700 pounds (including lines and buoys) and their size was 6.5 feet by 6.5 feet by 34 inches.

4.6.2. When developing the DESTINATION's stability instructions in 1993, the qualified individual used 700 pounds as the weight of each crab pot, including gear, within his calculations. The captain of the vessel at the time informed him of the crab pot's weight. The qualified individual did not verify the actual weight of each pot through direct observation. Further, the qualified individual did not specifically indicate the weight of each crab pot within the stability instructions.

4.6.3. The DESTINATION's owner purchased new pots since the 1993 stability instructions. The owner purchased pots measuring 7 foot by 7 foot by 34 inches to replace the 6.5 foot by 6.5 foot by 34 inch pots.

4.6.4. Dorian Metal Fab and Eclipse Gear Supply, the companies that supplied the replacement pots to the owner before 2016, have since gone out of business. Dungeness Gear Works, the company that last supplied refurbished pots to the DESTINATION, provided limited records regarding pot sales to the DESTINATION. The owner of Dungeness Gear Works stated he sold the DESTINATION 25 pots in May of 2000. The pots dimensions were 7 foot by 7 foot by 34 inches. He calculated the weight of the material supplied on the "cut sheet", which showed each pot weighed 721 pounds, lines and buoys weighed 149 pounds, for a total of 870 pounds.

4.6.5. In June 2016, the owner of the DESTINATION purchased 101 reconditioned pots from Dungeness Gear Works. The owner of Dungeness Gear Works stated they do not weigh the pots prior to delivering them to a customer. Rather, they calculate the weight of the pots based on the cut length of the steel used during reconditioning, and determined the total weight of each pot was 719 pounds.

4.6.6. The owner of the DESTINATION did not keep records of the crab pots indicating its specifications or when purchased. He stated that he knew the crab pots were each 7 foot by 7 foot by 34 inches, but did not know the number or weights of those pots onboard the vessel. When asked to provide the weight of the crab pots, he stated, "I don't know. You guys probably know more than I do, if you've retrieved a pot. I don't know the weight of it now."

## Recovered Crab Pot

4.6.7. On July 25, 2017, the Coast Guard Cutter HEALY recovered a crab pot located near the wreck of the DESTINATION on the sea floor. Using the cutter's crane and calibrated scale, the pot weighed 880 pounds including the gear stored inside (see Figures 44 and 45).

Figure 44. Crewmembers onboard the HEALY recovered a crab pot located near the wreck of the DESTINATION on the sea floor. Photo taken by Coast Guard Public Affairs on July 25, 2017.


Figure 45. The HEALY weighed the recovered crab pot at 880 pounds with gear.
Photo taken by Coast Guard Public Affairs on July 25, 2017.

4.6.8. On August 24, 2017, while the HEALY was in Dutch Harbor, Alaska, CFVEs from Marine Safety Detachment Dutch Harbor examined the recovered pot and collected additional information (see Figures 46-49).

4.6.9. The crab pot was damaged, but measurements taken indicate a top bar length of 7 feet by 7 feet, and a depth overall of 32 inches. The pot contained two buoys, each stenciled with a number. The larger yellow buoy had "42234" and the smaller red buoy had "50". The "42234" matches the DESTINATION's ADF&G shellfish vessel registration number. There were three ¾ inch lines in the pot, two red and one light blue. When faked out on deck, the red lines measured at 177 and 197 feet, and the blue line measured at 189 feet. The combined weight of the gear (buoys and line) was 140 pounds, and the pot itself weighed 700 pounds, for a total combined weight of 840 pounds.

Figure 46

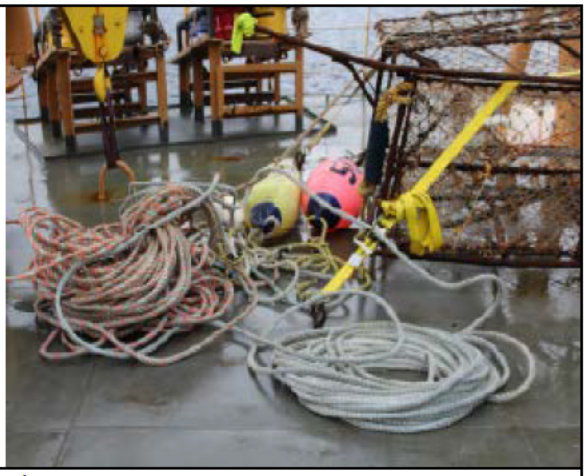


Figure 47

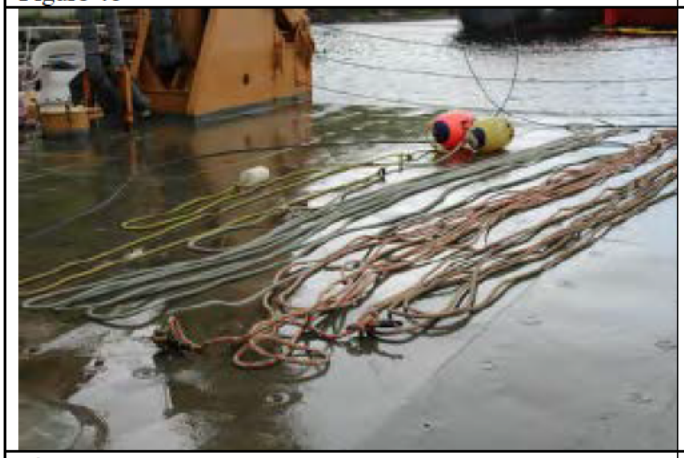


Figure 48


Figure 49

Figures 46-49. Photos of recovered crab pot examination taken by MSD Dutch Harbor vessel examiners.

## 4.7. Lifesaving and Communications Equipment

### Lifesaving Equipment

4.7.1. The DESTINATION had onboard all lifesaving equipment required by the CFV regulations of 46 CFR Part 28. Figure 50 provides illustrations of typical lifesaving equipment required by the regulations, including EPIRB, liferaft, and immersion suit.

Figure 50. Open source web images of typical EPIRB, liferaft and immersion suit.

4.7.2. A third party surveyor from NAVTECH/USSA completed a valuation and survey of condition inspection on June 7, 2016 and a dockside safety examination on June 10, 2016 for the DESTINATION. This was the last survey and examination on the vessel. During both, the third party surveyor documented that the vessel had the following lifesaving equipment, as listed in Figure 51.

| Lifesaving Equipment | | |
|---|---|---|
| Type | Amount | Details |
| Personal Flotation Devices (PFD) | 6 | -- |
| Liferings | 2 | -- |
| Flares | -- | -- |
| Immersion Suits | 6 | -- |
| Inflatable Liferaft | 1 | DBC 8 person |
| Pack Type | -- | SOLAS A |
| Hydrostatic Release expiration date: | -- | February 2018 |
| Inspection Date: | -- | July 2018 |
| EPIRB | 1 | McMurdo A406 |
| Bracket Category | -- | One |
| Hydrostatic Release expiration date | -- | May 2021 |
| Battery expiration date: | -- | May 2021 |
| NOAA Registration expiration date | -- | May 2018 |
| Beacon ID: | -- | ADCD41C3040028D |

Figure 51. 2016 listing of lifesaving equipment onboard the DESTINATION.

4.7.3. As illustrated in Figure 52, the inflatable liferaft was located on the port side on top of the captain's cabin, aft of the wheelhouse. The EPIRB was stored on the starboard side, on the aft bulkhead of the captain's cabin.


Figure 52. Locations of the liferaft and EPIRB.
Undated photo taken and provided by former crewmember.

Communication and Automatic Identification System (AIS) Equipment

4.7.4. The DESTINATION had onboard all communication equipment required by the CFV regulations of 46 CFR Part 28, including VHF-FM radiotelephone, Single Side Band (SSB) radio, and Automatic Identification System (AIS) Equipment.

4.7.5. A third party surveyor from NAVTECH/USSA completed a valuation and survey of condition inspection on June 7, 2016 and a dockside safety examination on June 10, 2016 for the DESTINATION. This was the last survey and examination on the vessel. During both, the third party surveyor documented that the vessel had the following communication equipment, as listed in Figure 53.

| Communication Equipment | |
|---|---|
| Raytheon 150-SSB (1) | Icom IC-2100 HM/FM (1) |
| Standard Horizon Explorer VHF (1) | Icom M-700 (2) |
| Standard Horizon LH 10-Hailer (1) | Global Star satellite phone (1) |
| Icom IC-M604 VHF (1) | Standard Horizon –VHF (1) |
| Sea 222- SSB (1) | Mitsubishi Trac Phone (1) |
| SEASAT – Standard C (1) | -- |

Figure 53. 2016 listing of communication equipment onboard the DESTINATION.

4.8. Vessel Operations

## Personnel

4.8.1. The owner of the DESTINATION has a long history working in the BSAI fishing industry. He started working on fishing boats at age 8. In 1977, he collaborated with his brother to purchase his first fishing vessel, the JUPITER, which later ran aground and was lost in 1981. The brothers then purchased the KETA that same year. In 1985, the owner purchased the COMPASS ROSE and renamed it the DESTINATION. By 1993, he stopped operating the vessels to take an active role as owner-management, including owning and operating the SILENT LADY for a short period, and then acquiring the LADY JOANNE.

4.8.2. In 1993, the owner hired the captain to operate the DESTINATION for the next fishing season. The owner allowed the vessel captain to hire and decide the vessel's crew.

4.8.3. The crewmembers onboard the DESTINATION had years of experience working onboard the DESTINATION, ranging between 3 to 23 years (see Figure 54).

| Crewmember | First Pay Date | Years Onboard |
|---|---|---|
| Captain | November 1994 | 23 |
| Engineer | May 1996 | 21 |
| Deckhand 1 | April 1995 | 22 |
| Deckhand 2 | November 2010 | 7 |
| Deckhand 3 | December 2010 | 7 |
| Deckhand 4 | April 2014 | 3 |

Figure 54. Crewmember experience working onboard the DESTINATION.

## Licensing

4.8.4. U.S. Code and federal regulations exempt vessels of less than 200 GT from compliance with the Officer's Competency Certificates Convention, 1936, implemented in 46 USC 8304 and 46 CFR 15. Therefore, as a vessel of 196 GT, there was no requirement for the crew of the DESTINATION to hold a valid Coast Guard license or credential.

4.8.5. The captain previously held a Coast Guard Merchant Mariner Credential issued on June 1, 2010, with an expiration date of June 1, 2015. The Coast Guard endorsed the credential with "Master to vessels of not more than 1600 Gross Registered Tons (Domestic Tonnage), 3000 Gross Tons (ITC Tonnage), Upon Near Coastal Waters, Radar Observer (Unlimited). Limited to service on vessels not equipped with life boats." The captain did not seek to renew.

4.8.6. Deckhand 2 was the holder of a Coast Guard Merchant Mariner Credential issued on September 21, 2015 with an expiration date of September 21, 2020. The Coast Guard endorsed the credential with "Master of self propelled vessels not including auxiliary sail of less than 100 GRT upon near coastal waters."

4.8.7. No other crewmembers held or had held Coast Guard Merchant Mariner Credentials.

## Training

4.8.8. Title 46 CFR 28.270 requires the master or individual in charge of each fishing vessel to ensure that the crew conducts drills and receives safety instruction at least once each month. A certified Fishing Vessel Drill Conductor must perform the drills and instruction.

4.8.9. The owner expected his captains to conduct and log the drills, especially at the start of the season or when a new crewmember came aboard. To assure the captains conducted the drills, he required them to fax him the crew training log forms.

4.8.10. On June 03, 2005, the captain and deckhand 1 attended a one-day, 10-hour course in Seattle, Washington held by the Alaska Marine Safety Education Association (AMSEA). This training fulfilled the requirements for an individual to conduct instruction, drills, and safety orientations as a Fishing Vessel Drill Conductor.

4.8.11. The captain held safety meetings with the crew prior to each fishing season and crewmembers sign an attendance sheet.

4.8.12. Former crewmembers indicated the captain took safety training, drills and instruction very seriously. The captain conducted the training while in port and addressed various situations, flooding, man overboard, and general overview of any type of emergency.

4.8.13. AMSEA and the NPFVOA offer formal stability training. In addition, NPFVOA makes its vessel safety manual and stability training videos available to CFV owners and operators. The owner never approached AMSEA or NPFVOA to provide this stability training for his crewmembers. None of the crewmembers from the DESTINATION participated in this training. The owner never provided his crew third party training courses, including stability training.

## Work/Rest

4.8.14. U.S. Code and federal regulations implemented in 46 USC 8304 and 46 CFR 15 specifically exempt fishing vessels, other than fish processing vessels, from watch, working hour (work-rest) requirements and compliance with the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978. The DESTINATION was not required to maintain a regulatory prescribed watch schedule, work-rest or maintain crew competencies.

4.8.15. The owner did not have any written or verbal company policies relating to work hours and fatigue. The owner left vessel work-rest hours up to the captain and crew.

4.8.16. A former crewmember stated that the crew working for “twenty-four hours wasn't uncommon, 36, 48 hours straight wasn't uncommon especially if there were delivery dates that had to be met depending on the scenarios…it just really all depended on how the season got off to a start… if we were running behind schedule. Usually that first trip was hell.” Another former crewmember stated a normal schedule would include 20 hours on, with 4 hours off. He added they “never” were able to get eight hours of sleep a night while fishing.

## Navigational and Engine Room Watch

4.8.17. Crewmembers stood navigational watch on the bridge monitoring the automatic steering of the vessel (autopilot). The bridge was equipped with a closed circuit video camera for live viewing in the engine room.

4.8.18. To prevent sleeping while on watch, the vessel was equipped with an alarm system and audible alarm that required manual reset every 10 minutes.

4.8.19. Crewmembers left the bridge unattended every hour with the autopilot on to visually inspect the engine room. During these rounds, they would grease the cutlass bearings on the shaft every six hours at 0000, 0600, 1200, and 1800.

## Freezing Spray Conditions

4.8.20. When transiting in freezing spray conditions, one former crewmember stated the watch would walk around on deck and check on the pot stack. Former crewmembers stated that they chip the ice off using rubber sledgehammers when freezing spray accumulated on the vessel.

4.8.21. One former crewmember stated that a vessel's stability book provides a "general idea what tonnage your boat could take for freezing spray. And everybody's judgment calls on how much ice they can take and handle and get rid of, a lot of experience involved in icing."

## No. 3 Hold Access Hatch

4.8.22. While in transit with pots on deck, the captain consistently directed the crew to keep access covers to number 1 and 2 holds closed and number 3 off. Figure 55 shows the access hatch cover to number 3 hold located on deck aft of the open number 2 hold hatch. The cover was typically stored on deck in close proximity to the number 3 hold.

Figure 55. Number 3 hold access hatch, circled in red.
Photo taken and provided by former crewmember.

4.8.23. One former crewmember stated, "When I was on the boat, I had a hatch cover open on the aft tank…The engineer said, [the captain] wants it that way, and that was the way it was." Another former crewmember stated, "Tank 3, we usually left the hatch off. Actually, we always left the hatch off."

## Propeller Shaft Stuffing Box

4.8.24. Access to the DESTINATION's propeller shaft tube and stuffing box for the gaskets is through an access hatch on the shaft void located on the lower deck of number 3 hold. The crew can drain into the engine room bilge any collected seawater in the shaft void that entered thru the stuffing box. The crew would then discharge the seawater overboard using the bilge system.

4.8.25. When known to be leaking, the crew would access the shaft void to tighten the bolts around the packing gland flange of the stuffing box. This would slow shaft seal leaks. Former crewmembers indicated the crew routinely checked and made needed adjustments to the stuffing box while in port, never while underway.

4.8.26. The owner stated he had a phone conversation with the captain on Thursday afternoon, February 9, 2017, while the DESTINATION was proceeding towards Dutch Harbor. During the conversation, the captain informed the owner that the stuffing box was leaking and the crew had to tighten the flange to a four-second drip. The captain planned to check the stuffing box while in Dutch Harbor.

## 4.9. Crab Fishing Operations

### Bait

4.9.1. According to the stability instructions, the DESTINATION's bait freezer could hold up to 6,048 pounds (2.7 LT) of bait.

4.9.2. Former crewmembers stated that in addition to the bait stored in the bait freezer, the crew carried extra bait on deck outside the galley door and by the bait chopper, as well as on the forecastle deck aft of the wheelhouse. On occasion, the crew would store bait in totes on top of the crab pots. In these cases, the totes usually contained about 1,000 pounds of cod used for bait.

4.9.3. During opilio season, one former crewmember stated, "For an average opilio trip we'd take approximately 10,000 pounds of box bait, 6,000 of that approximately would be in the freezer and then the rest would be on deck on the port side, palletized and strapped down and secured."

### Loading Conditions

4.9.4. As illustrated in Figure 56, the DESTINATION typically carried 200 pots stacked in five tiers and with number 1 and 2 holds flooded (tanked). When transiting from port to port or between fishing grounds with a full pot load, the first tier of pots was stored vertically, standing up on its end, and the upper tiers were stored horizontally on their sides. By leaving a gap down the centerline of the deck, the crew created a 7-foot-tall by 36-inch wide tunnel. The tunnel allowed the crew to walk along the deck down the centerline to reach the stern cleats, as well as to access the hatch covers located centerline on the deck, including all hold hatches, steering room and lazarette.

Figure 56. DESTINATION's typical pot loading condition.
Undated photo taken and provided by former crewmember.

4.9.5. Former crewmembers stated the crew needed to access the steering room or lazarette to access steering lines and pumps, and to check or address flooding, and access number 3 hold in order to reach the opening to the stern tube and stuffing box.

4.9.6. Multiple former crewmembers stated the captain consistently carried 200 crab pots. The captain was comfortable carrying 200 pots, as it was a manageable number for maximum efficiency. The size of pots fit the boat well, and allowed the crew to move the pots in a timely manner. One former crewmember referred to the captain's preferred 200 pot load as "a haystack, a big stack."

4.9.7. The owner did not know the captain's routine loading condition of the DESTINATION, the number of crab pots or the number of holds tanked when transiting. The owner did not have any recent conversations with the captain about the routine loaded condition of the vessel. When asked if he had any conversations with the captain regarding the loaded condition of the vessel, the owner stated, "We may have a long time ago, you know, in the '90s. I don't remember any recent, and I couldn't even pin a conversation down about it. We may have spoken about stability and many things about fishing, but I don't remember what they are."

4.9.8. The owner had one conversation with the captain regarding the DESTINATION's stability instructions. The conversation took place in 1993 when the captain first operated the DESTINATION. The owner stated, "Conversations, of course, have been so long ago. If you think, you know, back when he started running the boat in '93, we probably did. I don't remember the exact conversations back then. But after being with me for 23 years, I don't remember any recent conversations about it. But he was a very well-respected, very knowledgeable, one of the best guys I know in the fleet by the way, and I'm sure the book was available. I'm sure he used it regularly; although, I don't know."

4.9.9. The owner was not familiar with the loading table provided in the stability instructions. When asked if he was familiar with the loading table, the owner stated, "No… I've never captained this boat after it was made larger."

4.10. Crab Rationalization

## Quota System and Permitting

4.10.1. NOAA's National Marine Fisheries Service (NMFS) and the Alaska Department of Fish and Game (ADF&G) jointly manage the BSAI crab fisheries.

4.10.2. The NMFS Restricted Access Management Program issues annual quota permits and quota transfers amongst the participants for the BSAI Crab Rationalization Fishery.

4.10.3. The ADF&G's Division of Commercial Fisheries conducts fisheries research and management. ADF&G determines fleet-wide harvest levels, known as the guideline harvest level, for each fishery on an annual basis.

4.10.4. Prior to 2005, management of the BSAI Crab fishery consisted of an "Olympic" system, a "derby-style race for fish" system where vessels competed directly with each other to maximize catch and revenues within the limitations of the guideline and fleet-wide harvest level.

4.10.5. In 2005, management of the BSAI crab fishery changed from the Olympic system to a Crab Rationalization (CR), quota-based system. The CR system provides allocations of crab resources to harvesters (vessels and owners), processing companies (processors), and communities.

4.10.6. Under CR, the NMFS issues harvesters a quota share based on their catch history recorded during the historical period (qualifying years). Annually, the NMFS allocates harvesters an Individual Fishing Quota (IFQ) based on the species-specific amount authorized for harvest by weight within a certain timeframe, the Total Allowable Catch (TAC) determined by ADF&G, and the quota shares held by the harvester quota shareholder.

4.10.7. Similarly, processors hold a processing quota share also based on their historical participation during the fisheries, and annually receive an Individual Processing Quota (IPQ), the number of pounds based on the TAC, and their processor quota share holdings.

4.10.8. Also based on crab fishing landing history, CR assigned delivery quotas to regional offload and delivery locations: North, South and Undesignated. Harvesters and processors are required to land a percentage of their catch in those communities, thus protecting revenues and employment in fishery dependent coastal communities.

## Cooperative Pools

4.10.9. Many harvesters form cooperatives to pool, manage, lease or sell their IFQs. Cooperative managers will allocate the percentage of harvest quota to vessels participating within the cooperative. Cooperatives can transfer IFQs within the cooperative or to other cooperatives.

4.10.10. During the 2016-2017 crab season, the DESTINATION, managed under Destination Inc., belonged to the Inter-Cooperative Exchange (ICE) cooperative pool.

4.10.11. ICE currently has 183 member entities, residing in ten voting districts, and harvesting around 70 percent of the IFQ for each of the rationalized crab fisheries. During the 2016-2017 crab season, ICE had a total of 481 quota shareholders and 29 processing quota shareholders.

4.10.12. The DESTINATION was a member of the Alaska Fisherman's voting district, a voting district of ICE. There are six vessels with the Alaska Fisherman's voting district including the ALEUTIAN LADY, AMERICAN LADY, and CONSTELLATION (affiliated with Shelford Fisheries), and the DESTINATION, DETERMINED, and the KETA (associated with Destination Inc.).

4.10.13. Some of the voting districts in ICE have managers that manage their voting districts. Some of them will have 30 or 40 vessels in their voting districts and hire a manager to arrange for deliveries and transfers of IFQ between other ICE cooperatives, and outside of ICE, and conduct other administrative work related to the operation of the cooperative. The Alaska Fisherman's voting district does not have a specific voting district manager, but rather the owners manage the IFQs.

4.10.14. The CR program involves a matching process where each IFQ is matched with an IPQ. The Alaska Fisherman's voting district, as with each voting district within ICE, has the ability to match their own designated IFQ with IPQ holders.

4.10.15. On February 11, 2017, the Alaska Fisherman's voting district had two vessels that were fishing 914,118 pounds of IFQ for the 2016-2017 opilio season, the DESTINATION and ALEUTIAN LADY. After February 11, 2017, the ALEUTIAN LADY harvested 774,293 pounds and the Alaska Fisherman's voting district transferred the remaining portion of the IFQ.

4.10.16. On October 11, 2016, ICE, as a cooperative, entered into a share match and lengthy season arbitration agreement with Trident Seafoods as the processor for the 2016-2017 crab season. The agreement set price and delivery terms that were subject to arbitration. It established that the cooperative agrees to deliver to the processor its IFQs, and the processor agrees to accept all IFQ crab delivered.

4.10.17. The executive director of ICE's correspondence indicated Trident Seafoods in St. Paul planned to close its facility between February 20-25, 2017. An ICE cooperative vessel completed its delivery in St. Paul on February 23, 2017.

Quota Trading to Meet Delivery Deadlines

4.10.18. The executive director of ICE stated that because opilio season ends on the last day of May, there is enough time for vessels to deliver their crab. However, some vessels have other obligations, such as other fisheries or tender operations, so they may establish their own dates for completion. Trident Seafoods operates the only crab processing facility in the North Region (St. Paul). The processing plant works with harvesters to land the crab in an efficient and economic timeframe to minimize operating expenses.

4.10.19. The executive director of ICE stated vessel operators and the cooperative could work with the processors in cases of a vessel having a delivery date that is incompatible with their operations, or when they cannot meet projected delivery deadlines established by the processors. If the cooperatives and processors cannot agree upon delivery or pricing terms, there is an option for negotiation and arbitration related to the delivery of the catch to the facility.

4.10.20. The executive director of ICE stated a processor facility would have to stay open longer if the cooperative was unable to deliver all their IFQs. ICE works with the processor's as much as possible to get the IFQ to the Trident Seafoods St. Paul facility by the projected closure date. It is common practice for ICE members to trade North for South IFQs if the individual member does not believe they will be able to make all their deliveries to the North facility in advance of the projected closure date.

4.10.21. The executive director of ICE stated other options are available. In 2014, a regulatory change established a Regional Landing Exemption in which cooperatives can apply for an exemption to landing crab in the North if weather conditions, or any other conditions, make it impossible, difficult, or hazardous to land crab there. In exchange, the cooperative would have to provide some compensatory landings the next crab season, or other negotiated terms between the processors and the communities. Application of the Regional Landing Exemption is complex. Thus, ICE tries to avoid it by transferring IFQs to vessels that can make the deliveries earlier in the season and trading North for South IFQs within the cooperative.

4.10.22. On December 2, 2016, the fleet manager at Trident Seafoods in St. Paul sent the BSAI crab fleet a letter indicating the facility was planning to close between February 20-25, 2017. At no time after Trident Seafoods issued this letter did the owner or the captain of the DESTINATION request an extension of the delivery date. The fleet manager also stated that if a vessel operator has concerns regarding the target delivery date, he would be willing to work on a solution and extend the facilities operations.

4.10.23. In the past, the captain of the DESTINATION communicated concerns to Trident Seafoods regarding delivery dates in St. Paul. In a December 20, 2015 e-mail to Trident Seafoods, the captain stated "…we plan on fishing cod starting in January, and… I'm not sure about your rather enthusiastic date of closing St. Paul…"

4.10.24. The captain of the ALEUTIAN LADY explained that Trident Seafoods in St. Paul is the sole Northern IPQ facility, and he understood they try to target a certain timeframe to open and close the processing plant as soon as they can, especially to avoid delays due to the harbor icing later in the season. He stated that Trident Seafoods fleet manager does a good job of scheduling harvesters to coordinate delivery of their catch to the facility. The fleet manager established delivery schedules based on 10-day advanced notice, with confirmation notification three days in advance of delivery. If a vessel needs to reschedule their delivery date and contact the facility in advance, Trident Seafoods would accommodate the request. The captain of the ALEUTIAN LADY indicated that he has missed scheduled delivery dates before but was able to reschedule without issue.

4.10.25. The captain of the SILVER SPRAY explained, in his view, the rationalization system provides flexibility; offloading times and dates are worked out within the system. He added, "as far as maybe not making a delivery date, there is usually flexibility to deliver another date."

4.11. Search and Rescue

Summary of SAR Efforts

4.11.1. The Coast Guard first became aware the DESTINATION was in distress at 0615 on February 11, 2017, when the D17 CC received a satellite 406 MHz EPIRB distress alert message transmitting approximately 2.7 NM north of Dainoi Point, St. George Island (see Figure 57).

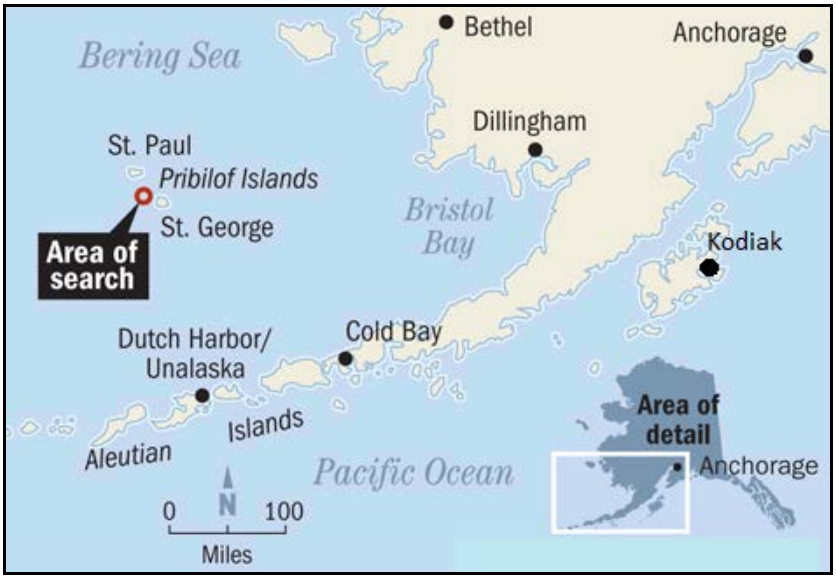



Figure 57. General area map of Western Alaska and search area. Seattletimes.com.

4.11.2. After confirming the EPIRB was registered to the DESTINATION and attempts to call the vessel and establish communications, the D17 CC contacted the SAR Mission Coordinator (SMC). The SMC directed SAR operations utilizing multiple rotary wing (helicopter) and fixed wing aircraft, a Coast Guard Cutter, and Good Samaritan vessels (voluntary assistance vessels).

4.11.3. At approximately 0930, Good Samaritan vessels arrived at the DESTINATION's AIS and EPIRB Last Known Position (LKP), and located a debris field. The first Coast Guard aircraft arrived at the vessel's LKP at 1013. At 1140, a Good Samaritan vessel recovered the DESTINATION's transmitting EPIRB, life ring and crab buoys. Upon concluding that the DESTINATION sank and after extensive searches found no survivors, the Coast Guard suspended active search operations pending further development (ACTSUS) at 1700 on February 14, 2017. During SAR operations, the Coast Guard conducted 21 total search sorties, consisting of 69.71 hours, 5,731 square NM of ocean and 5,887 NM track miles searched.

Coast Guard SAR Resources in Western Alaska/Bering Sea

4.11.4. The Coast Guard's SAR readiness and mission response standards published in COMDTINST M16130.2F provides resource planning guidance to Coast Guard District and Sector Commanders, who are responsible for the basing or staging of SAR units and assets. In making their resource deployment decisions, they must take into account resource constraints, environmental considerations and other factors.

4.11.5. Available Coast Guard SAR resources in Western Alaska mainly include air resources from Air Station Kodiak with five C-130 fixed wing long-range aircraft (Figure 58) and six H-60 medium range helicopters (Figure 59). Coast Guard cutters also patrol the region, including a 378-foot cutter, capable of launching and recovering a H-65 helicopter. During a typical opilio crab season, or depending on the number of commercial vessels operating in the western Bering Sea region, Air Station Kodiak operates a Forward Operating Base (FOB) out of Cold Bay with one H-60. The H-60 operating out of Cold Bay can reach crab vessels operating in the region on the first sortie.

Figure 58. HC-130

Figure 59. H-60

4.11.6. The Coast Guard describes SAR levels of readiness, including B-0 and B-2 status. B-0 means an aircraft will launch within 30 minutes of notification of distress with an on-scene time within 90 minutes after launch. B-2 means an aircraft will launch within two hours of first notification of distress. B-2 readiness does not include a requirement for the aircraft to arrive on-scene within a certain timeframe.

4.11.7. During SAR operations in the western Bering Sea region, the Coast Guard uses multiple aircraft, including one for cover and another for "self-rescue." The cover aircraft, typically a
C-130, provides communication support given the limited radio coverage in the Bering Sea. The self-rescue aircraft, usually a rotary wing, launches so it is ready to respond if the first SAR aircraft goes down in the water.

4.11.8. On February 11, 2017, at Air Station Kodiak, a H-60 was in a B-0 status. The Cold Bay H-60 was in a B-2 status.

4.11.9. At 0615 on February 11, 2017, D17 CC received a satellite 406MHz EPIRB first alert report from the United States Mission Control Center, which monitors EPIRB transmissions.

4.11.10. This report indicated a detection time of 0613 and a beacon position of 56° 37.3N and 169° 57.8W (approximately 2.7 NM west of Dainoi Point, St. George Island). The report also included beacon registration database information listing the vessel's name: DESTINATION; radio equipment: VHF, SSB; owner's name, and contact phone numbers.

4.11.11. The DESTINATION's EPIRB, a McMurdo Smartfind E5, did not contain a built-in GPS receiver. There was no requirement for the EPIRB to contain a built-in GPS receiver. GPS EPIRBs transmit precise coordinates within the first few minutes to the overhead satellite in a single pass. Rather, the DESTINATION's non-GPS version transmitted its coordinates using doppler shift from the over-flying satellites. The transmitted position accuracy is dependent on the number of receiving satellites and improves location accuracy over time.

4.11.12. Following receipt of the distress alert report, the D17 CC Operations Unit Controller (OU) watchstander called the owner at the listed contact phone numbers, left a voice message, and eventually spoke with the owner to confirm the DESTINATION was operating in the Bering Sea. The OU then asked Sector Anchorage and Communications Detachment Kodiak to initiate radio callouts, Urgent Marine Information Broadcasts (UMIB) on VHF and HF radio and Safety Net Messaging via Immarsat C. With these external communications, the Coast Guard attempted to contact the DESTINATION and asked other vessels operating in the vicinity to attempt to contact the vessel.

4.11.13. During this process, the OU also checked the AIS display system in the D17 CC, noting the DESTINATION's last AIS position feed transmitted about the same time of the initial EPIRB distress alert and the positions were within the same area.

4.11.14. After the OU took initial actions, at approximately 0634 the D17 CC briefed the SMC regarding the DESTINATION. The SMC has overall responsibility for the SAR case, including the final decisions on how to respond effectively. The SMC is the direct representative of the SAR Coordinator (SC) and is assigned to carry out all aspects of planning, coordinating, and managing the response to a SAR incident. The SMC assigned to the DESTINATION case was the District 17 Incident Management Branch Chief.

4.11.15. The OU watchstander stated the he recalled contacting Air Station Kodiak at approximately 0644 to request a Coast Guard C-130 fixed wing aircraft and the Coast Guard helicopter located at FOB Cold Bay.

4.11.16. Figure 60 provides a map from the D17 CC SAR brief, showing the deployed SAR assets and Figure 61 is an image of the initial Alpha Search plan. The D17 CC generates these maps using the Search and Rescue Optimal Planning System (SAROPS) program.

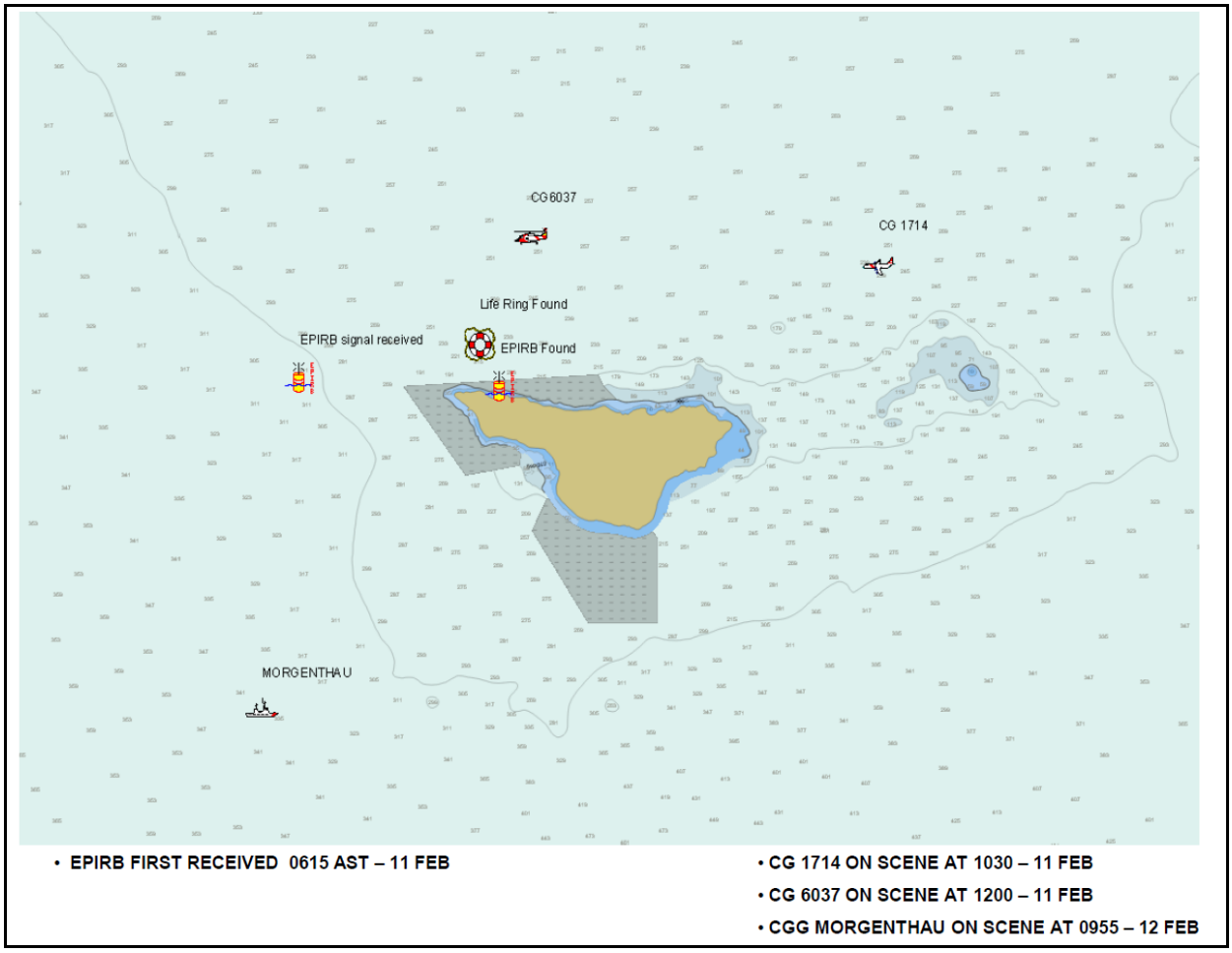


Figure 60. D17 CC SAR brief map of Coast Guard deployed SAR assets at search area.

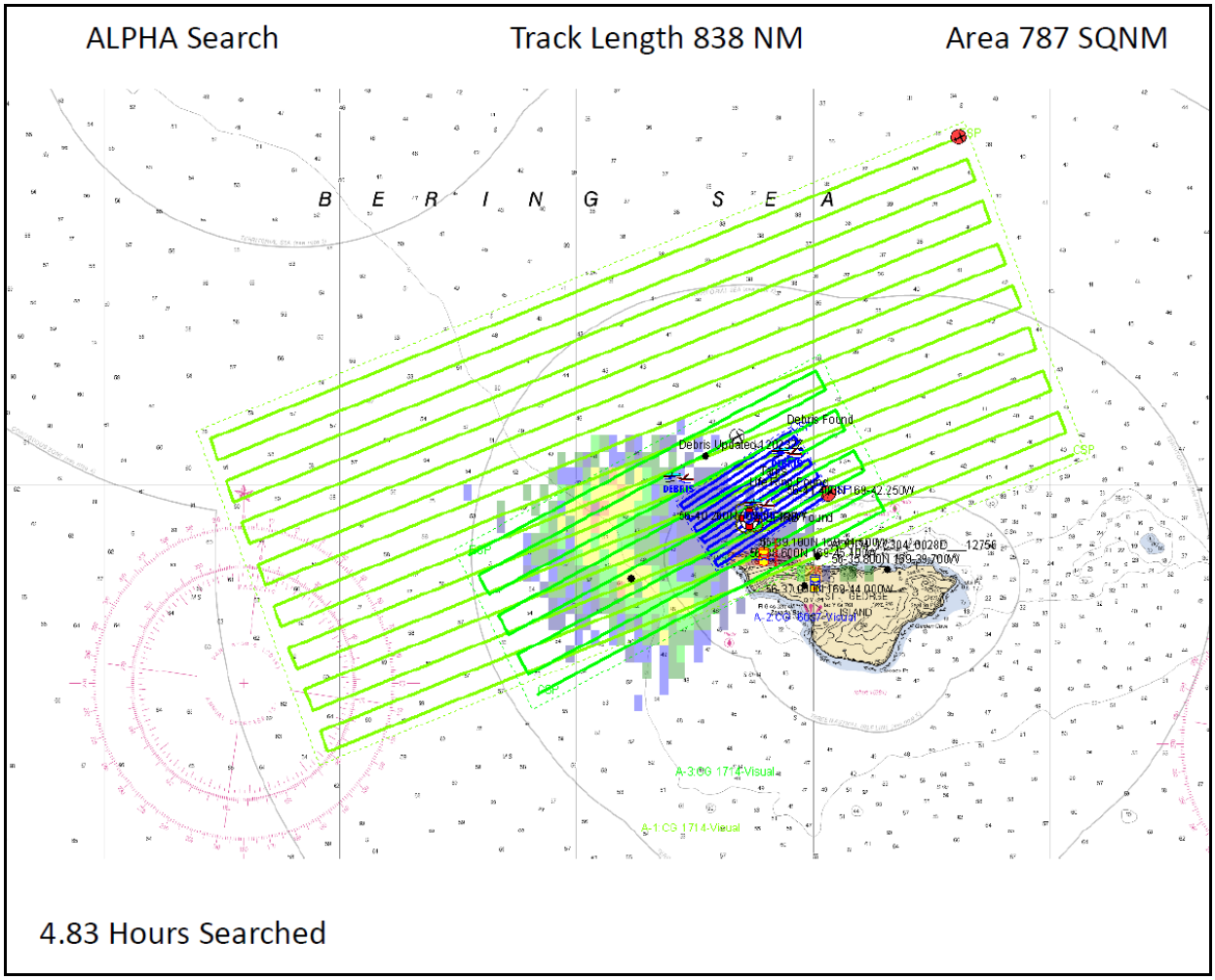



Figure 61. D17 CC SAR brief map indicating Coast Guard's initial Alpha search plan.

## On-Scene Coast Guard and Good Samaritan Assets

4.11.17. As part of the overall SAR efforts, the Good Samaritan vessels were the first to arrive on-scene after hearing the Coast Guard's UMIBs requesting assistance from nearby vessels to help locate the DESTINATION. At approximately 0930, the Good Samaritan vessel SILVER SPRAY located buoys and an oil sheen at approximate position 56° 41.40 N and 169° 42.25 W. At approximately 0950, the BERING ROSE arrived at the last known AIS position and reported no sight of the DESTINATION. The BERING ROSE then altered course to search the last known EPIRB position.

4.11.18. At approximately 0745, the Coast Guard's first SAR asset, a C-130 aircraft, tail sign CG1714, launched from Air Station Kodiak. After approximately a two and half hour flight, it arrived at DESTINATION's LKP at approximately 1013 and commenced search patterns.

4.11.19. The Coast Guard's rotary wing aircraft H-60, tail sign CG6004, initially attempted to launch from Air Station Kodiak at approximately 0809. However, its departure was delayed due to ice accumulating in the engine inlets as it taxied on the runway. This required the H-60 to return back into the hanger to de-ice the engine inlets. It launched later at approximately 0840.

4.11.20. The Coast Guard's rotary wing aircraft H-60, tail sign CG6037, launched from FOB Cold Bay at approximately 1004 and arrived at the DESTINATION's LKP at approximately 1200. Upon arrival on-scene, it commenced search patterns. The H-60 located the EPIRB floating in position 56° 37 N and 169° 44 W and directed the SILVER SPRAY to its location.

4.11.21. At approximately 1140, the SILVER SPRAY located and recovered a lifering bearing the name "DESTINATION". (see Figure 62).

Figure 62. Photo of recovered lifering taken by onboard the SILVER SPRAY.

4.11.22. At approximately 1225, the SILVER SPRAY located and recovered the DESTINATION's EPIRB (Figure 63) and reported the NOAA registration number listed on the EPIRB to D17 CC. The SILVER SPRAY also reported they found the EPIRB's tether line attached with electrical tape to a floating yellow rope.


Figure 63. Photo of the recovered EPIRB taken onboard the SILVER SPRAY.

4.11.23. At approximately 1000 on February 12, 2017, the Coast Guard Cutter MORGENTHAU arrived on scene and assumed On-Scene Coordinator of all SAR Units.

Suspension of Search and Rescue Operations

4.11.24. The Coast Guard confirmed the collected debris, including a lifering and EPIRB, belonged to the DESTINATION. SAR operations did not locate any survivors, crewmember remains, or the vessel's liferaft.

4.11.25. Coast Guard D17 CC watchstanders used the Probability of Survival Decision Aid (PSDA) software within the SAROPS to calculate predicted survival times from the effects of hypothermia during cold-water immersion. Using PSDA, the watchstanders calculated best-case survival times. Functional time was 8.06 hours and predicted cold survival time was 10.65 hours, assuming crewmembers were wearing a clothing ensemble of shirt, sweater and survival suit.

4.11.26. Functional Time (core temperature above 34°C or 93.2°F) is the length of time (hours) during which an individual may participate in self-rescue or take actions that will enhance survival/protection from exposure. Cold Survival Time (hours) is the time it takes for the core temperature to drop to 28°C or 82.4°F. Below that threshold, the probability of death due to hypothermia significantly increases.

4.11.27. At 1700 on February 14, 2017, the SMC granted ACTSUS of search efforts based on the diminished chance of survival after three days in the environment and the coverage of the search area. ACTSUS was based on exceeding predicted survival time of 10.65 hours.

4.12. Survey and Dive Operations

NOAA Side-Scan Surveys

4.12.1. On March 24, 2017, the MBI requested NOAA's assistance in the search for the DESTINATION. The MBI also requested NOAA's assistance to conduct possible subsurface inspection, photography and recovery of retrievable evidence.

4.12.2. On April 3, 2017, the Director of NOAA's Office of Marine and Aviation Operations provided a response to the MBI's request. NOAA was prepared to provide the platforms and capabilities, including the NOAA Ships OSCAR DYSON and FAIRWEATHER (see Figures 64 and 65).

Figure 64. NOAA Ship OSCAR DYSON


Figure 65. NOAA Ship FAIRWEATHER

4.12.3. On April 30, 2017, the OSCAR DYSON arrived at the DESTINATION's LKP. Working over 27 hours through May 2, 2017 the crew attempted to locate the DESTINATION using the ship's Simrad ME70 multi-beam echo sounder. During the process, the crew covered 21 square NM and 207 linear NM. While their echo sounder images did not confirm the location of the DESTINATION, the OSCAR DYSON's crew created a database file of potential sonar contacts and forwarded those to the FAIRWEATHER's crew.

4.12.4. On July 8, 2017, the FAIRWEATHER arrived at the DESTINATION's LKP and commenced survey operations. Using its Klein 5000 side-scan sonar, the FAIRWEATHER's crew located a target matching the description of the vessel just outside the DYSON's echo sounder coverage area (see Figure 66).

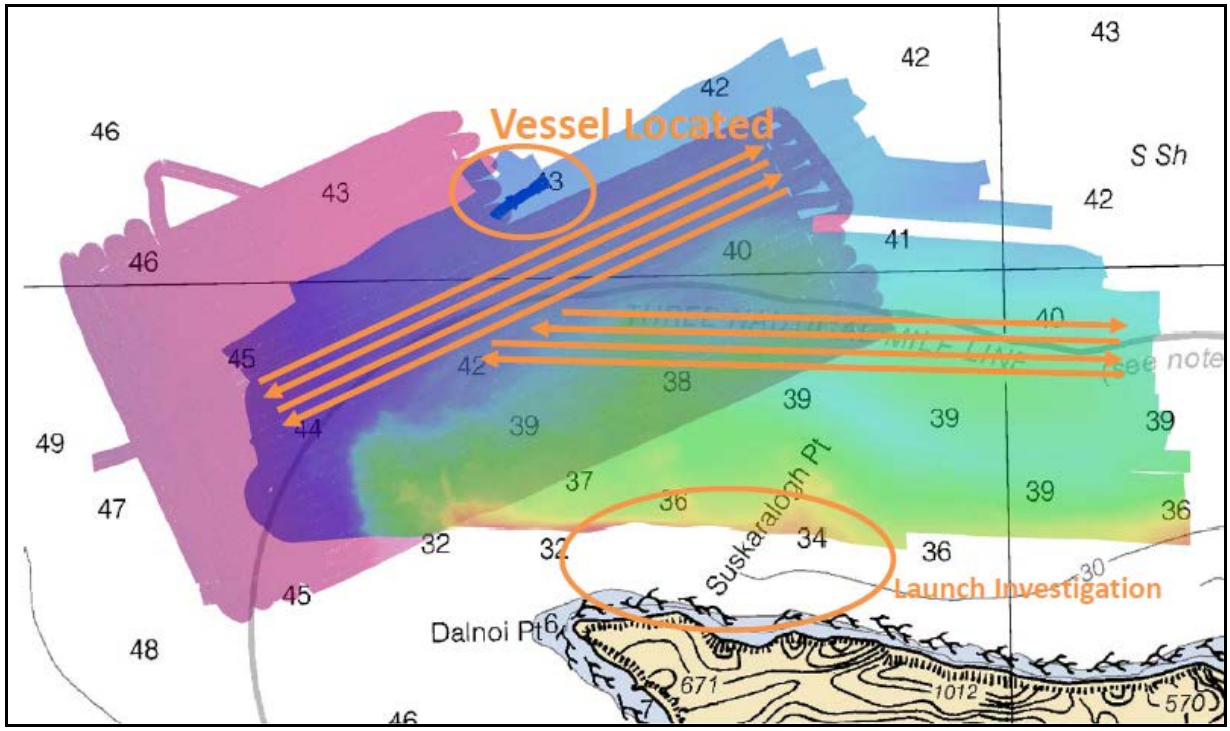


Figure 66. NOAA side-scan sonar tracks to locate the DESTINATION. FAIRWEATHER's (blue and green), OSCAR DYSON's (red). Provided by NOAA Ship FAIRWEATHER.

4.12.5. The FAIRWEATHER determined the DESTINATION's resting location was located at 56° 40.88 N and 169° 47.61 W, a position approximately 4.19 NM northeast of the vessel's last known AIS position and approximately 7 NM north of Dainoi Point. (see Figure 67).

4.12.6. Figures 68, 69, and 70 shows the FAIRWEATHER collected side-scan sonar imagery indicating the DESTINATION lying on its port side, facing southwest in approximately 78 meters (256 feet) of water. A scour line extended approximately 100 meters (330 feet) southwest from the vessel.

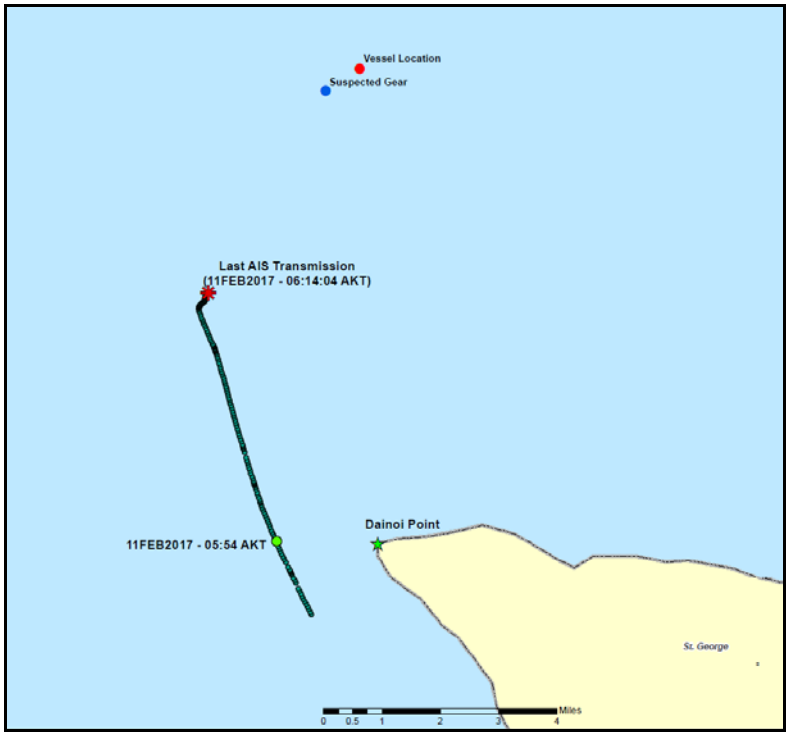



Figure 67. Location of DESTINATION's resting location in relation to its last known AIS position and Dainoi Point. Image produced by MBI.

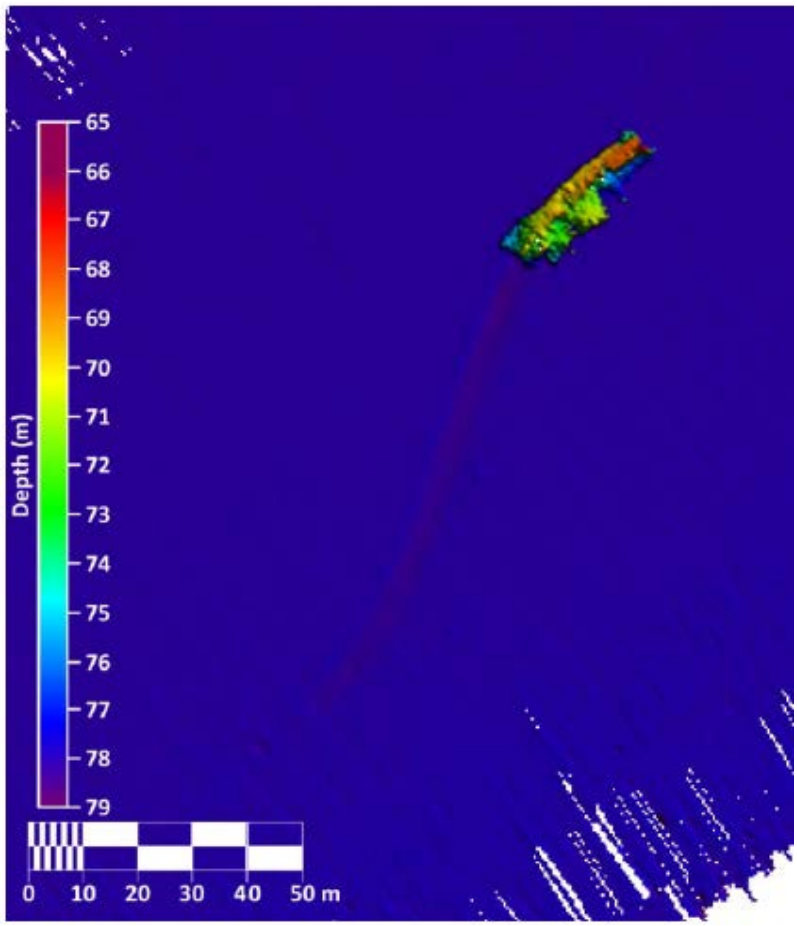



Figure 68. NOAA side-scan sonar imagery of the DESTINATION. Provided by NOAA Ship FAIRWEATHER.

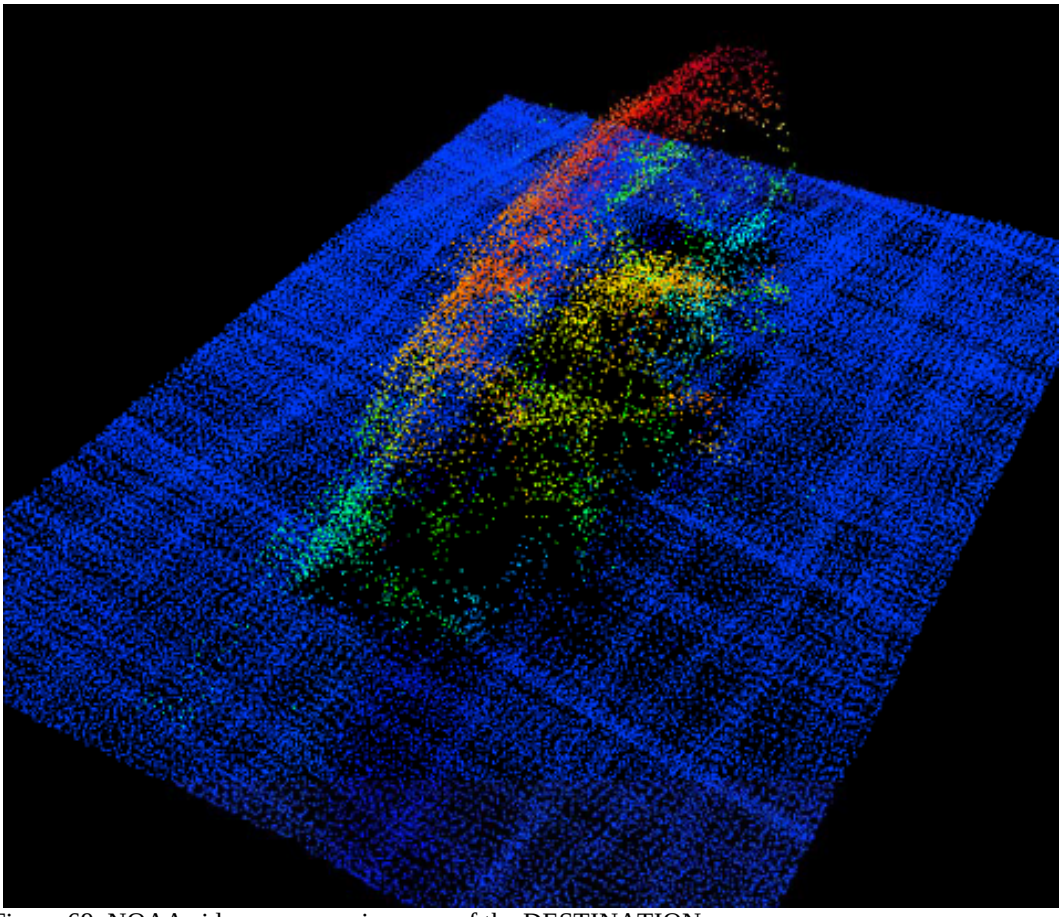


Figure 69. NOAA side-scan sonar imagery of the DESTINATION.
Provided by NOAA Ship FAIRWEATHER.

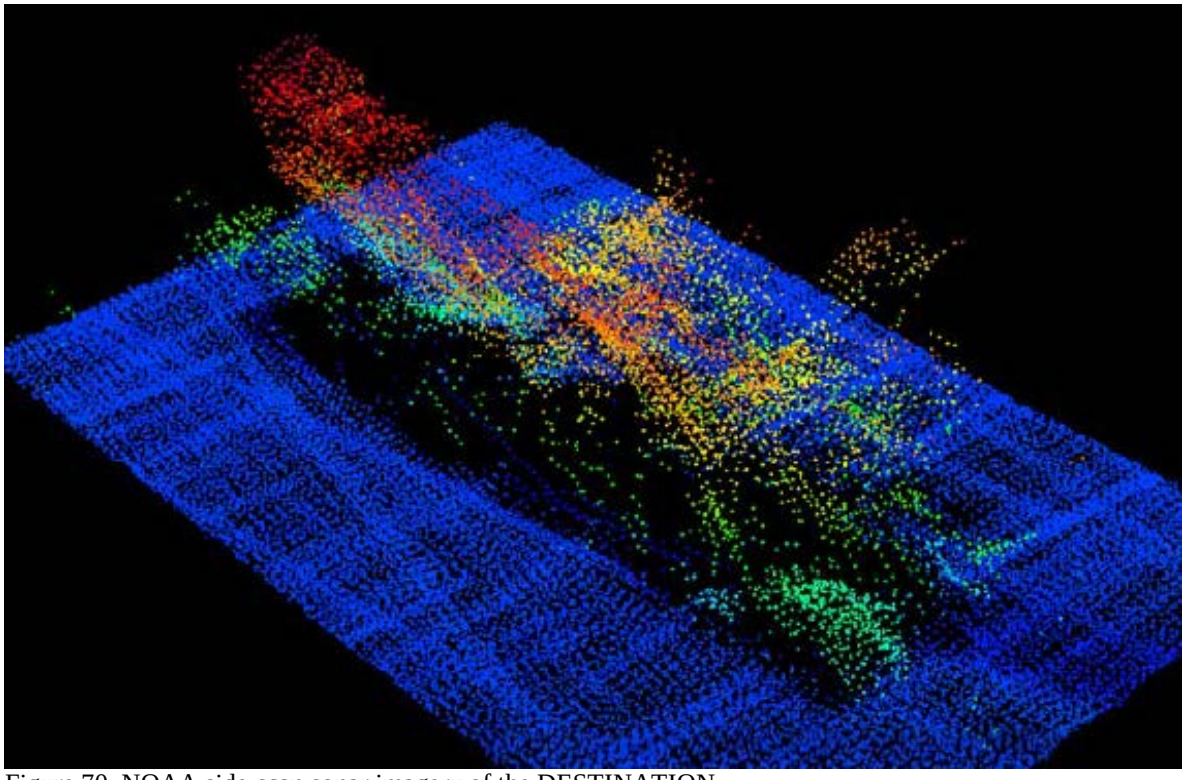


Figure 70. NOAA side-scan sonar imagery of the DESTINATION.
Provided by NOAA Ship FAIRWEATHER.

4.12.7. Figure 71 shows the FAIRWEATHER's side-scan sonar imagery identifying a target approximately 617 meters (2,024 feet) southwest of the vessel. The image is consistent with the crab pots loaded on the deck of the DESTINATION.

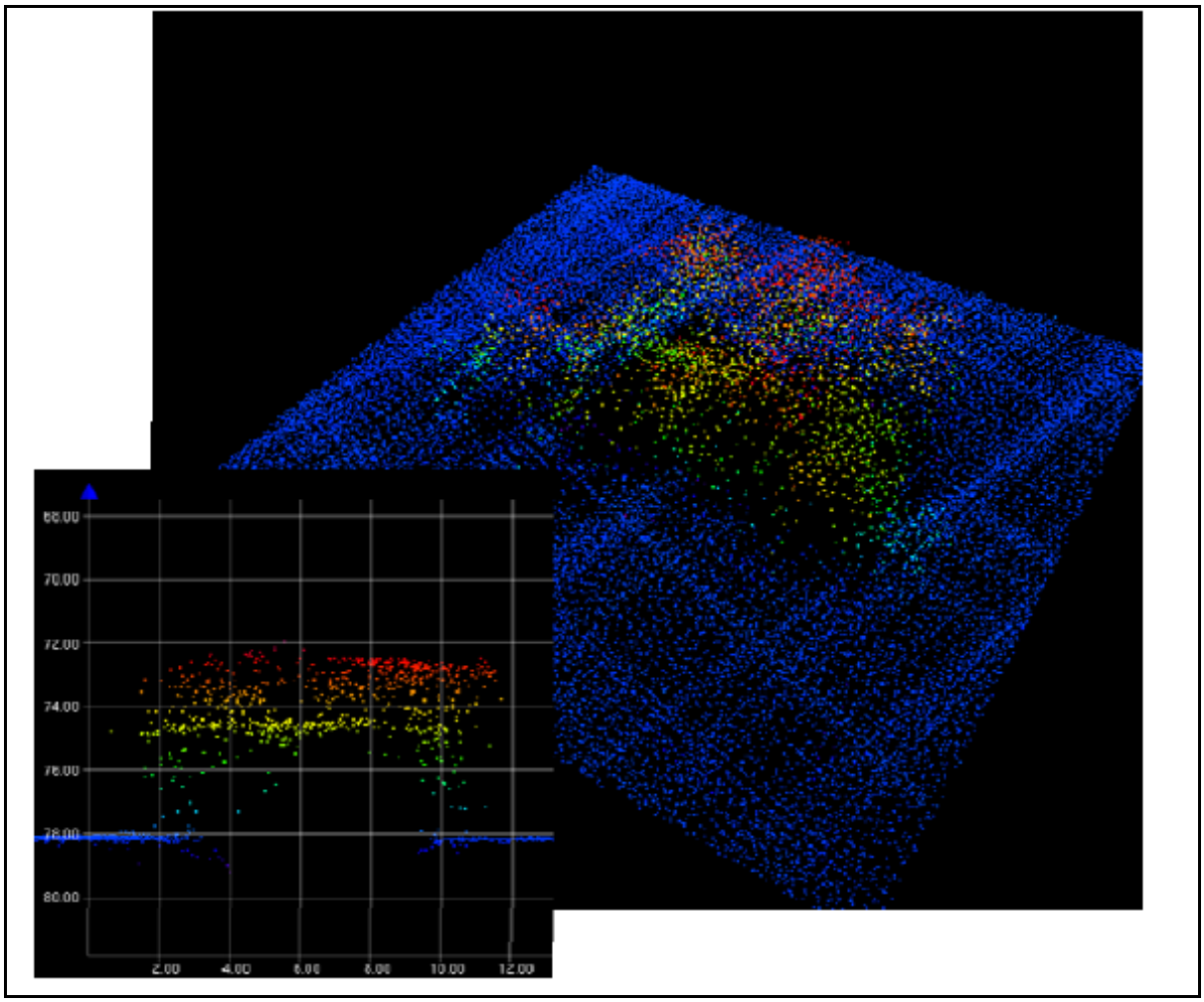



Figure 71. NOAA side-scan sonar imagery of the pots from the deck of the DESTINATION. Provided by NOAA Ship FAIRWEATHER.

## Coast Guard Dive Operations

4.12.8. On March 13, 2017, the MBI requested the Coast Guard's Deployable Specialized Forces (DSF), Regional Dive Locker West, to assist and support in locating and investigating the DESTINATION. The MBI requested DSF Dive capability for subsurface imagery, inspection and limited salvage of the DESTINATION.

4.12.9. In May 2017, the DSF Dive Locker West identified the Coast Guard Cutter HEALY to transport and deploy a Coast Guard Research and Development Center's Remotely Operated Vehicle (ROV) and Dive Locker personnel during its summer 2017 Polar Region operations.

4.12.10. On July 25, 2017, the DSF Dive Locker West, working on the Coast Guard Cutter HEALY, deployed a ROV over the DESTINATION's location identified by the NOAA Ship FAIRWEATHER. Due to strong sub-surface currents, the ROV was only able to collect limited imagery. (see Figures 72, 73, and 74).

Figure 72. ROV imagery showing the DESTINATION's draft marks.
Photo provided by Coast Guard Dive Locker West.

Figure 73. ROV imagery showing the DESTINATION's freeing ports.
Photo provided by Coast Guard Dive Locker West.

Figure 74. ROV imagery showing a portion of the DESTINATION's name.
Photo provided by Coast Guard Dive Locker West.

## 5. Analysis and Opinions

### 5.1. Voyage Planning and Stability

#### 5.1.1. Failure of the captain to take advantages afforded by Crab Rationalization (CR).

The captain failed to take advantage of the safety benefits provided by the CR program, namely increased opilio fishing season length, which provides the ability to rest the crew in preparation for upcoming fishing operations. The opilio season opened on October 15, 2016 and closed on May 15, 2017. The DESTINATION fished for cod from January 8 to February 3, 2017, which had the effect of a reduced timeframe to make the scheduled delivery deadline of opilio crab by February 25, 2017 in St. Paul. In an effort to maintain the DESTINATION's economic efficiencies and scheduled delivery, the captain departed Dutch Harbor carrying 200 crab pots in five tiers under heavy freezing spray warnings, with extra bait, and a fatigued crew.

As discussed in an article within the Spring 2009 Coast Guard Proceedings of the Marine Safety and Security Council titled "Improving Commercial Fishing Vessel Safety Through Collaboration", the 2005 implementation of the CR fishery management system brought several changes that improved safety within the BSAI fleet. CR ended the "Olympic/race-to-fish" system, improved economic stability, and allowed more efficient and safer vessels to harvest their issued quota.

Unlike in the Olympic system where operators would carry as many pots as possible to improve the ability to quickly locate and catch crab in the intensely competitive derby fishery, the CR system affords operators more time to harvest the catch. From a safety perspective, the extended season allows operators to take the time needed to prepare their crews and vessels, and to delay departure or shelter in protected areas to avoid hazardous weather conditions. It also means vessels need not hold maximum catching power and can significantly reduce the number of pots loaded onboard. Apart from carrying fewer pots, the number of pot lifts required decreased, allowing for a reduction in the fishery pace that affords crews more opportunity for rest and reducing fatigue.

The captain did not take advantage of these benefits provided by CR. The DESTINATION had time to fish and deliver its harvest to St. Paul prior to the opilio season closing in May 2017. Yet, the captain felt pressure to meet advertised deadlines and was informed by the fleet manager at Trident Seafoods in St. Paul to bring extra bait. Therefore, he chose to transit with 200 crab pots in five tiers and carry extra bait.

The captain also did not provide the crew time to rest and reduce fatigue sustained fishing for cod in the weeks prior. Former crewmembers stated it was common to work more than 20 hours a day, and they never were able to get eight hours of uninterrupted sleep while fishing.

As discussed in NVIC 02-08, which provides criteria for evaluating the effectiveness of Crew Endurance Management System (CEMS) implementation, CEMS provides a system of proven practices for managing endurance risk factors that affect operational safety and crewmember efficiency in the maritime industry. Addressing the full scope of endurance management, CEMS encompasses a range of environmental, physiological, operational, and psychological risk factors. The process of implementing CEMS is flexible enough to enable a vessel or company to incorporate these practices into their Safety Management System.

CEMS guidance emphasizes the importance of sufficient sleep and rest for crewmembers to avoid fatigue and maintain situational awareness. Crew endurance risk factors, such as fatigue, can lead to human error, poor decision making and work performance degradation.

The captain could have requested an extension of the delivery time but neglected to ask for one. He also could have traded his North IFQ for South IFQs with other members within his cooperative, as was common practice when vessels were unable to make their deliveries by the time the processing plant wanted to close. He could have avoided carrying extra bait by asking other vessels to carry it for him or take the time to transit from the fishing grounds to Dutch Harbor to load more bait. In addition, the captain could have delayed departure to avoid heavy freezing spray conditions and allow his crew to rest for the upcoming voyage.

5.1.2. Failure of the stability instructions and assessments to comply with all stability criteria.

Independent analysis conducted by the Coast Guard's Marine Safety Center (MSC) found the naval architect who conducted the 2013 stability assessment limited his evaluation to Metacentric Height (GM) values. MSC found the installation of the bulbous bow provided no additional benefit and the vessel did not meet the intact stability criteria. With the naval architect not analyzing stability across a broader range of criteria, and the owner not verifying the accuracy and detail of the assessment, they collectively failed to recognize modifications to the vessel resulted in marked changes to the vessel's stability.

To assist in determining stability factors that may have contributed to the DESTINATION's sinking, the MBI requested MSC's team of naval architects conduct a technical review and provide a stability analysis report. The MBI requested MSC's report identify the applicable stability regulations and confirm that the vessel's stability instructions complied with those standards. In addition, the MBI requested the report include an analysis of stability across various internal and external forces that were likely acting on the vessel at the time of the casualty. This included the vessel's stability in its assumed loaded condition from Dutch Harbor, ice accumulation en route to St. Paul, and the effects of downflooding of the number 3 hold.

MSC's analysis report is provided as an Appendix to this ROI. The report summarized their findings, along with an enclosure containing detailed vessel stability criteria and their method of analysis taking into account assumptions, estimations and limitations. In an effort to illustrate and verify the MBI's assessment of contributing stability factors, this analysis utilized relevant technical and quantitative data from MSC's report.

The DESTINATION, as a CFV over 79 feet in length and having completed substantial alterations during its 1993 modifications, was subject to stability regulations of 46 CFR 28, Subpart E - Stability. As indicated in MSC's stability analysis report, the vessel was required to meet intact stability righting energy criteria found in 46 CFR 28.570 and the severe wind and roll criteria of 46 CFR 28.575.

In order to validate the stability results of the DESTINATION's 1993 stability instructions and 2013 stability assessment of the bulbous bow to the intact righting energy criteria regulations, MSC independently developed a new computer hull model and used HydroStatics software. As illustrated in Figures 75 and 76, MSC generated the computer rendering using a digitizer to accurately transform the vessel's 1993 2-D lines plan into a 3-D computer hull model.

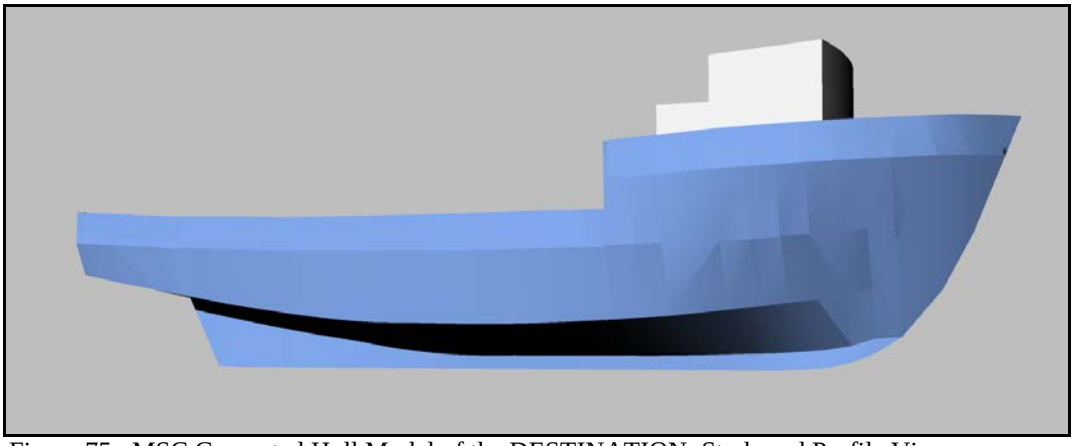


Figure 75. MSC Generated Hull Model of the DESTINATION: Starboard Profile View

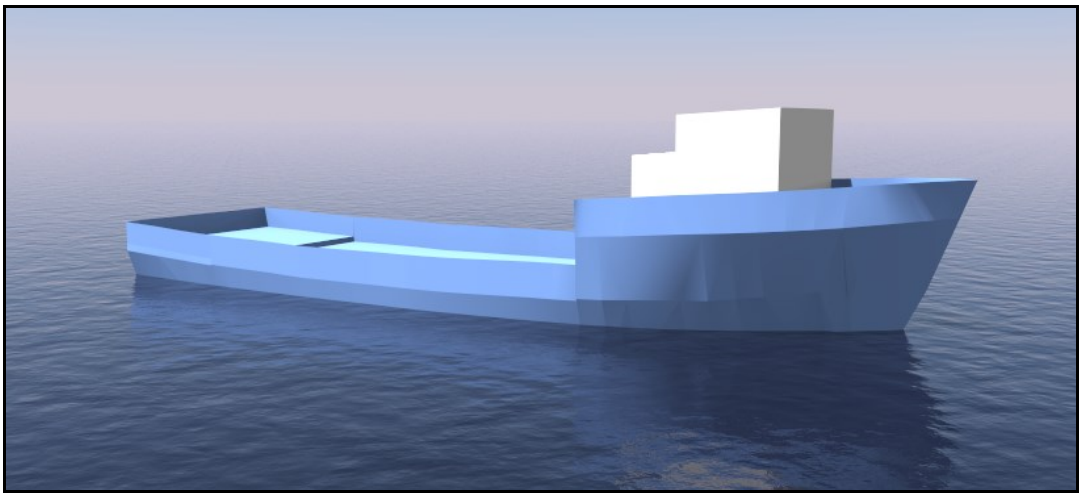


Figure 76. MSC Generated Hull Model of the DESTINATION: Starboard Bow Top View

Within the 1993 stability instructions and stability letter, the qualified individual indicated the DESTINATION's stability characteristics met or exceed the minimum intact stability criteria found in 46 CFR 28, Subpart E – Stability. MSC's independent analysis shows the vessel did not comply with intact stability criteria for the majority of prescribed loading conditions found within the stability instructions. MSC's model results showed 5 out of 10 loading conditions did not comply with the intact stability criteria, including the loading condition 3 – winter condition.

The naval architect's 2013 stability assessment letter documented the DESTINATION was safe to conduct crab-fishing in the Bering Sea when operating under the previously issued 1993 stability instructions. The letter referenced that the naval architect created and used a new hull computer model and indicated calculations determined the bulbous bow had a "negligible" reduction to the vessel's GM of only about 2 inches.

MSC's independent analysis detected a disparity between the hull model they created based on the vessel's 1993 lines plans to the one developed and supplied by the naval architect reflecting his 2013 stability assessment. Contrary to the naval architect's model that showed the vessel met stability criteria, MSC's model results showed 8 out of 10 loading conditions did not comply with intact stability criteria across loading conditions found within the stability instructions.

MSC explained the disparity between the two results can be attributed to the differences in the hull dimensions, in which the naval architect had slightly longer dimensions for vessel length, beam and depth. For vessels of this size, even slight differences in hull dimensions can alter stability criteria. The extended length of the naval architect's model resulted in the vessel trimming significantly farther forward when the same loading conditions were applied. In general, MSC's results showed the bulbous bow reduced the righting arm values and provided no additional benefit to the vessel's stability as all stability criteria results further decreased.

The naval architect limited his 2013 stability assessment to only GM values. He did not calculate for intact stability righting energy criteria across larger angles of heel, nor was he asked by the shipyard to do so. MSC's independent analysis confirmed while the vessel met initial GM requirements, some loading conditions failed intact righting energy criteria. MSC indicated that after such a modification, the entire range of stability should be analyzed as GM is only an indicator of initial stability, not a good predictor of overall stability through larger angles of heel.

Title 46 CFR 28.505 – Vessel owner's responsibility, places the CFV owner with the burden of selecting a qualified individual to evaluate stability under Subpart E. As discussed in the preamble to the final rule, the Coast Guard's position was that qualified individuals will recognize instances when the vessel's stability is markedly changed, and they would affect appropriate amendments within the stability instructions. The Coast Guard explained with no regulatory body or other third party review of stability evaluations or instructions, the responsibility for determining the accuracy of stability instructions rests with the vessel owner.

The naval architect's stability assessment letter did not reference if his assessment was conducted in accordance with the applicable regulations of 46 CFR 28, Subpart E – Stability. Further, the owner did not directly select the naval architect to do so, or verify if the stability assessment letter assessed required intact stability righting energy criteria. In limiting the 2013 stability assessment to only GM stability criteria, the naval architect and the owner failed to recognize the extent to which the bulbous bow markedly changed the vessel's stability.

5.1.3. Failure of the captain to follow established cargo loading and stability procedures.

In loading and transiting with the bait on top of the crab pots along with the two totes and the sorting table, the captain did not follow or adhere to the vessel's stability instructions and established stability guidance. The stability instructions and guidance prohibited loading cargo above the height of the crab pots. The placement of this cargo on top of the crab pots adversely affected the stability of the vessel by raising the vessel's center of gravity and increasing the likelihood of capsizing or sinking.

On February 9, 2017, while moored at the Kloosterboer Cold Storage Facility in Dutch Harbor, the DESTINATION's crew loaded four pallets of squid bait weighing a total 7,060 pounds on top of fifth tier of crab pots. With the crew carefully placing and arranging the bait on top of the crab pots, it appears the crew intended to leave the bait in that position for the voyage to St. Paul. On previous occasions, the captain directed the crew to load totes usually containing about 1,000 pounds of bait on top of the crab pots prior to transit.

The DESTINATION's stability instructions included a crab pot and deck-loading table (see Figure 41). Below the table is information regarding loading and equivalent deck cargo in lieu of crab pots. The text explained, "The amount of such cargo should not exceed the total weight

or cargo height for crab pots in a similar loading. In general, keep all loads stowed as low in the vessel as practicable." With the DESTINATION already loaded with the maximum number of tiers (5) while moored at Kloosterboer Cold Storage Facility in Dutch Harbor, placing the cargo on top of the crab pots violated and exceeded this stability provision.

The DESTINATION's stability instructions also included excerpts of the stability guidance chapter from the NPFVOA's Vessel Safety Manual. The guidance in this section explains how various factors, such as load height, lifting, free surface and icing, can adversely affect vessel stability. Regarding effects of load height, the guidance warns against placing loads higher on the vessel. Figure 77 is an illustration provided within the guidance depicting the adverse effects of placing loads high on a vessel's stability. As indicated, placing loads high will raise the center of gravity and cause a dramatic reduction in a vessel's righting energy, range of stability and maximum righting arm.

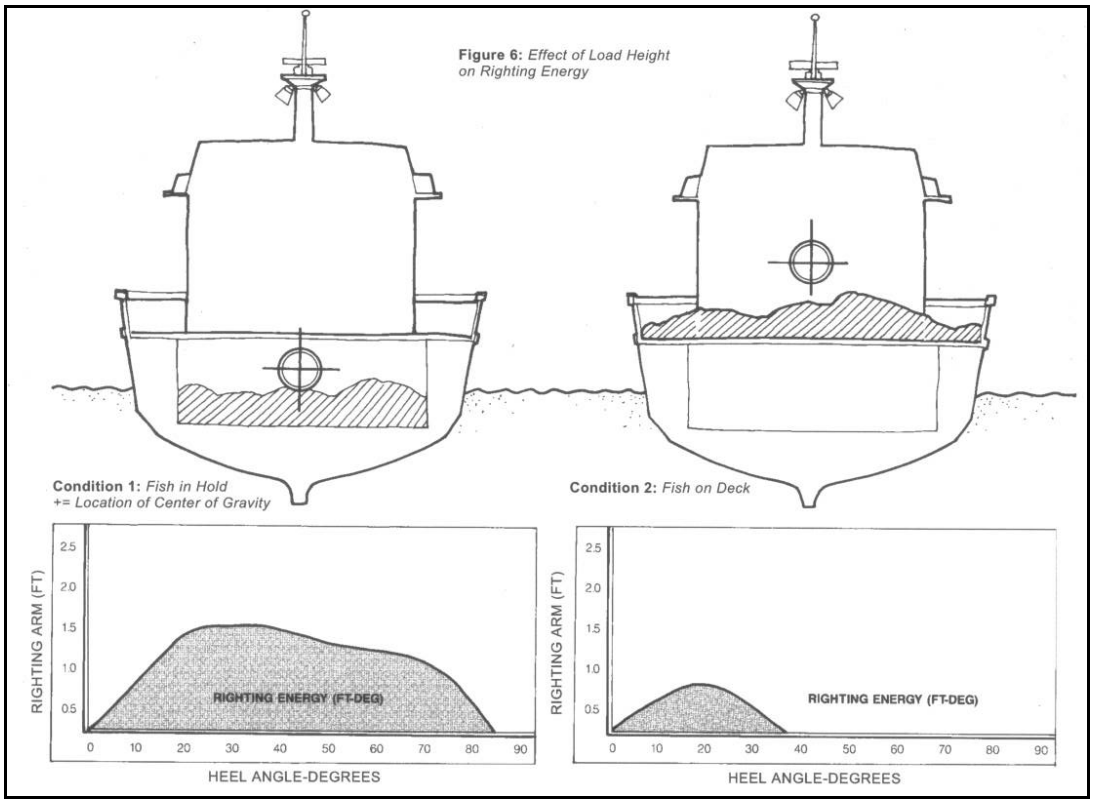


Figure 77. Excerpt of the stability guidance within the stability instructions.

When conducting detailed assessments of a vessel's stability, naval architects examine a vessel's righting arm curve. As illustrated in Figure 78 from the Coast Guard's Best Practice Guide to Vessel Stability, the righting arm curve is a plot of a vessel's righting arm versus angle of heel. A righting arm is a measurement of a vessel's ability to right itself when disturbed from its upright position.

As discussed in MSC's report, generally, the greater the righting arm, the better the vessel's stability characteristics. The area under the righting arm curve (measured in foot-degrees), also called righting energy, is often used as a measure of the vessel's ability to absorb energy imparted by wind, waves, or other forces. A vessel with very little righting energy could roll past its range of positive stability and capsize as a result of even a relatively small disturbance.

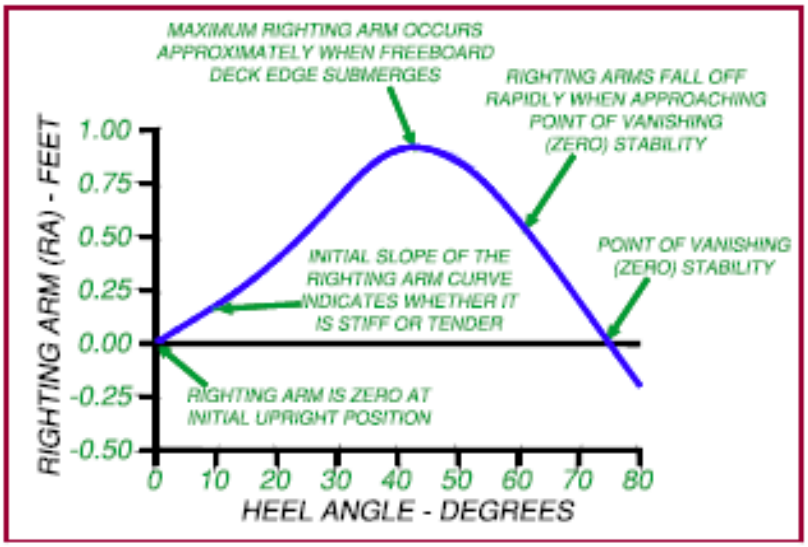



Figure 78. Typical characteristics of the righting arm curve.
From the Coast Guard's Best Practice Guide to Vessel Stability.

At the request of the MBI, MSC analyzed the stability of the DESTINATION's departure from Dutch Harbor, loaded in condition 3 – winter with number 1 and 2 holds tanked, 200 crab pots of 840 pounds each, and approximately 8.8 LT (19,706 pounds) of bait loaded on the vessel in various locations including the freezer and on top of the crab pots. Their analysis confirmed that the bait loaded on top of the crab pots added additional weight above the vertical center of gravity prescribed within the stability instructions adversely affected the vessel's stability.

Results of MSC's computer modeling found, with the exception of initial GM criteria, the vessel failed to meet all of the intact stability requirements of 46 CFR 28.570 – Intact righting energy. Figure 79 is a plot that compares the righting energy for the vessel's departure loaded condition compared to the crab pot loading table condition 3. As illustrated, the departure loaded condition provides far less righting energy than established within the vessel's stability instructions.

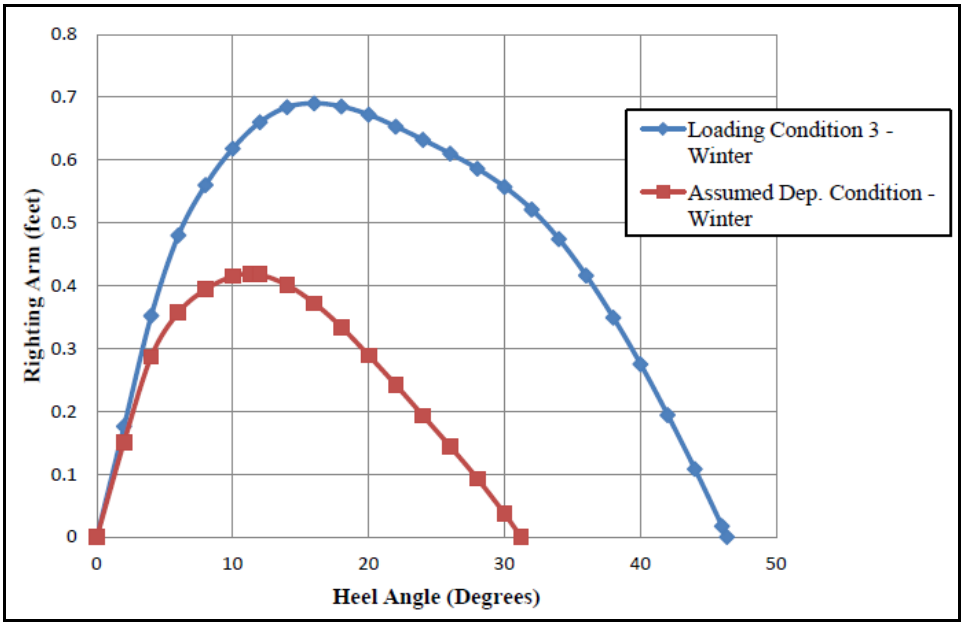



Figure 79. DESTINATION's righting arm curves - departure condition compared to the stability instructions. Provided by MSC.

MSC also analyzed the DESTINATION's maximum Vertical Center of Gravity (VCG) curves at varying drafts and trims. As the drafts and displacements increase, the maximum VCG for which the vessel passes the applicable stability criteria decreases. Illustrated in Figure 80, the assumed departure condition point for the vessel clearly falls outside the maximum VCG curves.

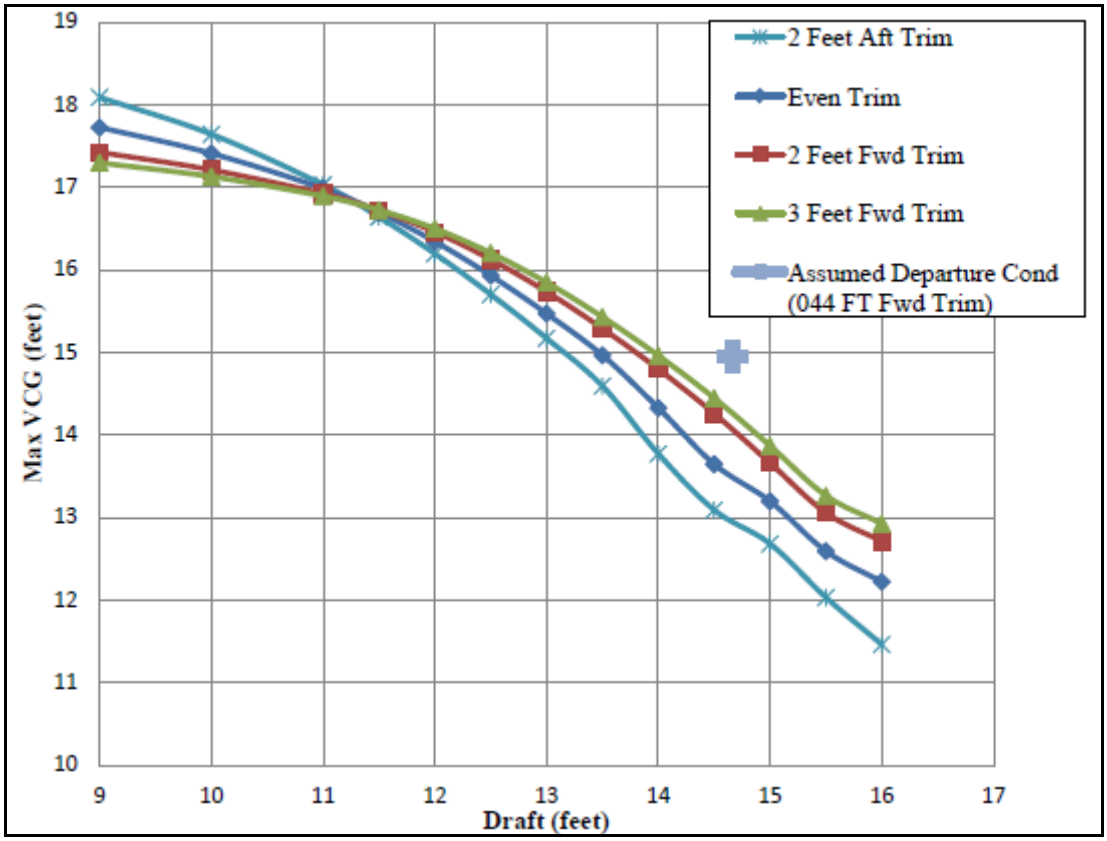



Figure 80. DESTINATION's maximum VCG curves compared to its assumed departure condition. Provided by MSC.

In accordance with 46 CFR 28.530 – Stability instructions, CFV owners must provide the captain stability instructions, developed by a qualified individual, with loading constraints and operating restrictions which maintain the vessel in a condition meeting all applicable stability requirements. If the captain determines there is a need to load the vessel in a manner not established in the stability instructions, prudence dictates the captain would inform the owner, who would the contact the qualified individual to receive additional guidance. The captain of the DESTINATION, in departing Dutch Harbor in this loaded condition, failed to report and receive guidance from a qualified individual and operated the vessel in an adverse stability condition.

The DESTINATION, when departing Dutch Harbor in its loaded condition far exceeded the stability criteria anticipated or evaluated within the vessel's stability instructions and was significantly below minimum intact stability righting energy requirements. Any additional loads from icing or water in the number 3 hold coupled with external forces from severe wind and waves would further reduce the vessel's stability and make it more vulnerable to capsizing.

5.1.4. Failure of the captain to prevent and reduce excessive ice accumulation.

During its transit to St. Paul, the DESTINATION would have accumulated excessive ice from freezing spray conditions. Ice accumulations would have exceeded the weight of assumed ice calculated within the vessel's stability instructions and established in icing criteria requirements. With the captain's failure to direct his crew to take the time necessary to clear the ice from the deck during transit and not taking the opportunity to anchor in the shelter of Zapadni Bay, St. George Island, the excessive ice accumulation placed the vessel in an adverse stability condition.

The exact amount of ice the DESTINATION accumulated during its transit to St. Paul, and the steps the crew took to clear the accumulated ice is unknown. There is no record or MBI testimony indicating the DESTINATION reported their condition to other mariners.

To determine the amount of ice the DESTINATION could have accumulated from freezing spray conditions during its transit towards St. Paul, the MBI conducted an analysis using NWS weather and sea state data, the Overland graphs and application of the icing predictor algorithm. As illustrated in Figure 81, the vessel experienced light to moderate icing conditions (0.1 to 0.8 inches an hour) in the morning hours of February 10, 2017 and heavy icing conditions (0.8 to 1.6 inches an hour) after 1500 on February 10, 2017. The vessel would have accumulated between 12 to 24 inches of ice between 1500 on February 10, 2017 and 0600 on February 11, 2017.

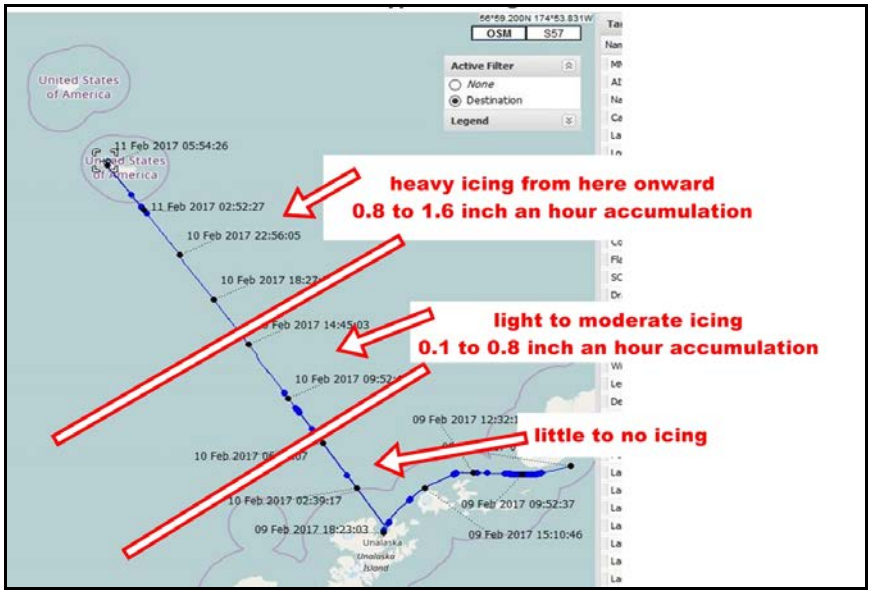


Figure 81. Calculated ice accumulation during the DESTINATION's transit. Provided by NTSB.

At the request of the MBI and NTSB, faculty of Engineering and Applied Science at Memorial University (MU) of Newfoundland, St. John's, Canada, conducted numerical estimations of ice load that accumulated on the DESTINATION. Using weather and environmental data at the time of the vessel's transit from Dutch Harbor to St. Paul, from 2315, February 9, 2017 to 0615, February 11, 2017, MU faculty ran computer simulations based on numerical code and marine icing research. The simulations calculated ice accumulation weight under low load (no crab pots) and full load (200 crab pots) conditions.

Figure 82 is a graph of MU's simulation solution. Full load (Mean) data shows the vessel could have accumulated approximately 108 LT (241,920 pounds) of ice.

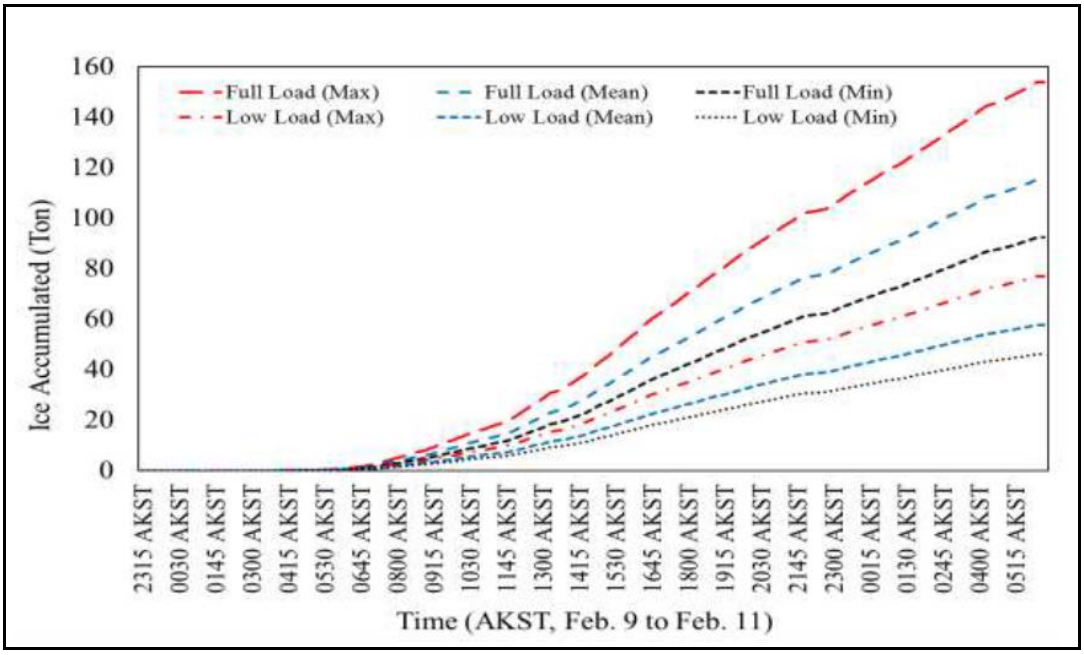



Figure 82. Simulated numerical solution of ice accumulation for the DESTINATION. Provided by Memorial University of Newfoundland, St. John's, Canada.

Title 46 CFR 28.550 – Icing, establishes weight of assumed ice on each surface above the waterline of a vessel. The qualified individual uses these weights of assumed ice to calculate and develop the vessel's stability instructions. For vessels operating north of 66° North latitude between November 15 and April 15, the weight of assumed ice must be at least 6.14 pounds per square foot on horizontal surfaces and 3.07 pounds per square foot on vertical surfaces. This weight corresponds to a thickness of 1.3 and 0.65 inches, respectively. The weight of assumed ice for vessels operating between 42° and 66° North latitude must be at least one-half these amounts.

The DESTINATION's stability instructions accounted for 11.61 LT (26,006 pounds) per square foot of all horizontal and vertical projected area. Thus, on the DESTINATION, a thickness of 1 inch equates to 8.93 LT (20,003 pounds). One LT is equivalent to 2,240 pounds.

MU's simulated ice accumulation solution of approximately 108 LT (241,920 pounds) corresponds to the MBI's analysis above using the icing predictor algorithm. Both assessments demonstrate the DESTINATION could have accumulated between 12 to 24 inches of ice. An ice thickness of 12 inches on DESTINATION equates to 107 LT (239,680 pounds). With 12 inches of ice, the vessel would have carried an additional 95.39 LT (213,673 pounds) of weight more than calculated and accounted for within the vessel's stability instructions. This weight equates to loading an additional 305 crab pots weighing 700 pounds each on deck.

At the request of the MBI, MSC analyzed the effects ice accumulation would place on the DESTINATION's stability in its loaded condition from Dutch Harbor to St. Paul. Their analysis demonstrates that ice weight accumulating higher on the vessel adversely affects its stability.

Results of MSC's computer modeling found none of the icing load conditions, in increments from 1 -12 inches, passed the intact stability requirements of 46 CFR 28.570 – Intact righting energy. MSC's respective righting arm curves is provided in Figure 83, illustrating icing loads ranging from 0 – 8 inches. Ice loads greater than 9 inches are not shown, as they resulted in negative initial GM heights. Negative GM heights indicate a vessel is unstable and susceptible to capsizing.

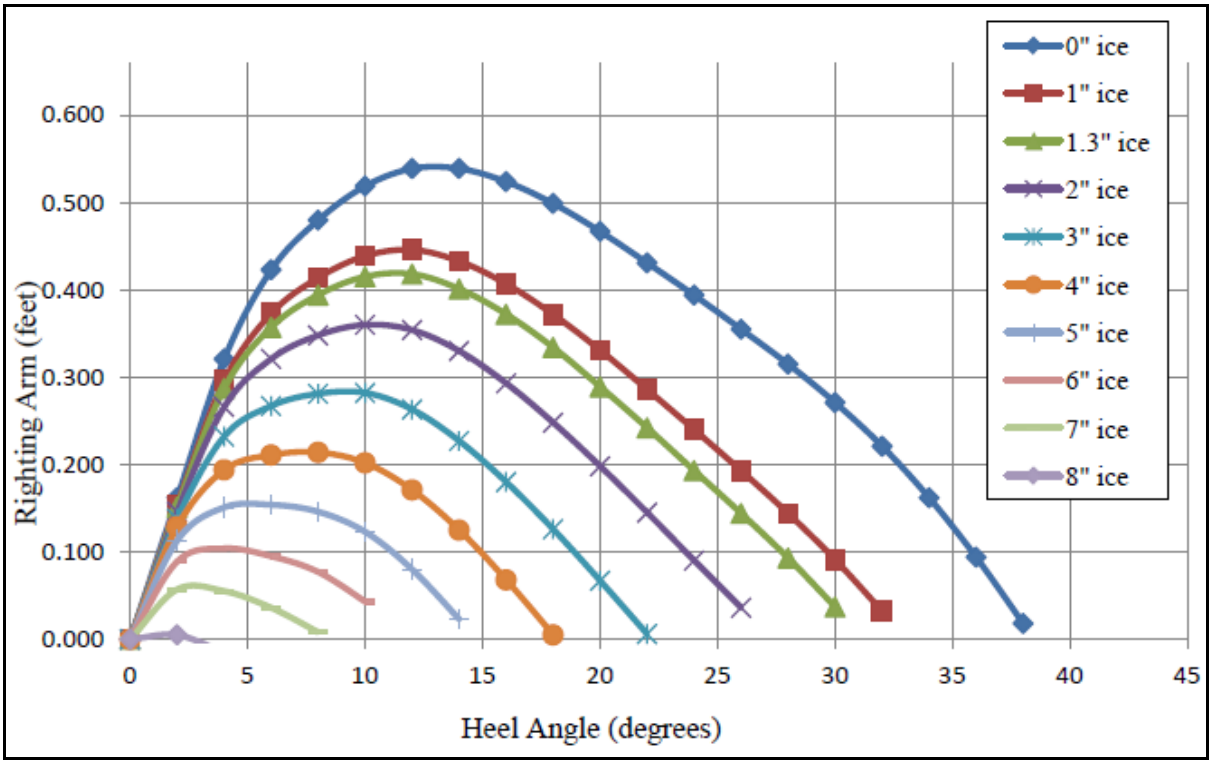



Figure 83. DESTINATION's righting arm curves for incremental ice loads in departure load conditions from Dutch Harbor. Provided by MSC.

It is also important to note, modeling excessive icing requires making numerous assumptions, as the centers of gravities (longitudinal, transverse, and vertical) are all unknown. When conducting the effects of icing on the DESTINATION's stability, MSC used the center of gravities provided within the vessel's stability instruction for all increments.

As this casualty demonstrates, ice accumulation on CFVs operating in the Bering Sea do exceed assumed ice thickness listed in the stability calculations of 46 CFR 28.550 – Icing, and used by the qualified individual to develop the vessel's stability instructions. The DESTINATION and other nearby vessels each accumulated ice over the assumed ice accumulation established within this regulation.

If the DESTINATION did accumulate 12 or more inches of ice, it would have exceeded 9 times its assumed ice calculations. For vessel's that do not account for these actual observed conditions that exceed 1.3 inches calculated within their stability instructions, the vessel's stability is at risk if the captain does not properly anticipate and take immediate corrective action.

Title 46 CFR 28.550 – Icing, does not indicate under what conditions a CFV's captain is to apply reduced loading to account for freezing spray conditions. It only mentions, for vessels operating above 42° North latitude during winter months (November – April), the assumed weight of ice

must be included in the vessel's loading conditions when performing the stability calculations to generate stability instructions. In the preamble to the final rule, the Coast Guard stated those concerned with stability instructions for operating personnel (such as the vessel owner or the qualified individual), must consider providing guidance on the meteorological conditions which favor icing and the best methods to minimize icing and its effects on stability.

The DESTINATION's stability instructions discussed the hazards of operating in icing conditions, advising possible actions to avoid ice accumulation include reducing speed or changing the vessel's heading to minimize sea spray and physically removing the ice from the vessel. The crab pot loading table defined winter conditions as "whenever icing conditions may be anticipated (north of 42° North latitude between November 15 and April 15)."

The Coast Guard's Best Practices Guide to Vessel Stability suggests operators alter course to return to warmer or protect waters, transit downwind while taking precautions from broaching and boarding seas, keep freeing ports clear of ice to allow rapid draining, maintain radio communication with other vessels, and make ready all lifesaving equipment.

During its voyage to St. Paul, on two separate occasions the DESTINATION "jogged" into the seas (headed into the wind and/or slowed down). The first occasion was on February 10, 2017 from approximately 1331 to 1341 and the second from approximately 2210 to 2250.

Because excessive ice build-up from freezing spray increases a vessel's center of gravity and adversely effects stability, CFV captains understand the importance of ice removal. Therefore, it is also reasonable to assume the captain of the DESTINATION directed the crew to work on deck to chip and remove ice during these jogs. However, given the relatively short duration of these jogs (10 and 40 minutes each), the crew most likely did not spend enough time to remove an adequate amount of ice to improve the vessel's stability condition.

Chipping and removing ice off a vessel is strenuous work, taking a vessel's crew many hours to complete. Given the crew was fatigued from its recent cod fishing season, they most likely didn't have the stamina to dedicate the required amount of energy and effort needed to clear the vessel of ice accumulations while underway. Working less than one hour does not appear long enough to manage the ice accumulation and improve the vessel's stability condition.

5.1.5. Failure to comply with CFV freeing port area requirements.

The DESTINATION did not meet aggregate freeing port area requirements of 46 CFR 28.555. Because the Coast Guard's CFV Safety Examination Booklet does not include freeing port compliance on its checklist, the vessel's non-compliance with the freeing port requirements remained unchecked. Limited freeing port area negatively impacted the vessel's intact stability.

The MSC calculated the DESTINATION's freeing port area to determine if the aggregate clear area of the freeing ports on each side of vessel complied with the requirements of 46 CFR 28.555 – Freeing ports. Plans and calculations regarding the dimensions of the vessel's freeing ports do not exist. The owner and shipyard did not produce or maintain formalized plans when the vessel was modified in 1993.

While the stability instructions indicate the DESTINATION's freeing ports comply with 46 CFR 28.555 requirements, it did not include its dimensions or aggregate area. Absent plans, MSC referred to a photo taken by the third party surveyor on June 10, 2016 (Figure 84) showing a detailed view of the vessel's starboard profile. Using this photo, MSC calculated the dimensions of the freeing ports using known measurements of the vessel, such as the vessel's draft marks.


Figure 84. DESTINATION, June 10, 2016 in Seattle, WA.
Photo provided by a third party surveyor.

The DESTINATION had nine freeing ports on each side of the main deck, with an estimated area of 120 square inches each, for a total of 1,080 square inches. In accordance with 46 CFR 28.555 requirements, with a bulwark length of 72 feet, the vessel is required to have 2,390 square inches of freeing port area per side. Only having 54 percent of required amount of aggregate clear area, the vessel failed to meet freeing port area requirements.

Because the CFV Safety Examination Booklet and its supplement do not include freeing ports as a checklist item, Coast Guard and third party dockside safety examiners are not directed or prompted to verify a vessel's compliance with freeing requirements.

A vessel with insufficient freeing port area would likely allow more seawater becoming trapped on the main deck. This water would add additional weight to the vessel, raise the overall VCG, and increase the free surface moment acting on the vessel as the water flows side to side. These factors negatively impact the vessel's intact stability.

5.1.6. Failure to maintain vessel buoyancy and stability.

After passing Dainoi Point, the DESTINATION's transit was no longer in the protection of the leeward side of St. George Island. Exposed to building seas and hazardous currents, the vessel turned into the seas. After making the turn, the vessel suddenly lost speed and became exposed to boarding seas that resulted in swamping and downflooding of the vessel. The vessel's loading condition far exceeded stability criteria anticipated or evaluated within the stability instructions and was significantly below the required standards. With narrow room for absorbing additional stability risk from the cumulative effects of heavier pots, ice load and downflooding, it was doubtful the vessel could maintain buoyancy and survive hazardous conditions.

Bering Sea fishermen operating off St. George Island are well aware of the hazardous waters off Dainoi Point. The strong tides combined with winds coming from the opposite direction create building seas, requiring vessels to use extreme caution when transiting the area. With the tides running to the north and the winds coming from the northeast, the DESTINATION most likely experienced these hazardous sea conditions as it passed Dainoi Point.

The DESTINATION turned to starboard into the hazardous sea conditions it encountered as it passed 4.4 northwest of Dainoi Point. After a span of two minutes into the turn, at 0612 and 11 seconds, the vessel abruptly lost speed from 1.5 knots to 0.9 knots and its heading started to pivot to the opposite direction while it continued to drift due north.

The sudden loss of speed coupled with the heading pivoting around while moving in the opposite direction is indicative of a vessel that lost maneuverability - loss of steerage and control. The MBI does not have data to support why the vessel abruptly lost speed, but it is possible that the vessel suffered a catastrophic impact from a large steep wave or from burying the bow in the backside of the preceding wave. With the loss of maneuverability, the vessel was unable to maneuver or maintain a heading positioned into the oncoming seas. This exposed the vessel to following seas (waves on the stern), beam seas (waves on the vessel's side), or quartering seas (waves on the vessel's stern quarter) and seriously compromised the vessel's ability to maintain buoyancy and stability.

As boarding seas began to flood the deck, there was a greater risk of the DESTINATION swamping from water remaining trapped on deck from bulwarks or blocked freeing ports. The excessive ice accumulations would have covered the hinged freeing ports and prevented or limited boarding seas to freely flow off the vessel. Further, the new bulwark would have trapped water at the bow. The insufficient freeing port area would likely result in more seawater becoming trapped on the main deck in foul weather. This water would add additional weight to the vessel, raise the vessel's overall center of gravity, and increase the free surface moment acting on the vessel as the water flows side to side. All of the factors would further diminish a vessel's intact stability and swamp the vessel.

The captain of the DESTINATION consistently directed the crew to keep the number 3 hold access hatch open, even in transit. The MBI does not have direct evidence to confirm the status of this hatch during the vessel's transit from Dutch Harbor. However, working on the premise that the access hatch was always open, it would have significantly reduced the vessel's overall buoyancy due to uncontrolled downflooding of number 3 hold.

Downflooding is the entry of water into the hull that results in progressive flooding and the loss of stability. The downflooding adversely affects a vessel's righting energy. It also increases the negative effects of free surface on the vessel's stability - the free motion of liquids to the low side of the vessel as it heels over. This moves the center of gravity to the outboard side of the vessel preventing the vessel from returning to the upright condition. Further, the added weight of the ice accumulation coupled with the water on deck and the flooded number 3 hold would further reduce the freeboard of the vessel. This would cause the vessel's deck edge to submerge faster, further preventing the vessel from maintaining buoyancy and stability.

At the request of the MBI, MSC analyzed the effect incremental flooding of the number 3 hold would place on the DESTINATION's stability. Using the vessel's departure loading condition and applying incremental levels of salt water flooding from 0 – 6 feet, MSC computer modeling found no flooding condition passed the intact stability requirements of 46 CFR 28.570 – Intact righting energy. Figure 84 provides the respective righting arm curves. Flooding greater than 6 feet are not shown because of negative initial GM heights, indicating the vessel was in an unstable condition where capsizing is likely. In general, by permitting the number 3 hold access cover to remain open, partial flooding would impair stability by increasing the free surface effect and increasing the vessel's aft draft.

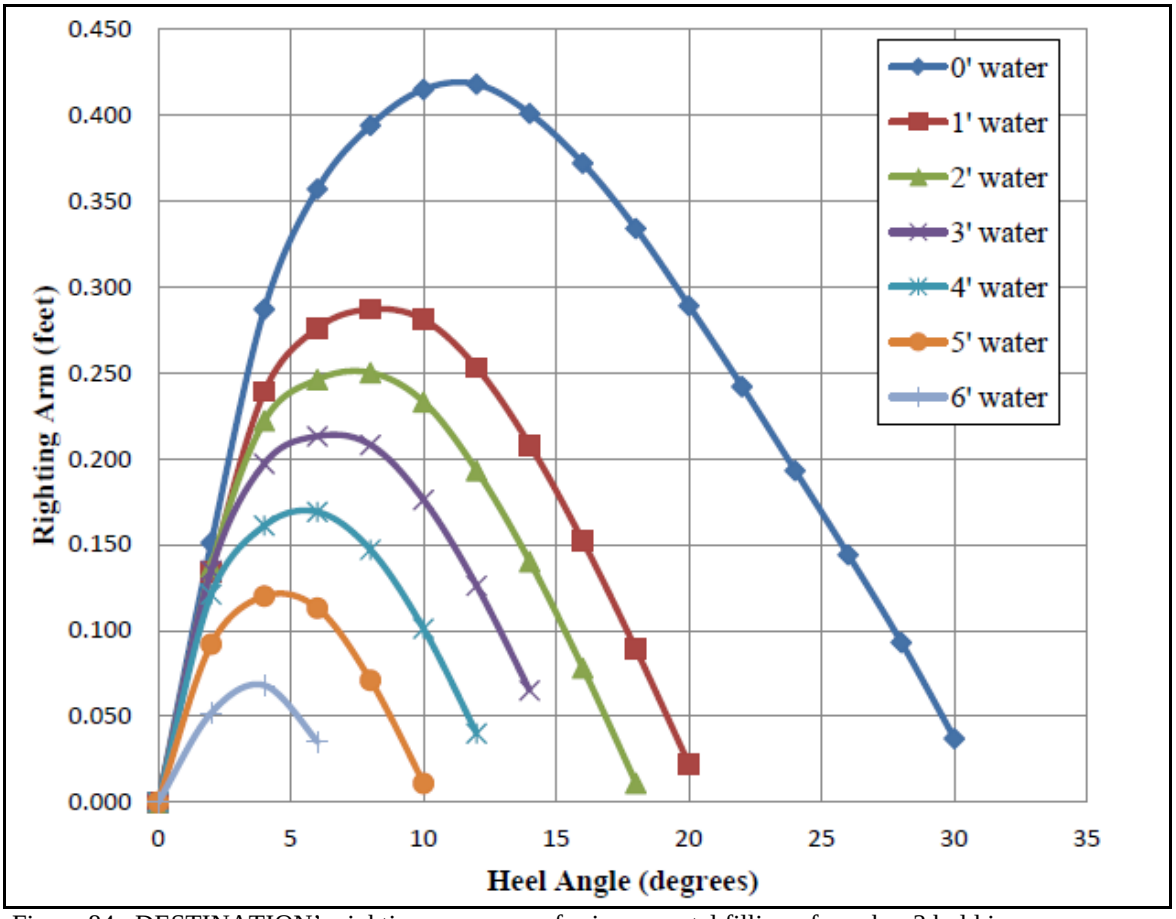



Figure 84. DESTINATION's righting arm curves for incremental filling of number 3 hold in departure load conditions from Dutch Harbor. Provided by MSC.

## 5.2. Survivability Factors

### 5.2.1. Crew's inability and limited time to deploy lifesaving equipment.

As the DESTINATION's number 3 hold flooded, the vessel started to lose buoyancy and sink within a matter of minutes. With the vessel already in an at-risk stability condition from overloading crab pots, bait stored on top of the crab pots, and heavy ice accumulation, the vessel could not recover from the catastrophic loss of maneuverability and stability event with uncontrolled downflooding. Within a manner of minutes, the vessel started to capsize and sink. Without making ready all lifesaving equipment, the crew had very little time, if any, to react.

There was no indication that the crew transmitted radio calls for assistance or deployed lifesaving equipment. It would be a challenge for any crewmember or fisherman to conduct emergency broadcast radio calls, don a survival/immersion suit and deploy the liferaft in this short period of time. The Coast Guard and other vessels operating nearby did not receive mayday calls from the DESTINATION.

After extensive SAR operations, the Coast Guard did not locate or recover survivors, immersion suits or the liferaft. The MBI does not have enough evidence to determine if the liferaft hydrostatic release activated deploying the liferaft.

The MBI believes once the cold seawater flooded the vessel's inner compartments and living quarters, the crew's survivability chances were minimal. The crew would have most likely experienced cold shock and cold incapacitation. Cold shock can cause death within 1-3 minutes. Cold incapacitation can occur within 5-15 minutes and results in muscular failure where a person can no longer swim, use hands meaningfully or maintain position in the water, and can cause death within 5-30 minutes. If not wearing an immersion suit or entering into a deployed liferaft, the crew's chances of survival was severely limited without immediate assistance and rescue.

### 5.2.2. Crew's limited survival time without immediate assistance and rescue.

Assistance and rescue resources did not arrive to the DESTINATION's LKP until 4 hours after the initial EPIRB distress signal. The first Good Samaritan vessel and SAR aircraft arrived at approximately 0930 and 1004, respectively. Because cold incapacitation can cause death within 5-30 minutes, the crew's chances of survival was severely limited without immediate assistance and rescue.

The MBI determined the initial Coast Guard SAR rotary aircraft in B-0 and B-2 status launched outside established Coast Guard readiness standards. The B-0 status H-60 out of Air Station Kodiak attempted to initially launch approximately just under 2 hours after the first notification of distress. This initial attempted launch time for this H-60 exceeded Coast Guard B-0 readiness launch standards of 30 minutes after the Coast Guard's first notification of distress. Due to ice accumulation in its engine inlets, this H-60 launched approximately 2 hours and 45 minutes after the first notification of distress.

The B-2 status H-60 out of FOB Cold Bay did not launch until approximately 4 hours after first notification of distress. The launch time for this H-60 exceeded Coast Guard B-2 readiness launch standards of 2 hours after the Coast Guard's first notification of distress.

The MBI does not have a record of the designated readiness status for the C-130 fixed wing aircraft out of Air Station Kodiak. The MBI determined that the C-130 did not launch until approximately 1 and a half hours after first notification of distress.

The MBI determined that the B-0 status H-60 out of Air Station Kodiak did not arrive at the DESTINATION's LKP within B-0 response standards of 90 minutes.

Determining compliance with established Coast Guard SAR standards is outside the scope and mandate of the MBI's investigation. Assessments regarding the effectiveness of any Coast Guard's SAR response is a function of the SAR Coordinator (SC). The SC, District 17 Commander in this case, may initiate an after action review or a SAR case study consistent with COMDTINST M16130.2F.

The authority and purpose of this MBI is to determine as closely as possible the factors that contributed to the marine casualty in order to develop recommendations aimed at preventing reoccurrence. The MBI must also determine whether there is evidence of misconduct on the part of any licensed person or Coast Guard personnel that caused or contributed to the casualty. To this end, the MBI focused its fact finding and analysis to the factors that contributed the DESTINATION marine casualty - its sinking and the loss of life of its crewmembers.

The MBI determined the launch delays of the Coast Guard aircraft was not a contributing factor in the loss of life to the DESTINATION's crew. Because of the instantaneous and catastrophic nature of the vessel's sinking, the vessel's crew did not have enough time to take effective corrective or emergency action. Without the ability to deploy lifesaving equipment, the crew was already in a life-threatening situation within minutes of the frigid water flooding the vessel. The MBI believes the DESTINATION's crew was incapacitated well before any Coast Guard aircraft could have launched within established standards.

### 5.3. Stability Information Accuracy

#### 5.3.1. Failure of the owner to update stability instructions to reflect heavier pot weight.

Each pot with gear loaded on the DESTINATION weighed at least 840 pounds, 140 pounds heavier per pot than the assumed pot weight of 700 pounds used to calculate the vessel's stability instructions. The stability instructions were not updated to account for the cumulative additional weight of the heavier pots loaded on the vessel.

It is unknown if the captain was aware that the crab pots loaded on the DESTINATION were heavier than the assumed pot weight used to calculate the vessel's stability instructions. The owner did not keep records of when he purchased the crab pots or their specifications, and did not update or amend the vessel's stability instructions to reflect the new heavier pots. The owner was not familiar with the loading table provided in the stability instructions and had limited conversations with the captain regarding the vessel's stability instructions, with the last conversation taking place over two decades ago in 1993.

The simplest way to adjust and comply with the established stability instructions to reflect the heavier pot weight would have been to calculate the new number of permitted pots by weight ratio. That is, reduce the total number of pots permitted by the corresponding amount of additional weight. The total number of pots permitted should have been reduced to a number less than the former capacity, multiplied by the ratio of weight per pot established by the stability instructions to the new heavier pot weight.

In formula, this means:

$$\text{New Pot Capacity} = \frac{(\text{Existing Pot Capacity} \times \text{Previous Pot Weight})}{\text{New Pot Weight}}$$

Solving for the new pot capacity permitted, on the DESTINATION, using winter load condition 3 (1 and 2 holds tanked, pots allowed: 224 in 5 tiers), yields:

$$\text{New Pot Capacity} = \frac{(224 \times 700)}{840} = 186$$

Loaded with 200 pots weighing 840 pounds each when departing Dutch Harbor, the DESTINATION was overloaded by 14 pots (200 - 186 = 14). At 840 pounds per pot, this equates to an additional 11,760 pounds not accounted for in the stability instructions. This additional weight would have contributed to a reduction in the vessel's established stability.

Regarding the impact of changes in weight aboard vessels, the Coast Guard utilized a similar weight ratio process in 2011 when implementing new Assumed Average Weight per Person (AAWPP) passenger weight and vessel stability requirements for inspected passenger vessels. At that time, in lieu of requiring vessel owners to conduct new stability tests, the Coast Guard allowed owners to demonstrate compliance with the new passenger weight standards by using the weight ratio process to determine and adjust required reductions in total number of passengers permitted.

5.3.2. Failure of the owner to provide suitable and accurate stability instructions.

The owner of the DESTINATION failed in his responsibility, as required in 46 CFR 28.500, Subpart E – Stability requirements, to provide the captain with accurate stability instructions to maintain the vessel in a satisfactory stability condition. The stability instructions did not indicate the assumed weight of the crab pots and failed to account for vessel modifications or alterations including increases to the weight of the pots and the installation of a new bulwark at the bow.

These modifications constituted "weight creep" – the accumulation of additional weight on the vessel over time that reduces the vessel's overall stability. Without conducting a reassessment or updating the originally issued stability instructions to reflect these modifications and address weight creep, the vessel's loading constraints and operating restrictions became inaccurate and obsolete. The captain's use of the inaccurate stability instructions posed a safety risk to the vessel and crew. This stability risk manifested and became apparent as the vessel transited with 200 crab pots loaded in five tiers in heavy icing conditions and hazardous seas off St. George Island, resulting in the loss of buoyancy and sinking.

Title 46 CFR 28.530 requires owners of certain CFVs to provide the captain stability instructions. As discussed in the regulation and in the preamble to the final rule, the intent of the requirement is to ensure owners select a qualified individual to perform stability calculations and provide the captains with stability instructions. The instructions provide captains with loading constraints and operating restrictions to meet the applicable stability requirements or to maintain the stability of a vessel that has been substantially altered. The format of the instructions is at the discretion of the vessel's owner, but must be in a format the captain can easily understand.

The regulations do not require a regulatory agency or third party review or approve the stability instructions at any specified time interval. The preamble to the final rule explained, "For inspected vessels, such as passenger vessels and freight ships, the Coast Guard reviews stability instructions to ensure that the information provided to operating personnel is suitable and accurate. For uninspected vessels, such as commercial fishing vessels, with no regulatory body or other third party examination of stability evaluations or instructions, the responsibility for determining the accuracy and detail of stability instructions rests with the vessel owner."

The regulations only require reassessment or updates when the vessel has been substantially altered. Title 46 CFR 28.501 defines criteria when a vessel is substantially altered in a manner that does or does not adversely affect a vessel's stability. In the preamble to the final rule, the Coast Guard provided a flow chart to explain the requirements of 46 CFR parts 28.500 and 28.501. Discussing the intent and scope of substantial alterations, the Coast Guard explained 46 CFR 28.501 requires stability instructions for each substantial alteration, stating, "It is not the Coast Guard's intent or expectation that all substantial alterations will be compensated for by revised stability instructions without regard to the stability evaluations required by the subpart. The Coast Guard's position is that qualified individuals will recognize instances when the stability of a vessel has been so markedly changed by one large or many small alterations that simple changes in the stability instructions are not appropriate."

After the DESTINATION completed its modifications in 1993, it was subject to Title 46 CFR 28 Subpart E – Stability requirements. The owner hired a qualified individual to conduct an incline test and stability assessment, the basis of which supported the qualified individual's issuance of the vessel's trim and stability report and associated stability letter. The qualified individual did not specifically mention if the modifications met major conversion or substantially altered criteria. However, he issued the stability report citing it met the stability instructions requirements of 46 CFR 28 Subpart E. The vessel's owner never updated the stability instructions since its original issuance in 1993.

The MBI reviewed the DESTINATION's compliance with the applicable regulations of 46 CFR 28.530 – Stability instructions. The MBI determined, in general, the 1993 stability instructions met the basic requirements. The vessel's stability instructions contained ready and easy to use information for the captain to maintain the vessel in a satisfactory stability condition. The format of the report provided simple maximum crab pot loading tables, loading instructions and diagrams, and operational guidance.

The intent of 46 CFR 28.530 places the owner with the responsibility for determining the accuracy and detail of stability instructions. It is the MBI's opinion that the owner failed to insure the stability instructions was accurate or contained enough detail.

The stability instructions did not include specific detailed information listing the assumed weight per crab pot as 700 pounds each with gear. In not doing so, the owner failed to ensure the stability instructions fully established baseline data for the captain to detect and account for vessel modifications, alterations, changes to crab pot weights or weight creep.

As described in the Coast Guard's Best Practice Guide to Vessel Stability, weight creep is the accumulation of extra spare parts, fishing gear, or a series of seemingly small modifications to a vessel or its fishing gear that can significantly reduce a fishing vessel's overall stability. As illustrated in Figure 85, weight creep reduces overall stability by raising the center of gravity "G" and reducing freeboard.

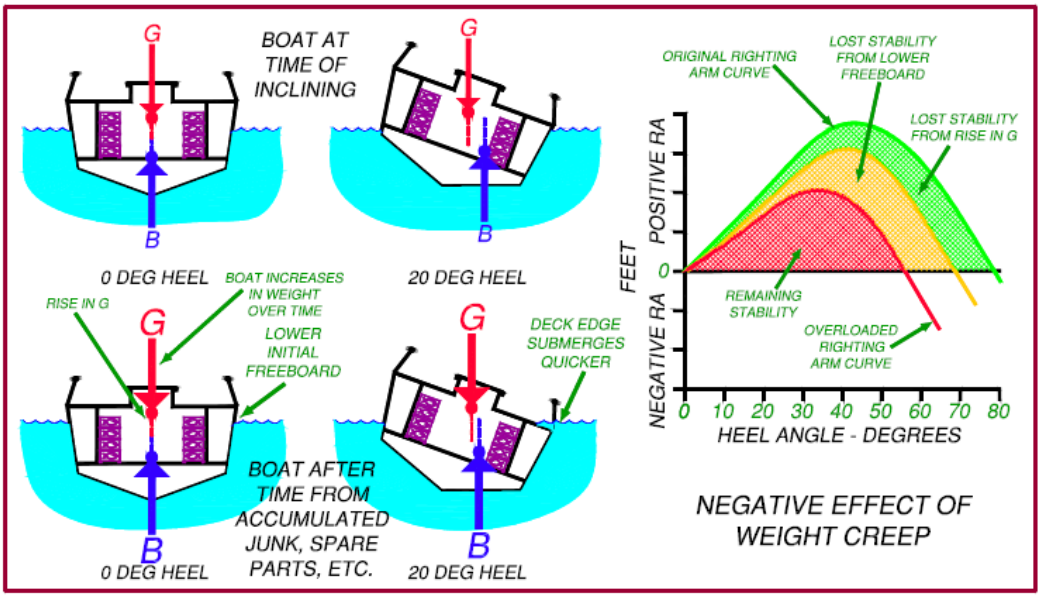



Figure 85. Illustration of weight creep effects on vessel stability.
From the Coast Guard's Best Practice Guide to Vessel Stability.

A vessel's crew may not notice reduced initial stability levels from weight creep, as it often occurs over long periods in small amounts. The guide recommends fishing vessel owners and operators should thoroughly inspect and clean any extraneous spare parts, fishing gear and equipment every 6-12 months. If modifications to the vessel or its fishing gear not included in the current stability assessment must remain, the owner should consult a Naval Architect or qualified individual about developing new stability guidance. The Coast Guard's Voluntary Safety Initiatives and Good Marine Practices for CFV published in January 2017 recommends the owner have the stability instructions reviewed by a qualified individual at least every five years, or after the vessel has been modified or altered in any way that changes its stability or handling characteristics.

Since initial stability assessment conducted in 1993, the weight of the crab pots on the DESTINATION increased from 700 pounds to 840 pounds, an increase of 140 pounds per pot. The vessel's 200 pot load at 840 pounds per pot resulted in 28,000 pounds of additional weight.

If the DESTINATION's owner noted and addressed this weight creep and conducted a reassessment of the vessel's stability instructions, it would have resulted in loading tables amendments, reducing the number of crab pots. By not amending the stability instructions to account for the heavier crab pots, the vessel operated in an adverse stability condition.

The owner failed to have a qualified individual conduct a stability assessment when he installed the bulwark in 2011 to replace the railing on the focsle deck. When the owner contracted the shipyard to install the bulbous bow, he did not inform the naval architect of weight changes from the heavier crab pots and the new bulwark at the bow. Thus, the owner did not provide a qualified individual, as required in 46 CFR 28.501 – Substantial alterations, with enough information to assess substantial alterations adversely affected the vessel's stability.

The naval architect limited his stability assessment only to the bulbous bow and hull repairs. He was not asked, and did not take into account the effect of additional weight from the heavier crab pots or new bulwark. He further did not conduct an assessment to determine if the bulwark on the focsle adversely effected the vessel's stability from any increases to free surface effects of water on deck, as required in 46 CFR 28.501 (d)(4). The added weight and any additional free surface effects from the bulwark remained unaccounted within the 1993 stability instructions.

5.4. Stability Compliance Oversight

5.4.1. Failure of the owner and captain to provide vessel stability and modification information during Coast Guard Dockside Safety Examinations and SCCs.

During Coast Guard Dockside Examinations, the owner and captains failed to provide examiners with information to fully verify and document the vessel's conformance to the applicable stability requirements of 46 CFR 28 Subpart E or any vessel modifications.

In each of DESTINATION's last four dockside safety examinations, the CFVEs did not document the vessel's conversion date within the MISLE database and did not enter the correct response to the stability section of the examination form. The owner and captains were aware of the vessel's modification history, but failed to document or discuss the conversion date or vessel modification information during the examinations. This resulted in the examiners inability to verify the vessel's compliance with the applicable stability regulations during the examinations.

During SSC's conducted on the DESTINATION, the Coast Guard examiners limited their spot checks to document the crab pots loaded on the vessel complied with the vessel's loading tables established within the stability instructions. The examiners did not weigh the crab pots to detect changes in the assumed weight used in the stability instructions.

With the examiners not weighing the pots, their stability assessment and validation of any changes to crab pot weights during SSCs is dependent on the information provided by the vessel's captain and owner. Because the examiners did not document a change to the pot weights, it illustrates the captain and owner of the vessel did not provide stability or vessel modification information to the examiner. As such, the examiners were unable to ascertain and verify the accuracy of the vessel's stability instructions at these SSCs.

Further, the captain of the DESTINATION notified MSD Dutch Harbor upon its arrival into Dutch Harbor on February 9, 2017, as required by ADF&G regulations. The captain declined the Coast Guard's invitation to participate in a voluntary SSC. If MSD Dutch Harbor conducted an SSC, the Coast Guard examiners would have likely verified the vessel was loaded in accordance with its stability instructions. However, without weighing the crab pots or discussing with the captain if the pots were heavier, the SSC would not have detected the vessel's stability instructions did not accurately reflect the heavier crab pots.

By failing to inform Coast Guard examiners of weight changes to the crab pots during Coast Guard Dockside Examinations and SSCs, and declining to take advantage of the voluntary SSC upon arrival into Dutch Harbor, the captain and owner missed opportunities to examine the accuracy of the stability instructions. Holding discussions with examiners would likely have helped verify the accuracy of the vessel's stability instructions and discuss possible solutions consistent with regulations and available guidance.

5.4.2. Failure of the Surveyor to verify stability compliance during the Third Party Dockside Safety Examination.

During the DESTINATION's last Dockside Safety Examination conducted in June 2016, the NAVTECH/USSA third party surveyor failed to fully verify and document the vessel's conformance to the applicable stability requirements of 46 CFR 28 Subpart E or any modifications to the vessel.

The surveyor was aware of the vessel's modification history. When conducting a valuation and survey of condition on June 7, 2016, he documented the vessel was sponsoned and lengthened by Tim Alls Shipyard in 1993. When conducting the dockside safety examination on June 10, 2017, he documented the vessel's year converted date of 1993 on the examination form. However, he did not mark the vessel as meeting stability instructions requirements on the examination form. During MBI testimony, the surveyor stated he "never commented on stability as a surveyor" and did not review stability instructions for accuracy nor comment on pot size or pot load because he was not familiar with stability formulations.

The Coast Guard's CFV Safety Examination Booklet, CG-5587, includes checklists to verify a vessels compliance with stability requirements. The CFVE PQS includes performance criteria for the trainee to demonstrate the ability to review safety requirements and stability instructions while validating the vessel's logs and manuals during a dockside safety exam. The PQS requires the trainee to verify the vessel has the required stability instructions, that it was prepared by a qualified individual, and that it is specific to the vessel type and service. It does not require the trainee to have familiarity with stability formulations.

The MBI determined that the third party surveyor's understanding regarding an examiners review of a CFV's stability instructions was unfounded. Clearly, it is the Coast Guard's expectation that when an examiner conducts a dockside safety examination, be it either a Coast Guard CFVE or third party surveyor, they must confirm and document the vessel holds the required stability instructions. Rather than carry out Coast Guard expectations, it appears the third party surveyor conducted the Coast Guard dockside examination in the same way he conducted a valuation and survey of condition, and thus avoided assessing the DESTINATION's stability instructions.

In not confirming the vessel's stability during the dockside examination, the surveyor missed an opportunity to facilitate a discussion with the owner. A discussion would have likely helped in determining the accuracy of the vessel's stability instructions and discuss possible solutions consistent with regulations and available guidance.

## 6. Conclusions

6.1. Cause of the Casualty

6.1.1. The initiating event for this casualty occurred when the DESTINATION transited past the leeward and sheltered side of St. George Island and altered course into the hazardous seas off Dainoi Point. After making the turn into unprotected waters, the vessel suddenly lost maneuverability and became exposed to boarding seas, which flooded and swamped the vessel's deck. Causal factors contributing to the vessel swamping were:

6.1.1.1. The owner failed to select a qualified individual to evaluate the vessel's stability and to provide the captain with accurate stability information that reflected stability righting arm energy criteria of the bulbous bow, the installation of the new bulwark at the bow and heavier crab pots.

6.1.1.2. The captain operated with outdated and obsolete stability information that did not take into account the installation of the new bulwark on the bow and heavier crab pots.

6.1.1.3. The captain failed to follow cargo loading procedures established in the vessel's stability instructions by loading bait and the sorting table on top of the crab pots.

6.1.1.4. The vessel's loaded condition upon departure far exceeded intact stability criteria anticipated or evaluated within its stability instructions and was significantly below stability righting energy criteria requirements.

6.1.1.5. The captain rushed departure from Dutch Harbor in order to meet perceived delivery deadlines.

6.1.1.6. The captain departed Dutch Harbor under heavy freezing spray warnings issued by the NWS and with a fatigued crew who were unfit to properly manage and remove ice accumulations while en route to St. Paul.

6.1.1.7. The captain operated with freezing spray accumulations exceeding the weight of assumed ice used in the vessel's stability instructions and listed in the icing regulations.

6.1.2. Subsequent to the boarding seas swamping the DESTINATION, the vessel experienced a catastrophic and unrecoverable loss of buoyancy and stability. Within minutes, seawater flooded the vessel's inner compartments, causing the vessel to suddenly capsize and sink. Causal factors contributing to the vessel sinking were:

6.1.2.1. Excessive water on deck due to non-compliant and limited freeing port clearing area, ice accumulation covering the hinged freeing ports and the new bulwark at the bow that collectively prevented boarding seas to freely flow off the deck.

6.1.2.2. Uncontrolled downflooding and flooding of the number 3 hold from boarding seas entering freely down the open access hatch cover while in transit.

6.1.2.3. External wind and wave action further reduced the vessel's righting energy.

6.1.3. Subsequent to the sudden and catastrophic flooding of the DESTINATION's inner compartments with frigid Bering Sea water, the vessel sank with all six crewmembers missing and presumed deceased. Causal factors contributing to the loss of life were:

6.1.3.1. Limited time and ability to take emergency action including mayday radio calls for assistance, donning immersion/survival suits, deploying and entering the liferaft.

6.1.3.2. Extremely limited functional and survival time from cold shock and cold incapacitation occurring well before any immediate assistance by Good Samaritan vessels and Coast Guard SAR resources could deploy or arrive.

6.2. Violations of Law by Credentialed Mariners: There were no acts of misconduct, incompetence, negligence, unskillfulness, or willful violation of law by a credential mariner that contributed to the casualty.

6.3. Violations by Members of the Coast Guard: There were no acts of misconduct, incompetence, negligence, unskillfulness, or willful violation of law by members of the Coast Guard that contributed to the casualty.

6.4. Violations Subjecting Parties to a Civil Penalty: The actions described in paragraph 6.1.1.1 above represent a violation subjecting the owner to a civil penalty of 46 CFR 28, Subpart E – Stability, for failing to comply with the stability requirements applicable vessels 79 feet or more in length. The owner failed to select a qualified individual to perform stability tests and calculations, as required in 46 CFR 28.505, to determine if modifications to the vessel or its fishing gear; including the installation of the bulbous bow, the new bulwark at the bow and the heavier crab pots constituted a substantial alteration.

6.5. Violations of Criminal Law: This investigation did not identify violations of criminal law.

6.6. Need for New or Amended Laws/Regulations: This marine casualty represents the need to amend 46 CFR 28, Subpart E – Stability regulations. Section 8.1.6 – 8.1.11. of this report addresses specific recommended changes.

6.7. Unsafe Actions or Conditions that Were Not Causal Factors in this Casualty:

6.7.1. The owner and captains failed of to provide vessel modification history to examiners during Coast Guard dockside safety examinations and SSCs.

6.7.2. The third party surveyor's failed to verify and document the vessel's stability compliance when conducting the vessel's last dockside safety examination.

6.7.3. The captain failed to take advantage of a Coast Guard SSC when offered by MSD Dutch Harbor upon the DESTINATION's arrival into Dutch Harbor on February 9, 2017.

6.7.4. The Coast Guard's dockside safety examination forms and CFVE PQS, and District 17's SSC processes did not provide direction for CFVEs to verify the weight of crab pots loaded onboard, to inquire with the vessel's owner regarding any recent modifications or alterations that would affect the accuracy of the stability instructions, or to evaluate the vessel's compliance with freeing port area requirements.

## 7. Actions Taken Since the Incident

7.1. In mid-February 2017, during the week following the DESTINATION casualty, staff from District 17's Incident Management Branch conducted an after action review of the SAR response. The purpose of the review was to identify potential planning or execution gaps in the District's existing SAR aircraft readiness launch standards and self rescue policies. Subsequent to the review, the staff identified and rectified shortfalls in existing policy execution.

7.2. On October 6, 2017, Coast Guard Office of Marine Investigations and Analysis (CG-INV) published Marine Safety Alert 11-17: Remain Upright by Fully Understanding Vessel Stability. Developed by the MBI in conjunction with District 13 and 17 Prevention Divisions, the safety alert provided the CFV industry with vessel stability best practice. The safety alert emphasized the importance of vessel owners and captains to understand, update, and confirm the accuracy of their vessel's stability instructions. The safety alert advised owners and captains to annually weigh their crab pots to ensure its weight matches the stability instructions, and to take precautions against icing conditions, maintain watertight integrity, and participate in available stability training courses.

7.3. During the four days in advance of the October 15, 2017 king crab season opener, District 17 CFVEs from Sector Anchorage and MSD Dutch Harbor conducted SSCs and dockside safety examinations in Dutch Harbor and King Cove. The examiners contacted 80 percent of the BSAI CFVs registered to participate in the king crab 2017 season; completing 42 SSCs and 6 dockside safety examinations. During each SSC and dockside safety examination, the examiners weighed the vessel's crab pots to verify if they matched the weights listed in the vessel's stability instructions. In the vast majority of cases, the weight of the crab pots proved heavier then what was listed in the stability instructions. Because the vessels carried about 80 percent of their maximum crab pot load, the examiners found none of vessels were overloaded with crab pots.

## 8. Recommendations

8.1. Safety Recommendations

8.1.1. Recommend District 13 and District 17 conduct education and outreach to promote awareness, compliance, and training opportunities with CFV stability instructions requirements of 46 CFR 28 Subpart E - Stability. Education and outreach can include developing safety alerts, attending industry workshops or hosting industry days with local CFV owners, captains, operators and naval architects or qualified individuals. The Coast Guard should highlight the owner's responsibilities to select qualified individuals to conduct stability assessments consistent with regulatory requirements, and to provide their captains with accurate stability instructions that reflects vessel alterations, modifications and changes to any new fishing gear, including the weight of crab pots. The Coast Guard should also encourage CFV owners and captains to attend stability training such as those offered by the NPFVOA and AMSEA. The training should include basic stability principles regarding overloading, alterations and weight creep, watertight integrity, icing, stability risks for the vessel's fishery, and the effective use of stability instructions specific to the vessel. Increasing awareness of stability will promote the importance of maintaining accurate stability instructions and reduce future catastrophic stability casualties.

8.1.2. Recommend District 13 and District 17, consistent with COMDTINST 16711.13B, conduct a targeted oversight audit on all BSAI crabbing vessels operating or home ported in their respective area of responsibility. The oversight audit should focus on efforts to promote the BSAI crabbing fleet's compliance, and documentation of stability instruction requirements as it relates to vessel weight creep modifications, conversions or substantial alterations. This targeted oversight audit will help promote and ensure the accuracy of stability instructions across the BSAI crabbing fleet.

8.1.3. Recommend District 17 develop policy regarding SSCs and ADF&G 24-hour notice regulations. The policy should address the planning, training, and execution of scheduled SSC operations, the scope and purpose of SSCs, and procedures examiners should follow when conducting and documenting SSCs or receiving ADF&G 24-hour notices. Developing policy regarding SSC and ADF&G 24-hour notices will establish expectations and provide BSAI crabbing fleet operators and Coast Guard examiners with improved procedures to confirm a vessel complies with stability requirements.

8.1.4. Recommend District 13 and District 17 CFVEs use direct verification to weigh the vessel's crab pots during dockside safety examinations and SSCs. Examiners should conduct direct verification by actual weight observations of a sample amount of crab pots using a calibrated scale supplied by the Coast Guard. In cases where the weight of the crab pots with its gear is different than the weight used to establish the vessel's stability instructions, the examiner should require the owner to work with a qualified individual to amend the stability instruction's loading tables. This direct verification should help ensure the weight of the crab pots are consistent and in accordance with the weights used to develop the vessel's stability instructions.

8.1.5. Recommend Commandant conduct a targeted oversight audit on all CFVs subject to the stability requirements of 46 CFR, Subpart E. The oversight audit should focus on efforts to promote stability compliance and documentation of stability instruction requirements as it relates to vessel weight creep, modifications, conversions or substantial alterations. The audit should also evaluate the efficiency of examination forms and the CFVE PQS to verify and document CFV stability and freeing port area compliance. This targeted oversight audit will help promote and ensure compliance and the accuracy of CFV stability to required standards.

8.1.6. Recommend Commandant amend 46 CFR 28.530 – Stability Instructions, to require owners to ensure the qualified individual includes within the stability instructions the assumed weight of crab pots used within the stability calculations. Requiring stability instructions to indicate the assumed weight of the crab pots will more effectively enable CFV owners to track weight creep and update the stability instructions before it adversely affects the vessel's stability.

8.1.7. Recommend Commandant amend 46 CFR 28.550- Icing, to reflect the intent of the icing regulations as indicated in the preamble to the final rule. The regulations should specifically require the owner to ensure the qualified individual includes within the stability instructions the weight and thickness of assumed ice used within the stability calculations. Further, when vessels operate under NWS freezing spray forecasts, the stability instructions should indicate the vessel may experience icing conditions that exceed the vessel's stability and that captains shall consider delaying departure from port, or if already underway, seek protected waters or take immediate action to minimize ice accumulations. Requiring stability instructions to indicate ice weight and thickness accumulation calculations will more effectively enable CFV captains to anticipate and manage ice accumulations before it adversely affects the vessel's stability.

8.1.8. Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFV owners and captains to present evidence of course completion after attending Coast Guard approved stability training. This will ensure owner and captains are aware of stability instructions requirements and procedures to minimize the potential for preventable vessel losses attributed to inaccurate stability instructions or improper loading of fishing vessels.

8.1.9. Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFVs owners to notify the Coast Guard when the vessel undergoes modifications, conversions or substantial alterations and if the owner selected a qualified individual to conduct a stability assessment. Such notifications will promote the Coast Guard's ability to obtain and document vessel modifications and to facilitate constructive conversations with the owner to detect and correct inaccurate stability instructions and reduce future catastrophic stability casualties.

8.1.10. Recommend Commandant amend 46 CFR Part 28, Subpart E – Stability, to require CFVs owners to maintain an onboard and shore side record of all incremental weight changes to the vessels lightship condition and fishing/cargo gear. Requiring the vessel owner to track weight changes over time will help the owner readily determine if the aggregate total will require a qualified individual to update the vessel's stability instructions, and thus reduce future catastrophic stability casualties.

8.1.11. Recommend Commandant amend 46 CFR Part 28, to require CFV owners and captains implement shipboard policies to address crew rest, work hours and fatigue. The shipboard policies should reflect the basic principles of the Coast Guard's Crew Endurance Management System (CEMS) used to identify and control crew endurance risk factors. Requiring owners and captains to implement crew rest policy would give crewmembers the opportunity to reduce their risk of fatigue-related accidents and help prevent casualties.

8.2. Administrative Recommendations

8.2.1. Recommend Sector Puget Sound, consistent with MOC Policy Letter 04-07, rescind acceptance of the NAVTECH/USSA third party surveyor who conducted the last dockside safety examination on the DESTINATION in June 2016. This will ensure the third party surveyor does not conduct another dockside safety examination until NAVTECH/USSA has provided the surveyor remedial training on CFV stability compliance verification and has recertified the surveyor to conduct Coast Guard third party examinations.

8.2.2. Recommend Sector Anchorage initiate Civil Penalty proceedings against the owner of the DESTINATION for failing to provide the captain with accurate stability instructions to maintain the vessel in a satisfactory stability condition, as required in 46 CFR 28.530.

8.2.3. Recommend District 17, consistent with COMDTINST M16130.2F, conduct a SAR case study, regarding SAR operations for the DESTINATION. The case study should evaluate, but need not be limited to, aircraft readiness launch standards. The case study should also audit the effectiveness of corrective measures established from the February 2017 after action review conducted by District 17's Incident Management Branch staff.

8.2.4. Recommend District 17 recognize the captain and crew of the BERING ROSE and SILVER SPRAY for their actions and efforts to deviate course, proceed to the DESTINATION's LKP, and participate as Good Samaritans assisting in SAR operations for the DESTINATION's crew.

8.2.5. Recommend this investigation be closed.

SCOTT W. MULLER
Commander, U.S. Coast Guard
Chairman, Marine Board of Investigation

Enclosure: Marine Board of Investigation Convening Order

Appendix: Coast Guard MSC Technical Review and Analysis of Stability Report

U.S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

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Stop 758, Washington, DC 20593-7581
Staff Symbol: CG-5P
Phone: (202) 372-1016
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16732
17 FEB 2017

# MEMORANDUM

From: P. F. Thomas, RADM
CG-5P

To: S. W. Muller, CDR
D5 (dpi)

Subject: MARINE BOARD OF INVESTIGATION CONCERNING THE SINKING OF THE CFV DESTINATION (O.N. 632374) APPROXIMATELY 3NM NORTH OF ST. GEORGE ISLAND, ALASKA WITH MULTIPLE LOSS OF LIFE

1. Pursuant to the authority contained in Title 46, United States Code (U.S.C.), 6301 and the regulations promulgated thereunder, you are to convene a Formal Marine Board of Investigation (MBI) consisting of the following members.

- CDR Scott Muller, USCG, Chairman
- LCDR [redacted] USCG, Recorder
- Mr. [redacted] USCG, Member

2. The Marine Board will thoroughly investigate the sinking and loss of life of the CFV DESTINATION (O.N. 632374) in accordance with the all applicable statutory and regualtory mandates. Upon completion of the investigation, the Board will issue a report to the Commandant with the evidence collected, the facts established, and its conclusions and recommendations. Conclusions or recommendations concerning commendatory actions or misconduct that would warrant further inquiry shall be referred by separate correspondence to the cognizant District Commander for consideration and action as appropriate. A daily summary of significant events shall be transmitted to Commandant (CG-INV) while the Board is in formal session.

3. Complete and submit your investigative report to Commandant (CG-INV) within 12 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 highly encouraged to submit any interim recommendations intended to prevent similar casualties, if appropriate, at any point during 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 U.S.C. 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/or submit or request additional evidence.

16732
17 February 2017

Subj: MARINE BOARD OF INVESTIGATION CONCERNING THE SINKING OF THE CFV DESTINATION (O.N. 632374) APPROXIMATELY 3NM NORTH OF ST. GEORGE ISLAND, ALASKA WITH MULTIPLE LOSS OF LIFE

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

#

Copy: PACAREA(p)
CCGD17(p)
CCGD13(p)
CCGD5(p)
SECTOR Anchorage
INCOE

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

Commanding Officer
United States Coast Guard
Marine Safety Center

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16710/P020932
Serial: H2-1800414
09 Feb 2018

# MEMORANDUM

From: S. E. Hemann, CDR
CG MSC-1

Reply to Attn of: Mr. [redacted]

To: S. W. Muller, CDR
Chairman, Marine Board of Investigation

Subj: POST SINKING INVESTIGATIVE STABILITY ANALYSIS OF THE F/V DESTINATION, O.N. 632374

Ref:
(a) Your memo dated 26 Oct 2017
(b) [redacted], P.E., F/V DESTINATION, Trim and Stability Report, 63 pages, dated 27 Oct 1993
(c) KraftMar Design Services letter, "Stability," dated 28 Jan 2013
(d) [redacted] Boatbuilding Drawing, "Lines & Offsets," Rev. A, dated 16 Nov 1992
(e) MBI, Assumed Departure Loading Condition at the Time of the Sinking, dated 26 Oct 2017

1. As requested in reference (a), the Marine Safety Center (MSC) performed a stability analysis of the F/V DESTINATION to assist the Marine Board of Investigation (MBI) in determining what may have led to its sinking. The findings are summarized below and enclosure (1) provides greater detail and describes the method of analysis. It is important to note that our analysis required that we make assumptions and estimations involving the vessel hull form, displacement, and location of the weights and centers of gravity; consequently, our findings are subject to uncertainty. Details of our analysis and assumptions are documented in the enclosure.

2. There is no record that the modifications completed in 1993 were formally considered by the Coast Guard to be a major modification or substantial alteration, however the author of reference (b) suggests that the modifications were treated as such. Given the extent of the alteration to the vessel, we reasonably conclude that the alterations were substantial and as such, the DESTINATION was required to meet the intact righting energy criteria of 46 CFR 28.570 and the severe wind and roll criteria of 46 CFR 28.575. The unintentional flooding requirement of 46 CFR 28.580 was not required as this was only applicable to vessels built on or after September 15, 1991.

3. Our calculations show that the DESTINATION did not meet the stability criteria for all loading conditions as asserted by the reference (b). MSC did not have copies of the model used, or the calculations completed by the author of reference (b), and thus was not able to identify the cause of discrepancies between our results and those presented in reference (b). It is perhaps more informative therefore to understand that generally our analysis aligned with that of reference (b) and to consider that the vessel operated under the instructions found in reference (b) and (c) for many years until the casualty. MSC found that on the day of the casualty, the loading condition exceeded that anticipated or evaluated in reference (b) and was below the required

standard. As indicated in the report any amount of icing and water in the #3 Hold would have further reduced stability as well. Although not explicitly explored by MSC, wind and wave action would have likely further hampered the vessel.

4. Our analysis shows that when loaded as indicated in reference (e) the vessel's righting energy would be reduced far below the minimum required for this vessel. MSC concludes that the internal and external forces that were likely acting on the vessel at the time of the casualty combined to overcome the vessel's righting energy and likely caused the vessel to capsize.

5. If you have questions or need additional information, please contact Mr. [redacted] or Lieutenant [redacted]

#

Encl: (1) Explanation of Analysis and Assumptions

# USCG MARINE SAFETY CENTER POST SINKING
# STABILITY ANALYSIS OF F/V DESTINATION
# February 9, 2018
# EXPLANATION OF ANALYSIS

## 1. General Comments Regarding the Analysis

- All references in this analysis are as listed on Marine Safety Center (MSC) Memo, Serial No. H2-1800414, dated February 9, 2018.

- DESTINATION was originally constructed in 1981 as an 81 foot US flagged uninspected commercial fishing vessel. In 1993 modifications were completed to lengthen and widen the vessel. In addition to adding approximately 30 feet of length, sponsons were added to widen the vessel from 26 feet to 32 feet. Neither the shipyard nor the owner produced or maintained construction or arrangement plans. Documentation from the time provides varying post-modification vessel lengths ranging from 98 feet to 110 feet. The length overall according to references (b), (c), and (d) is given as 110 feet, and is the length used in this analysis.

- There is no record that the modifications completed in 1993 were formally considered by the Coast Guard to be a major modification or substantial alteration, however the author of reference (b) suggests that the modifications were treated as such. Given the extent of the alterations to the vessel, we reasonably conclude that they were substantial and as such, the DESTINATION was required to meet the intact righting energy criteria of 46 CFR 28.570 and the severe wind and roll criteria of 46 CFR 28.575. The unintentional flooding requirement of 46 CFR 28.580 was not required as this was only applicable to vessels built on or after September 15, 1991.

- After the 1993 modifications, an inclining experiment was conducted and reference (b) was developed to define safe operating conditions for the vessel. Five loading conditions were defined with varying hold and crab pot usage. Reference (b) indicates the vessel was analyzed for the stability requirements of 46 CFR 28.570 and 46 CFR 28.575, but does not state how the stability calculations were performed or what software was used.

- As indicated in witness testimony, in 2013, KraftMar Design Services designed a bulbous bow for the vessel and was asked to conduct a stability assessment of the DESTINATION following the installation of the bulbous bow.

- Creative Systems' General HydroStatics (GHS) software version 15.5 was used to conduct stability analysis.

- All weights are reported in long tons (LT). One LT is equivalent to 2240 pounds.

- All vertical references and drafts were measured from a baseline drawn horizontally tangent to the lowest part of the molded hull.

- For a detailed assessment of stability, naval architects examine a vessel's righting arm curve. The righting arm curve is a plot of a vessel's righting arm versus angle of heel. A righting arm is a measurement of a vessel's ability to right itself when disturbed from its upright position. In general, the greater the righting arm, the better the vessel's stability characteristics. The area under the righting arm curve (measured in foot-degrees), also called righting energy, is often used as a measure of the vessel's ability to absorb energy imparted by wind, waves, or other forces. The righting arm curve is calculated by multiplying the weight of the ship by its righting arm at each angle of heel. The sum of these moments from zero (if the ship is at even keel) to the angle of vanishing stability is the total amount of energy the vessel has to prevent capsizing. A vessel with very little righting energy could roll past its range of positive stability and capsize as a result of even a relatively small disturbance.

- A term used throughout this analysis is metacentric height (GM). Metacentric height is an indicator of initial stability for a vessel through small angles of heel. It is the vertical distance between the vertical center of gravity (VCG) and the metacenter. The metacenter is a point at which a vertical line passing through the center of buoyancy while the vessel is at equilibrium intersects with other vertical lines stemming from the center of buoyancy as the vessel is heeled. In general, a larger GM indicates greater initial stability and will resist roll. Smaller GM values indicate less initial stability and will resist less against roll disturbances. A negative GM indicates a ship is unstable.

## 2. Lines Plan and Model Development

In order to validate the stability results found in reference (b), the MSC developed a computer hull model to analyze the vessel using GHS. MSC's model was developed by using a set of lines plans, reference (d), which does not include the later added bulbous bow. It should be noted that while there is some uncertainty in the origin of reference (d), as we were informed there were no construction or arrangement plans produced at the time of the 1993 modifications, it provides what appears to be a complete depiction of the vessel's hull form. Using GHS and reference (d), we independently developed a new hull model from this plan using a hull digitizer to accurately transform the 2-D lines plan into a 3-D computer hull model.

During development of our model, we evaluated a GHS model provided by KraftMar Design Services used in their 2013 analysis, both with and without the bulbous bow appendage added. We found several differences between the KraftMar Design services hull form and

reference (d). In comparing the KraftMar Design Services model to reference (d), the following differences in overall dimension were noted:

| | KraftMar Model | Lines & Offsets Plan |
|---|---|---|
| **Vessel Length (Watertight Envelope)** | 113.25 feet | 109.25 feet |
| **Beam** | 32.40 feet | 32.17 feet |
| **Depth to Main Deck** | 15.80 feet | 15.68 feet |

**Table 1: Dimension Differences**

Table 2 shows the hydrostatics for KraftMar's model compared to our independently digitized lines plan model. KraftMar's model has consistently heavier displacements and its longitudinal center of buoyancy (LCB) is consistently further aft.

| | KraftMar's Hull Model | | | MSC Hull Model | | |
|---|---|---|---|---|---|---|
| **Depth (ft)** | Displacement (LT) | LCB (ft) | VCB (ft) | Displacement (LT) | LCB (ft) | VCB (ft) |
| 9 | 200.24 | 0.06 fwd | 6.88 | 193.08 | 2.64 fwd | 6.85 |
| 10 | 266.13 | 0.96 aft | 7.53 | 255.27 | 1.86 fwd | 7.50 |
| 11 | 337.63 | 1.97aft | 8.16 | 323.30 | 0.93 fwd | 8.13 |
| 12 | 413.21 | 2.81aft | 8.78 | 396.12 | 0.02 fwd | 8.75 |
| 13 | 491.65 | 3.41aft | 9.37 | 471.69 | 0.65 aft | 9.35 |
| 14 | 572.36 | 3.82aft | 9.95 | 549.19 | 1.09 aft | 9.94 |
| 15 | 655.25 | 4.08aft | 10.53 | 628.68 | 1.38 aft | 10.52 |

**Table 2: Model Hydrostatic Comparison**
**Note: LCB is referenced from amidships**

When the loading conditions defined in reference (b) were analyzed in GHS, our model generated vessel trims very similar to those shown in reference (b), which further substantiated the hull model we developed. Conversely, the extended length of the KraftMar Design Services model resulted in the vessel trimming significantly farther forward when the same loading conditions were applied. The model developed by MSC was used throughout this entire analysis, unless otherwise specified.

Figures 1, 2, and 3 illustrate the results of the model as a Rhino 3D rendering prior to the bulbous bow addition.

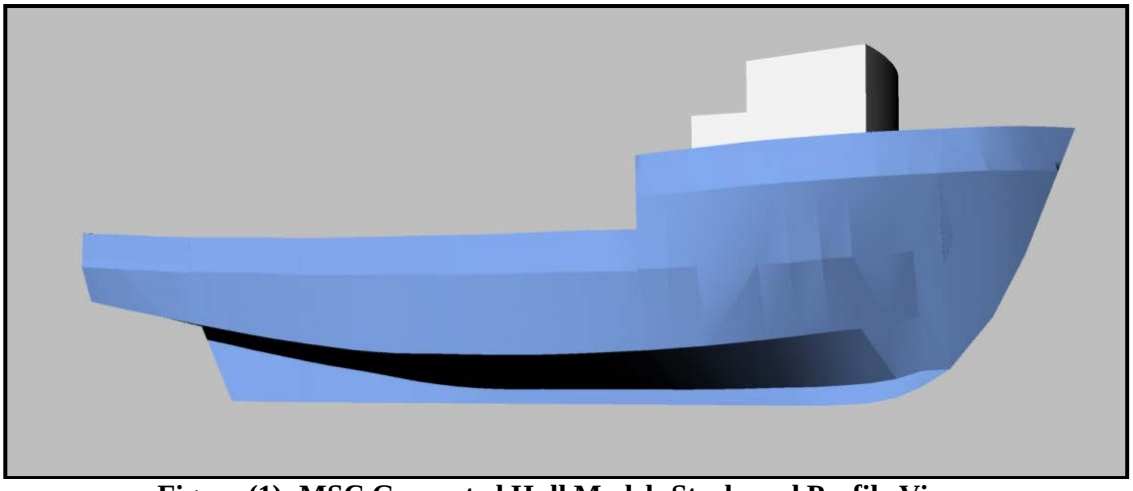


**Figure (1): MSC Generated Hull Model: Starboard Profile View**

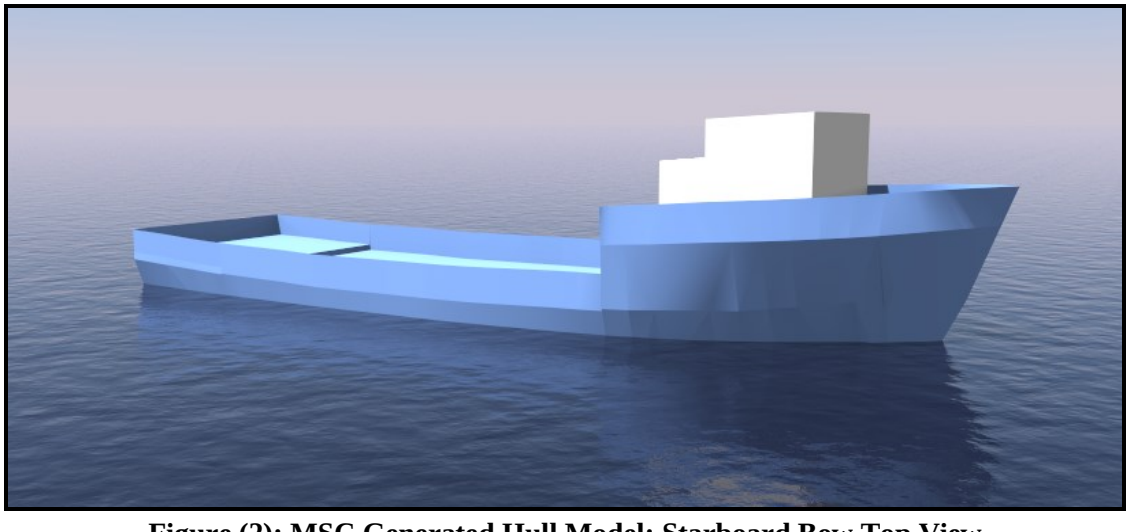


**Figure (2): MSC Generated Hull Model: Starboard Bow Top View**

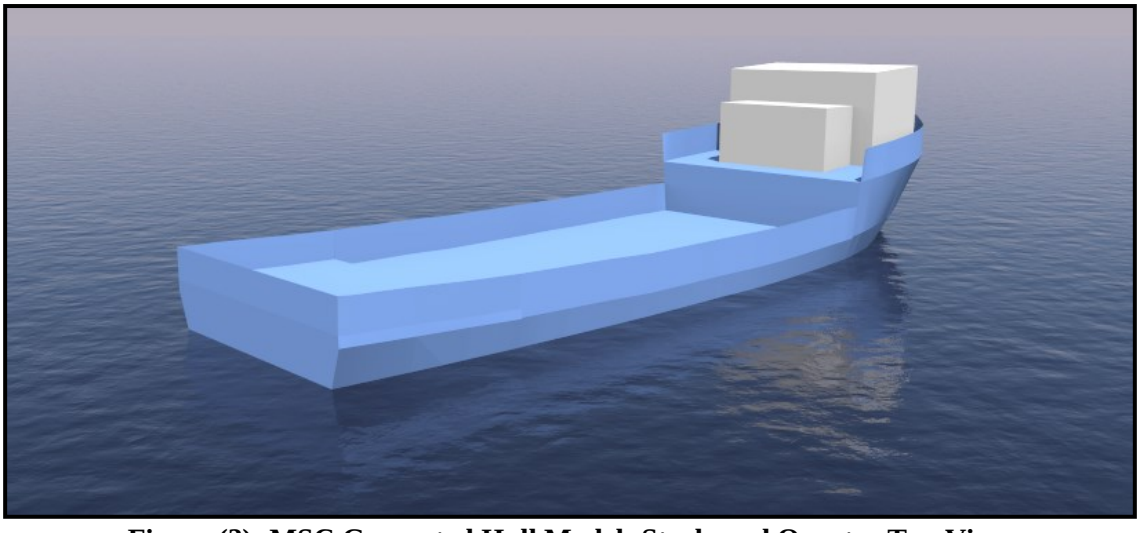


**Figure (3): MSC Generated Hull Model: Starboard Quarter Top View**

## 3. Lightship Value Estimation

Using our model, we recalculated the lightship values using the stability test data and the vessel's hydrostatic table found in reference (b). We were unable to replicate the provided results exactly, the calculated displacement used in the stability calculations at the time was approximately 2% heavier than that determined by our calculations, with a negligible difference in the vessel's centers of gravity. The lightship values we calculated are presented in table 3 below compared to those listed in reference (b). We do not believe the differences noted in the lightship characteristics would have a significant impact on the vessel's intact stability, as the displacement difference equates to a less than 1% difference for the assumed departure loading condition outlined in reference (e).

| | T & S Book Lightship | MSC Generated Hull Lightship |
|---|---|---|
| **Displacement (LT)** | 221.85 | 216.61 |
| **VCG (ft above baseline)** | 15.03 | 15.35 |
| **LCG (ft fwd of amidships)** | 8.29 | 8.43 |

**Table 3: Lightship Values comparing T & S Book and MSC Generated Hull Model**

## 4. Loading Conditions

Five distinct loading conditions were analyzed in reference (b). Each loading condition was analyzed for both summer and winter conditions. Winter loading conditions were evaluated by adding the weight effect of icing as detailed in 46 CFR 28.550 (1.3 inches on all horizontal surfaces and 0.65 inches on all vertical surfaces). These loading conditions differ in how many fish holds are full and whether or not the vessel has full or low consumables. We used our model to analyze whether the DESTINATION, when loaded in each of these five conditions, met the applicable intact stability criteria.

## 5. Intact Stability Assessment

As previously stated, the DESTINATION was required to meet the intact righting energy criteria of 46 CFR 28.570 and the severe wind and roll criteria of 46 CFR 28.575. The results presented in reference (b) indicate that the vessel met all applicable criteria. In some loading conditions the vessel's maximum righting arm occurred at angles of heel less than 25°. In such cases, as permitted by 46 CFR 28.570(c), the requirements of 46 CFR 170.173(c) were applied. Tables 4 and 5 below summarize the intact righting energy criteria for both 46 CFR 28.570 and 170.173(c).

Our analysis showed that in all loading conditions, the vessel's maximum righting arm occurred at an angle of less than 25°. Therefore, in our analysis we also applied the criteria in 46 CFR 170.173(c). Our results show that five out of the ten conditions were not in compliance with the intact stability criteria. Specifically, conditions of loadings 3 - winter, 4 – summer, 4 – winter, 5 – summer, and 5 – winter did not comply with the intact stability criteria.

Table 4 and 5 compare MSC results to the results presented in reference (b) for the Winter Loading Condition 5. While we note there were differences in the calculated values, it must be stressed that MSC was unable to review or verify the model or calculations used to produce reference (b).

| Limit | Required | T & S Book | MSC Results |
|---|---|---|---|
| **Initial Metacentric Height (GM)** | > 1.15 ft | 5.71 | 5.38 |
| **Righting Arm (GZ) at an angle of heel of not less than 30˚** | > 0.66 ft | 0.84 | 0.57 |
| **Angle of Maximum Righting Arm** | > 25˚ | 21.00 | 15.31 |
| **Area up to 40˚or Downflood Angle** | > 16.9 ft-deg | 28.37 | 21.76 |
| **Area up to 30˚** | > 10.3 ft-deg | 20.88 | 17.19 |
| **Area between 30˚and 40˚** | > 5.6 ft-deg | 7.49 | 4.57 |
| **Positive Righting Arm** | > 60˚ | 54.00 | 47.45 |

**Table 4: 46 CFR 28.570, Intact Righting Energy Criteria – Winter Loading Condition 5**

| Limits from 170.173 (c) | Required | T & S Book | MSC Results |
|---|---|---|---|
| **Initial Metacentric Height (GM)** | > 0.49 ft | 5.71 | 5.38 |
| **Angle of Maximum Righting Arm** | > 15˚ | 21.00 | 15.31 |
| **Area up to 40˚or Downflood Angle** | > 16.9 ft-deg | 28.37 | 21.76 |
| **Area between 30˚and 40˚** | > 5.6 ft-deg | 7.49 | 4.57 |
| **Area at Max Righting Arm** | > 12.54 ft-deg | 13.17 | 7.64 |

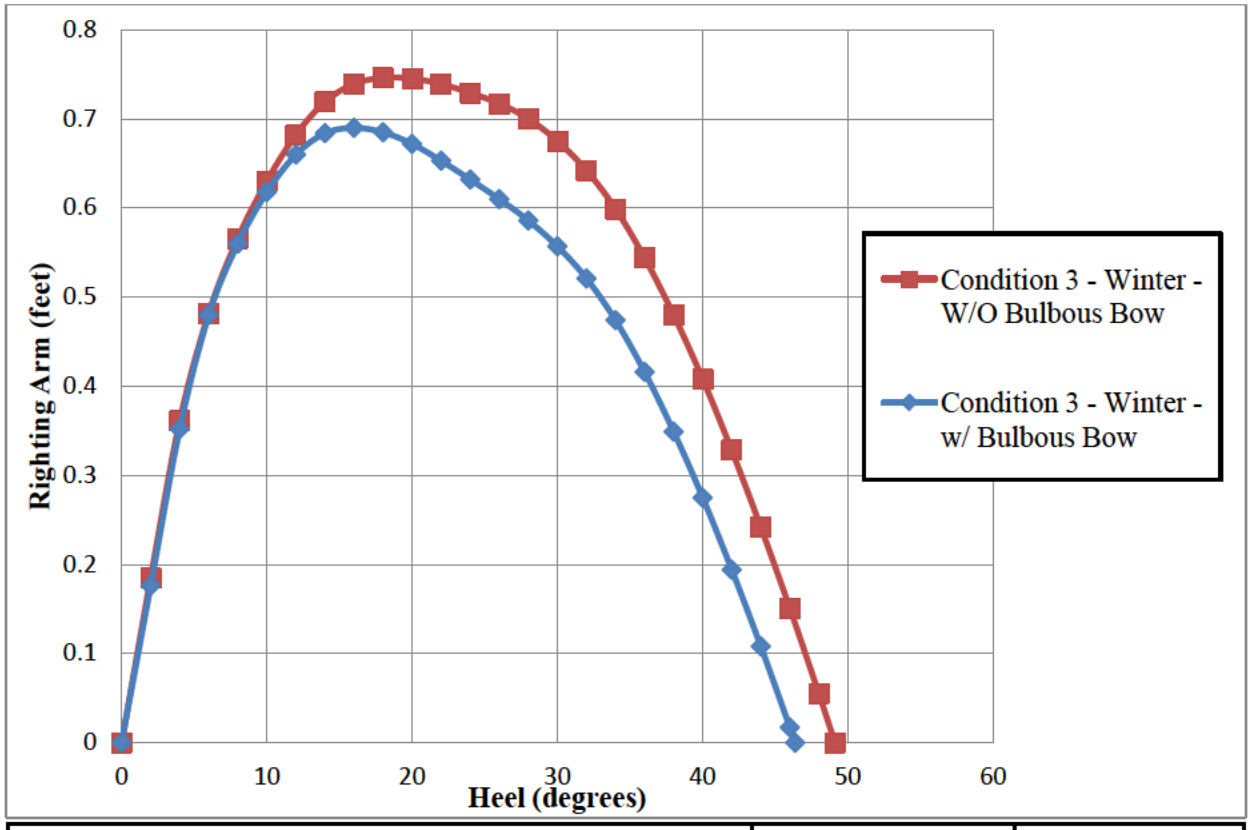
**Table 5: 46 CFR 170.173 (c), Intact Righting Energy Criteria – Winter Loading Condition 5**

DESTINATION was also subject to 46 CFR 28.575, severe wind and roll criteria. Given that our results show the vessel not complying with the righting energy based criteria, and the number of assumptions that would have to be made, we did not evaluate severe wind and roll.

## 6. Stability Evaluation Post Bulbous Bow Installation

Following our analysis of the DESTINATION using the loading conditions outlined in reference (b), we repeated the process with our independently digitized model modified to include the bulbous bow. We adjusted the vessel's lightship characteristics by incorporating the estimated weight change of the bulbous bow as provided in reference (c). We then revisited the intact stability criteria of 46 CFR 28.570 using the new model.

In general, our results showed the bulbous bow reduced the righting arm values and provided no additional benefit to the vessel's stability as all stability criteria results further decreased. Figure 4 below compares the righting arm curves of the winter loading condition 3 from reference (b) with and without the bulbous bow appendage.




| Limits from 170.173 (c) | Required | Attained Condition 3 w/o Bulbous Bow | Attained Condition 3 w/ Bulbous Bow |
|---|---|---|---|
| **Initial Metacentric Height (GM)** | > 0.49 ft | 5.29 | 5.02 |
| **Angle of Maximum Righting Arm** | > 15˚ | 18.00 | 16.00 |
| **Area up to 40˚or Downflood Angle** | > 16.9 ft-deg | 23.79 | 21.05 |
| **Area between 30˚and 40˚** | > 5.6 ft-deg | 5.62 | 4.35 |
| **Area at Max Righting Arm** | > 12.54 ft-deg | 9.49 | 7.76 |

**Figure (4): Comparison of Righting Arm Curves and Stability Criteria for Bulbous Bow Addition**

While reference (c) states that stability is negligibly reduced and that the owner "should be totally safe to operate the vessel in accordance with the current booklet," our analysis shows eight out of the ten loading conditions do not meet the intact stability criteria. Most typically, the vessel fails to meet the righting energy requirement of 46 CFR 28.570(a)(7) and 46 CFR 170.173(c)(5).

MSC independently analyzed the loading conditions presented in reference (b) using the KraftMar GHS model. Contrary to the analysis done with our model, these results show that the vessel met the applicable stability criteria of 46 CFR 58.570 and 46 CFR 170.173(c). Some of the disparity between the results of the stability analysis using our model and the one provided by KraftMar can be attributed to the differences in the models, however, we cannot confirm that this was the only contributing factor without evaluating calculations that may have been performed by them.

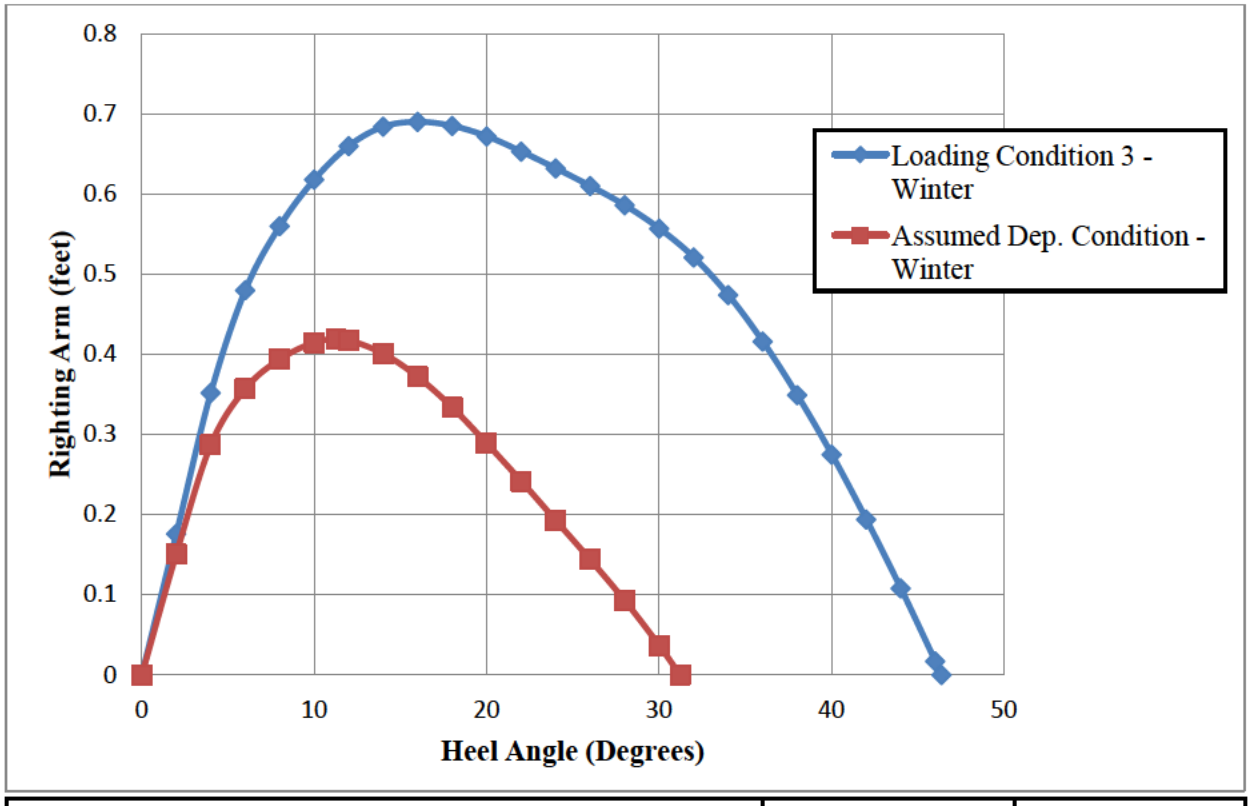
Reference (c) discusses the negligible impact the bulbous bow addition would have on the metacentric height (GM) of the vessel. In our independent analysis, it was confirmed that the vessel consistently met the initial GM requirement of 46 CFR 28.570(a)(1) in all loading conditions. However, after a modification such as this, the entire range of stability should be analyzed as GM is only an indicator of initial stability, not a good predictor of overall stability through larger angles of heel as indicated in Figure 4 where initially the righting arm curves are nearly identical, however at larger angles of heel, they differ.

## 7. Assumed Departure Loading Condition

MSC was provided with an assumed departure loading condition at the time of the sinking as outlined in reference (e). This condition was similar to the winter loading condition number 3 of reference (b), with the following differences:

- Crab pots are assumed to weigh 840 pounds rather than 700 pounds. A crab pot was recovered from DESTINATION using a remotely operated vehicle. This crab pot was weighed after being allowed to dry several days and was recorded as 840 pounds.
- An approximate total of 19,706 pounds (8.8 LT) of bait is stored on the vessel in various locations, rather than 6,048 pounds (2.7 LT) of bait in the freezer

As previously presented, our analysis indicates that the winter loading condition number 3 failed to meet the stability requirements in 46 CFR 28.570 with the exception of the initial metacentric height (GM) criteria. Therefore, as we anticipated, our analysis of this modified loading condition shows that the DESTINATION failed to meet any of the intact stability requirements in 46 CFR 28.570 with the exception of the initial metacentric height (GM) criteria. Figure (5) below compares the righting arm curves for the assumed departure condition versus the loading condition 3 winter from reference (b) using our hull model.




| Limit | Required | Attained Condition 3 - Winter | Attained Assumed Dep. Condition |
|---|---|---|---|
| **Initial Metacentric Height (GM)** | > 0.49 ft | 5.02 | 4.32 |
| **Angle of Maximum Righting Arm** | > 15˚ | 16.00 | 11.27 |
| **Area up to 40˚or Downflood Angle** | > 16.9 ft-deg | 21.05 | 8.27 |
| **Area between 30˚and 40˚** | > 5.6 ft-deg | 4.35 | 0.02 |
| **Area at Max Righting Arm** | > 12.92 ft-deg | 7.76 | 3.34 |

**Figure (5): Righting Arm Curves and Stability Criteria for Assumed Departure Loading Condition - Winter**

As noted above, the assumed loading condition of reference (e) does not correspond directly to an examined loading condition in reference (b). Both of these curves account for 1.3 inches on all horizontal surfaces and 0.65 inches on all vertical surfaces. In accordance with 46 CFR 28.530(b), each vessel must be provided with loading constraints and operating restrictions which maintain the vessel in a condition meeting all applicable stability requirements, as developed by a qualified individual. If the operators failed to load the vessel in accordance with the stability instructions, it is the responsibility of the owner/operator to contact the qualified individual to receive additional guidance.

## 8. Discussion of Substantial Alteration

While the loading condition of the DESTINATION at the time of the casualty was not in accordance with any of the stability instructions, it did not constitute a substantial alteration as defined by 46 CFR 28.501 and 28.510, such. A substantial alteration refers to physical modifications made to a vessel that would change its lightship characteristics, hull underwater shape, angle of downflooding, or buoyant volume. The way in which the DESTINATION was loaded adversely affected its stability as additional weight would have been added above the prescribed vertical center of gravity in reference (b), but this was not a result of physical modifications made to the vessel itself.

## 9. Potential Causal Factors

*9.1 Freeing Port Area*

As shown in figure (6) below, the vessel had nine freeing ports on each side. Reference (a) indicates that each had an estimated area of 120 $in^2$ resulting in a total freeing port area on either side of the vessel of 1,080 $in^2$. For a vessel with a bulwark length of 72 feet, in accordance with 46 CFR 28.555(d), the required freeing port area per side is 2,390 $in^2$ (16.6 $ft^2$). The required freeing port area far exceeds the actual freeing port area (1,080 $in^2$). Additionally, the port side of the DESTINATION had a raised shelter bulwark from the deckhouse to the midship crane. Per 46 CFR 28.555(e), this would increase the required freeing port area on the port side by an additional 550 $in^2$.


**Figure (6): Starboard Profile Showing 9 Freeing Ports**

Figure (6) shows the starboard profile with the nine freeing ports. A vessel with insufficient freeing port area would likely result in more seawater becoming trapped on the main deck in foul weather. This water would add additional weight to the vessel, raise the

vessel's overall vertical center of gravity (VCG), and increase the free surface moment acting on the vessel as the water flows side to side. These factors would negatively impact the vessel's intact stability.

*9.2 Maximum Draft and Trim*

Using GHS, we analyzed the maximum VCG curves at varying drafts and trims. The results are displayed below for the 46 CFR 170.173(c) stability criteria. As the drafts and displacements increase, the maximum VCG for which the vessel passes the applicable stability criteria decreases. A point representing the assumed departure condition from reference (e) is plotted on Figure 7. The assumed departure condition point clearly falls outside the maximum VCG curves. Our calculations indicate that a trim of 6 feet forward or greater would be required to allow the vessel to pass the stability criteria given the assumed loading condition VCG and draft. This draft is well outside the normal operating trims in which the vessel would have been operating.

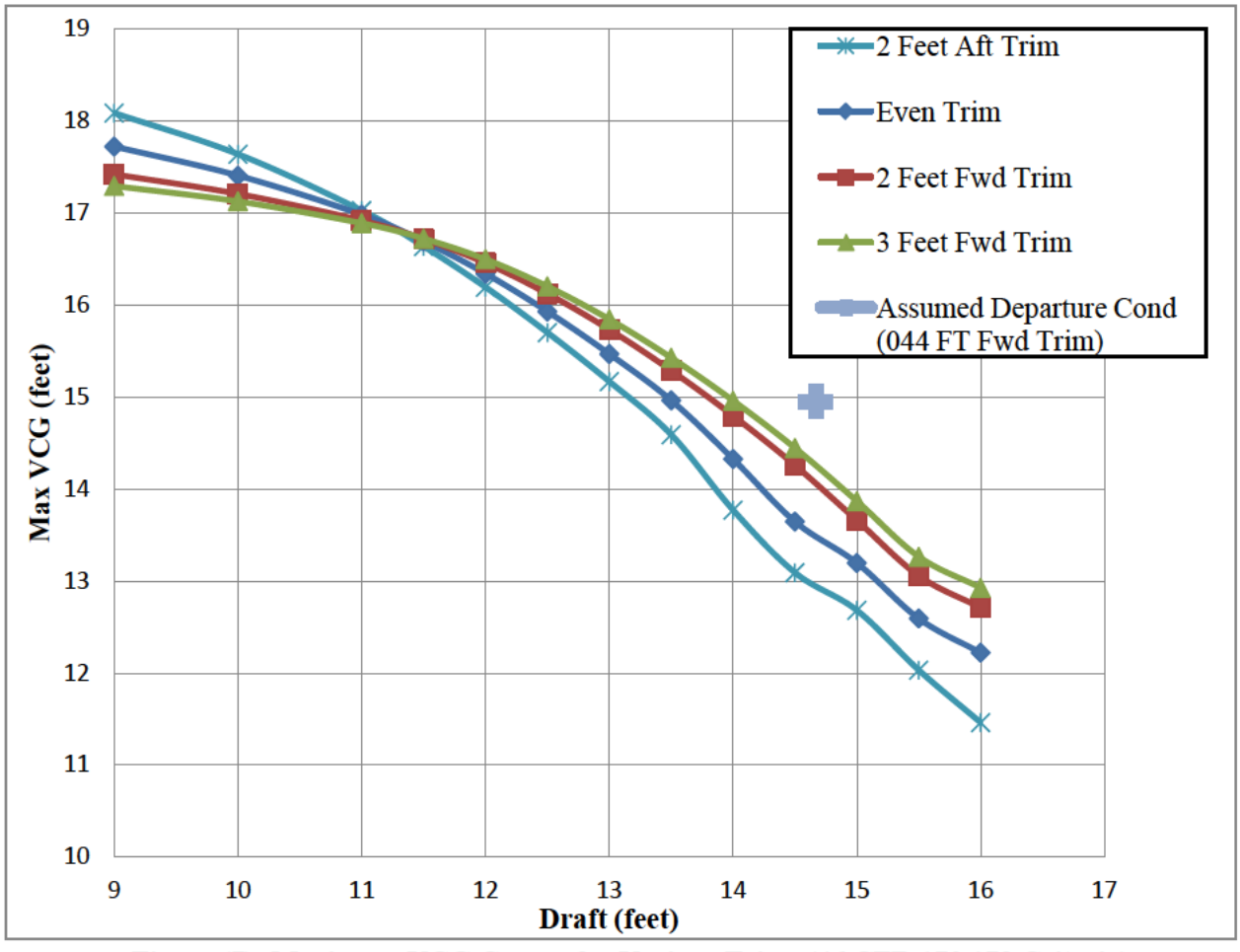



**Figure (7): Maximum VCG Curves for Various Trims (46 CFR 170.173 Criteria)**

## 10. Casualty Scenarios

### *10.1 Incremental Ice Loads*

We analyzed the assumed departure loading condition provided in reference (e) with increments of icing ranging from 1 - 12 inches. The respective righting arm curves are shown below in Figure (8) for icing loads ranging from 0 – 8 inches. Ice loads greater than 9 inches are not shown, as they resulted in negative initial metacentric heights.

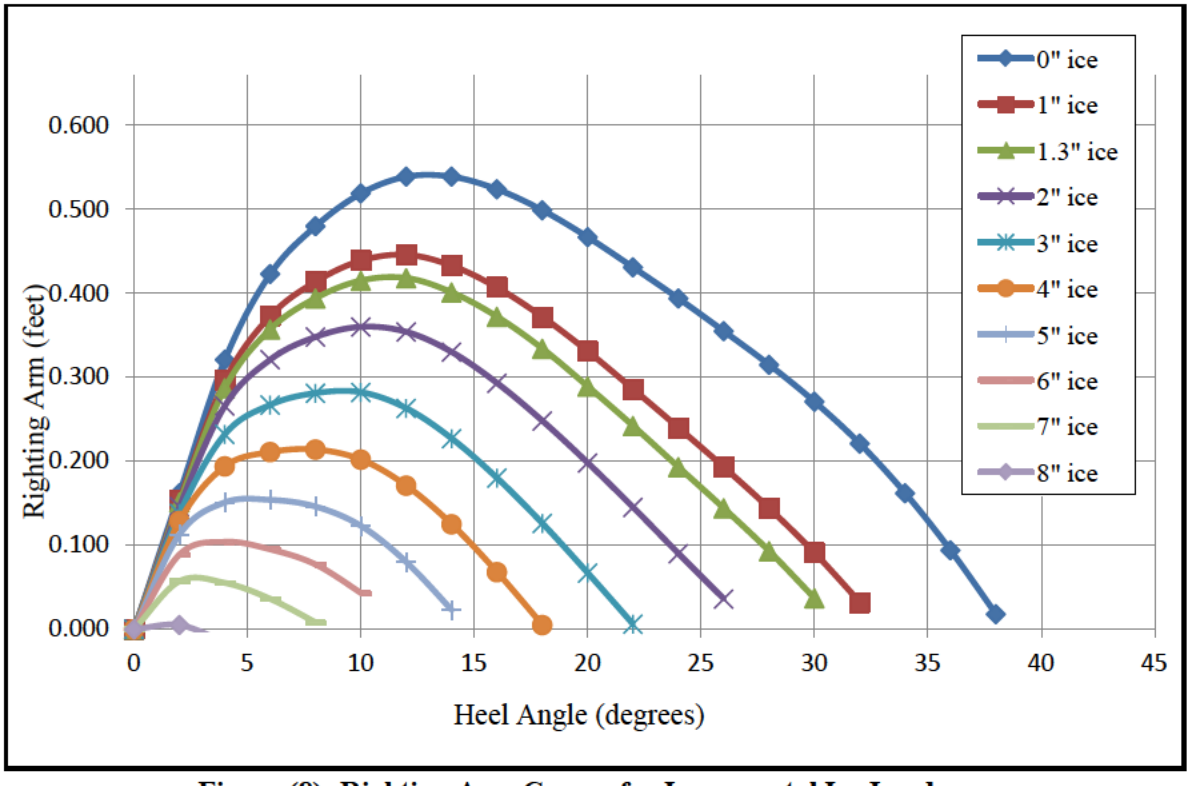



**Figure (8): Righting Arm Curves for Incremental Ice Loads**

In general, and as demonstrated above, icing weight would impair stability as icing equates to weight addition up high on the vessel. Our analysis showed no icing load conditions passed the intact stability criteria with the exception of the required initial GM. In our analysis, we used the center of gravities provided in reference (b) for all increments.

### *10.2 Incremental Seawater Loads*

It was reported that the vessel would operate with the #3 RSW Hold deck hatch left open, prompting the request for the analysis of water in the hold. We analyzed the assumed departure loading condition provided in reference (e) with incremental levels of salt water in the No. 3 hold ranging from 0 – 6 feet. The respective righting arm curves are shown below in Figure (9).

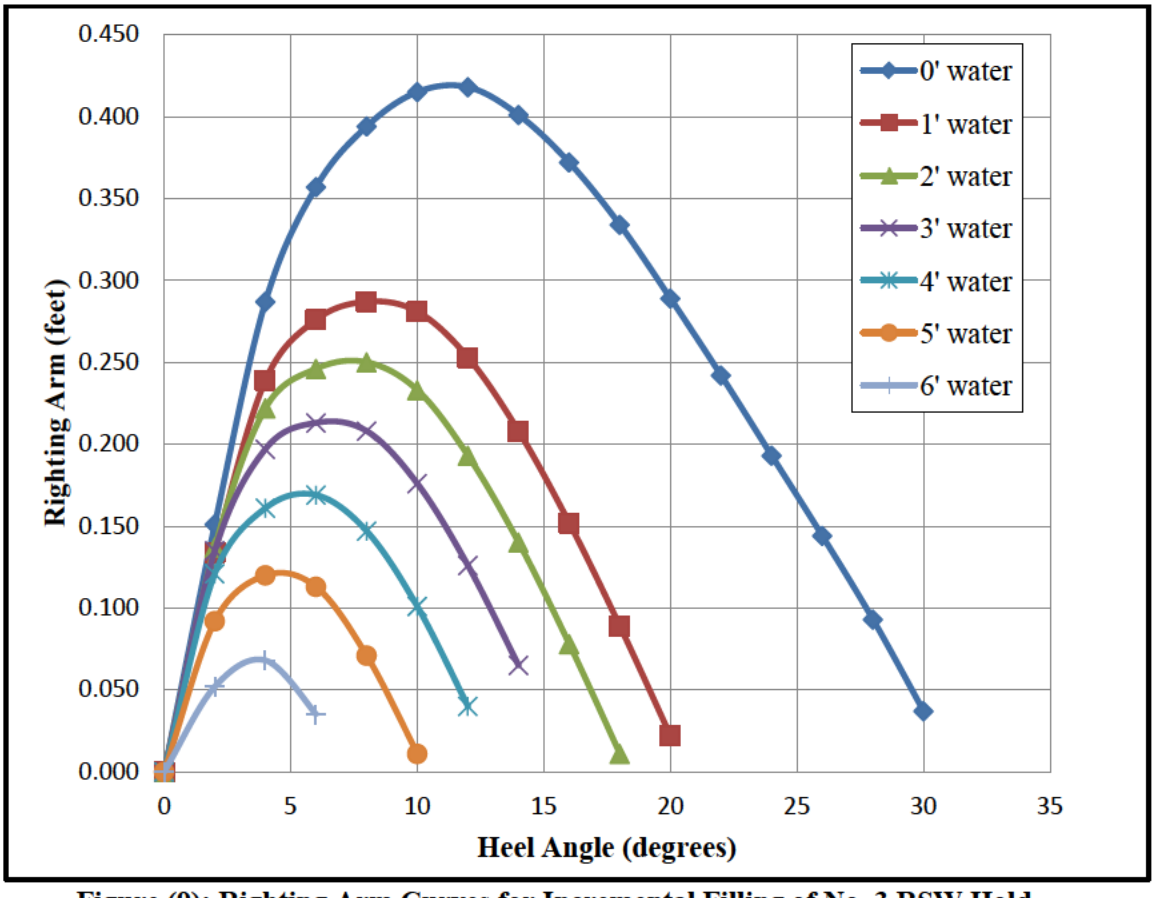



**Figure (9): Righting Arm Curves for Incremental Filling of No. 3 RSW Hold**

Hold #3 levels greater than 6 feet resulted in negative initial metacentric heights. The maximum sounding of Hold No. 3 per reference (b) is 9.75 feet. Again, our analysis of these incremental levels of salt water in Hold No. 3 using the assumed departure condition as a baseline, shows that the DESTINATION failed to meet any of the intact stability requirements in 46 CFR 28.570 with the exception of the required initial GM. In general, allowing the #3 Hold to be partially filled would impair stability by increasing the free surface effect and increasing the vessel's aft draft.

## 11. Results

The DESTINATION was a US flagged uninspected fishing vessel over 79 feet in length and, therefore subject to USCG stability regulations. The vessel was required to meet intact stability righting energy criteria found in 46 CFR 28.570 and the severe wind and roll criteria of 46 CFR 28.575.

Using a hull geometry model derived from reference (d), MSC analyzed the loading conditions presented in reference (b), and found that the majority of these conditions do not pass the applicable stability requirements of 46 CFR 28.570. However, the results presented in reference (b) indicate that all loading conditions met the regulatory requirements. We

found that our model confirmed the lightship values presented in reference (b) within 1% and our model trimmed and heeled as expected when using the loading conditions presented in reference (b). This would indicate that our model was very similar in form, size, and weight to that used to produce reference (b). It is unclear from reference (b) how the stability analysis was originally conducted or what assumptions were applied therefore, we can draw no conclusions as to cause of the discrepancy between reference (b) and our results.

We were asked if reference (c) adequately addressed the stability of the vessel following the addition of the bulbous bow. Reference (c) only discusses the negligible impact the bulbous bow addition would have on the metacentric height (GM). In our independent analysis, it was confirmed that the vessel far exceeded the initial GM requirement of 46 CFR 28.570(a)(1) in all loading conditions and that there was a very small reduction in GM following the modification. However, after a modification such as this, the entire range of stability should be analyzed as GM is only an indicator of initial stability, not a good predictor of overall stability through larger angles of heel. The need for a complete analysis is demonstrated by the results of our analysis presented in Figure 4. We found that at smaller angles heel, less than 10 degrees, the two righting arm curves are very similar indicating a negligible effect on righting energy. However, after about 10 degrees the reduction in righting arm energy is demonstrated. In conversations with KraftMar representatives, MSC was informed that KraftMar was not asked to, nor provided sufficient information to conduct a full stability analysis of the vessel after the 2013 modification.

MSC independently verified that the lightship characteristics applied in reference (b) appear to be accurate and reasonable.

MSC analyzed the required freeing ports on the vessel, and, assuming that the nine freeing ports on each side of the vessel each had an area of 120 $in^2$, the vessel failed to meeting the minimum freeing port area required by 46 CFR 28.555.

Reference (e) was provided to present the assumed departure loading condition prior to the vessel's sinking. It is a variation of reference (b) loading condition number 3, with heavier pots and 6.1 LT of additional bait. Using our hull geometry model further modified by the addition of a bulbous bow, MSC analyzed the presumed conditions and found that the vessel failed the applicable stability requirements with or without any additional ice loading or ingress of seawater.

MSC analyzed the DESTINATION applying incremental icing loads up to 8 inches. Our analysis showed that none of the icing load conditions passed the intact stability criteria, with the exception of the initial GM criteria. Ice loads greater than eight inches resulted in negative initial GM. In general, icing weight would impair stability as icing equates to weight addition up high on the vessel.

We analyzed the DESTINATION applying incremental levels of salt water in the No. 3 RSW Hold up to 6 feet. Again, our analysis of these incremental levels of salt water in the Hold No. 3 using the assumed departure condition as a baseline, shows that the DESTINATION failing to meet any of the intact stability requirements in 46 CFR 28.570, with the exception of the initial GM criteria.

We did not estimate or evaluate the heeling forces produced by wind or wave action on the vessel. However it can assumed that the vessel was significantly impacted by the severe weather conditions at the time of the casualty; the MBI indicates that winds at approximately 26.4mph, with gusts of 39mph, and waves at 12-14ft. For any vessel of this size, these weather conditions would be significant. As discussed above, the vessel had limited freeing port area, which would likely result in water entrapment and downflooding if the 3# Hold was left open as suspected. Also as discussed, any amount of icing would further degrade the stability of the vessel.

Given the uncertainty in our model and lack of detail as to the evaluation methods of the naval architects that produced references (b) and (c), MSC cannot definitely conclude that the vessel failed to meet applicable stability requirements. However, we have determined that the assumed loading condition greatly reduced the vessel's intact stability. The vessel had operated for many years with the guidance provided in reference (b) and (c), retained enough stability to operate for an extended period of time before encountering a particular situation where the combination of forces acting on the vessel were likely sufficient to overcome the vessel's righting energy and cause the vessel to capsize. While it is possible that the vessel sank before capsize, given the reduced righting energy, the conditions at the time of the casualty, MSC finds it most likely that the vessel capsized due to a loss of righting energy at the moment of the casualty.