

Executive Summary



The final photograph taken of the El Faro by TMR Terminal Manager on September 29, 2015, showing starboard list of approximately 4 degrees during loading operations prior to the final voyage. Credit: U.S. Coast Guard

The loss of the U.S. flagged cargo vessel EL FARO, along with its 33 member crew, ranks as one of the worst maritime disasters in U.S. history, and resulted in the highest death toll from a U.S. commercial vessel sinking in almost 40 years. At the time of the sinking, EL FARO was on a U.S. domestic voyage with a full load of containers and roll-on roll-off cargo bound from Jacksonville, Florida to San Juan, Puerto Rico. As EL FARO departed port on September 29, 2015, a tropical weather system that had formed east of the Bahamas Islands was rapidly intensifying in strength. The storm system evolved into Hurricane Joaquin and defied weather forecasts and standard Atlantic Basin hurricane tracking by traveling southwest. As various weather updates were received onboard EL FARO, the Master directed the ship southward of the direct course to San Juan, which was the normal route.

The Master's southern deviation ultimately steered EL FARO almost directly towards the strengthening hurricane. As EL FARO began to encounter heavy seas and winds associated with the outer bands of Hurricane Joaquin, the vessel sustained a prolonged starboard list and began intermittently taking water into the interior of the ship. Shortly after 5:30 AM on the morning of October 1, 2015, flooding was identified in one of the vessel's large cargo holds. At the same time, EL FARO engineers were struggling to maintain propulsion as the list and motion of the vessel increased. After making a turn to shift the vessel's list to port, in order to close an open scuttle, EL FARO lost propulsion and began drifting beam to the hurricane force winds and seas. At approximately 7:00 AM, without propulsion and with uncontrolled flooding, the Master notified his company and signaled distress using EL FARO's satellite distress communication system. Shortly after signaling distress, the Master ordered abandon ship. The vessel, at the time, was

near the eye of Hurricane Joaquin, which had strengthened to a Category 3 storm. Rescue assets began search operations, and included a U.S. Air National Guard hurricane tracking aircraft overflight of the vessel's last known position. After hurricane conditions subsided, the Coast Guard commenced additional search operations, with assistance from commercial assets contracted by the vessel's owner. The search located EL FARO debris and one deceased crewmember. No survivors were located during these search and rescue operations.

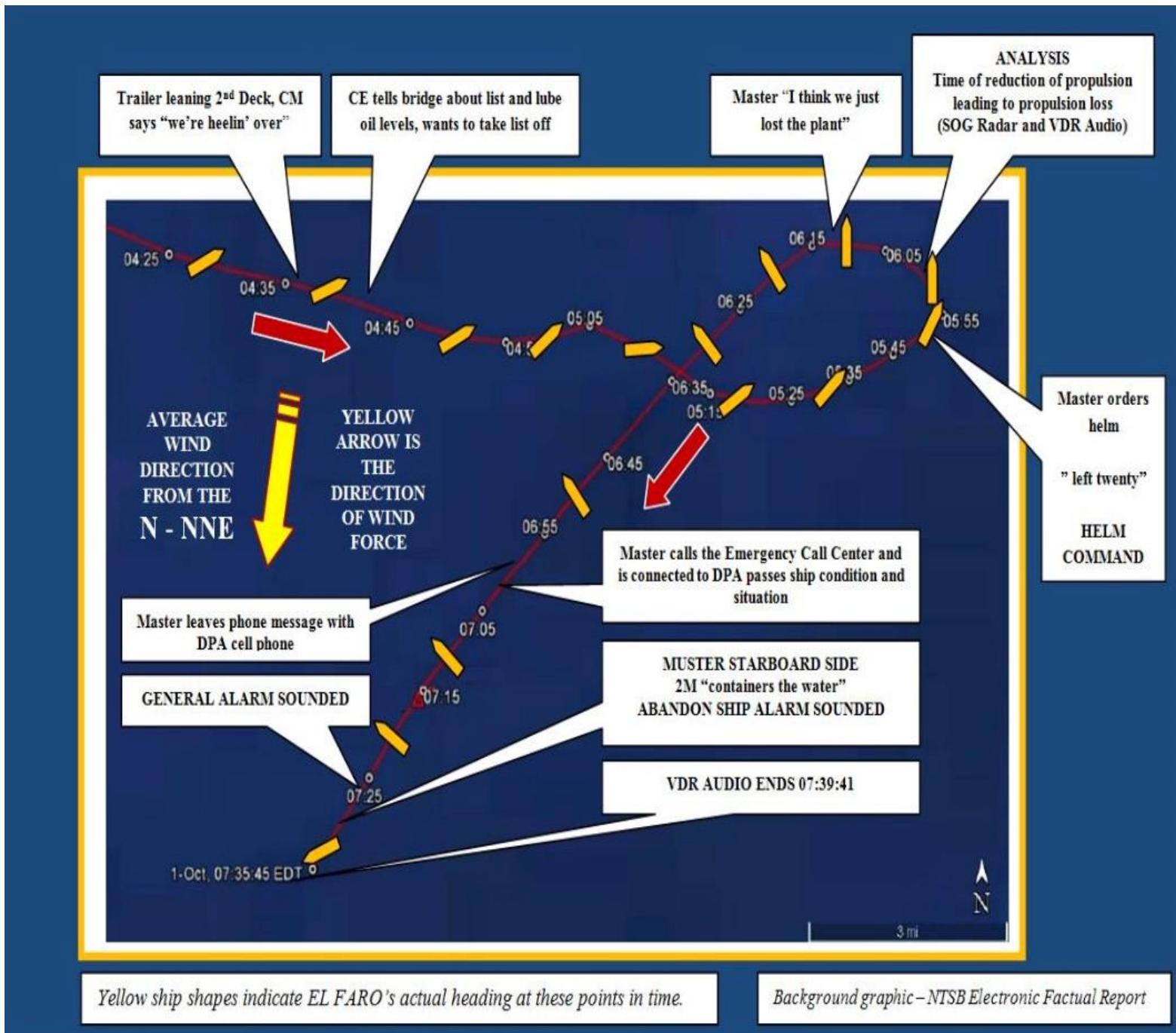


Illustration of significant events between 4:20 AM on October 1 and the sinking, showing ship heading and course over ground. Credit: U.S. Coast Guard

On October 3, 2015, a U.S. Navy surface asset contracted by the NTSB, using side-scan sonar, located the main wreckage of EL FARO at a depth of over 15,000 feet. EL FARO's voyage data recorder was successfully recovered from EL FARO's debris field on August 15, 2016, and it contained 26-hours of bridge audio recordings as well as other critical navigation data that were used by the MBI to help determine the circumstances leading up to this tragic incident.

Over the course of the investigation the MBI relied on visits to EL FARO's sister vessel, EL YUNQUE, to help understand the internal configuration of the PONCE class vessels and also identify operational and maintenance issues that could have impacted both vessels.

The scope of the MBI was expanded to include the entire Coast Guard Alternate Compliance Program after Authorized Class Society performance and regulatory oversight concerns were noted for EL FARO, EL YUNQUE, and several additional U.S. flagged vessels in the program.

Conclusions:

The Marine Board of Investigation identified the following series of events and associated contributing factors.

Event #1: EL FARO Sailed Within Close Proximity to Hurricane Joaquin

TOTE did not ensure the safety of marine operations and failed to provide shore side nautical operations supports to

its vessels.

TOTE did not identify heavy weather as a risk in the Safety Management System (SMS) and the Coast Guard had not exercised its flag state authority to require identification of specific risks.

TOTE and the Master did not adequately identify the risk of heavy weather when preparing, evaluating, and approving the voyage plan prior to departure on the accident voyage.

TOTE and the Master and ship's officers were not aware of vessel vulnerabilities and operating limitations in heavy weather conditions.

TOTE did not provide the tools and protocols for accurate weather observations. The Master and navigation crew did not adequately or accurately assess and report observed weather conditions.

TOTE did not provide adequate support and oversight to the crew of EL FARO during the accident voyage.

The National Hurricane Center (NHC) created and distributed tropical weather forecasts for Tropical Storm and Hurricane Joaquin, which in later analysis proved to be inaccurate. Applied Weather Technologies used these inaccurate forecasts to create the Bon Voyage System (BVS) weather packages.

The Master and deck officers were not aware of the inherent latency in the BVS data when compared to the NHC forecasts. Additionally, the Master and deck officers were not aware that they received one BVS data package with a redundant hurricane trackline.

The Master and deck officers relied primarily on graphical BVS weather forecasts rather than the most current NHC data received via SAT-C. EL FARO crew did not take advantage of BVS's tropical update feature and the ability to send BVS weather information directly to the bridge.

The Master did not effectively integrate the use of Bridge Resource Management techniques during the accident voyage. Furthermore, the Master of EL FARO did not order a reduction in the speed or consider the limitations of the engineering plant as EL FARO converged on a rapidly intensifying hurricane. This resulted in loss of propulsion, cargo shifting and flooding.

The Master of EL FARO failed to carry out his responsibilities and duties as Captain of the vessel between 8:00 PM on September 30 and 4:00 AM on October 1, 2015. Notably, the Master failed to download the 11:00 PM BVS data package, and failed to act on reports from the 3/M and 2/M regarding the increased severity and narrowing of the closest point of approach to Hurricane Joaquin, and the suggested course changes to the south to increase their distance from the hurricane.

The cumulative effects of anxiety, fatigue, and vessel motion from heavy weather degraded the crew's decision making and physical performance of duties during the accident voyage.

Event #2: EL FARO Experienced an Initial Starboard List and Intermittent Flooding

EL FARO developed a sustained wind heel to starboard as a result of the course change from 155 degrees to 116 degrees after passing south of San Salvador at approximately 1:30 AM on October 1. The wind heel brought the 2nd deck closer to the water line.

Intermittent flooding into one or more cargo holds on EL FARO began at this time. Water was able to enter Hold 3 through the open scuttle, and likely through deteriorated internal structures and open cargo hold ventilation fire dampers, which compromised watertight integrity. The increasing of EL FARO's load line drafts following the 2005-2006 conversion, combined with loading to near full capacity with minimal stability margin, increased the vessel's vulnerability to flooding in heavy weather.

Despite the apparent increase in cargo carrying capacity and increase load line draft which would result, the 2005-2006 conversion was not designated as a major conversion by the Coast Guard. Based on the available documentation, the final decision was based on the "Precedence Principle," in that the Coast Guard had previously not designated similar conversions of sister vessels EL YUNQUE and EL MORRO as major conversions.

The crew's complacency, lack of training and procedures, and EL FARO's design contributed to the crew's failure to assess whether the vessel's watertight integrity was compromised.

EL FARO's conversion in 2005-2006, which converted outboard ballast tanks to fixed ballast, severely limited the vessel's ability to improve stability at sea in the event of heavy weather or flooding.

The Master, C/M, and crew did not ensure that stevedores and longshoremen secured cargo in accordance with the Cargo Securing Manual, which contributed to RO/RO cargo breaking free.

The practice of sailing with open cargo hold ventilation system fire dampers in accordance with SOLAS II-2, Regulation 20 and U.S. regulations created a downflooding vulnerability which is not adequately considered for the purposes of intact and damage stability, nor for the definitions of weathertight and watertight closures for the purpose of the applicable Load Line Convention.

The Coast Guard practice of verbally passing deficiency information to the ACS surveyor without written documentation of the deficient condition resulted in an unknown or incomplete compliance and material condition history of EL FARO.

Event #3: EL FARO experienced a reduction in propulsion

EL FARO's reduction in speed, from approximately 16 knots to 9 knots that occurred between 3:45 AM to 4:15 AM on October 1 was the result of the routine blowing of tubes and the C/M making course changes. EL FARO never reached a speed through the water above 10 knots for the remainder of the voyage.

EL FARO's departure with a main lube oil sump level of 24.6", which was below the Machinery Operating Manual recommended operating level of 27", reduced the crew's ability to maintain lube oil suction for the main propulsion

plant.

Prior to 4:36 AM, EL FARO's main propulsion unit developed intermittent lube oil problems due to the starboard list.

Event #4: EL FARO Incurred a Severe Port List and Lost Propulsion

At 5:54 AM on October 1, the Master altered course to intentionally put the wind on the vessel's starboard side to induce a port list and enable the C/M to access and close the Hold 3 starboard scuttle. This port list was exacerbated by his previous order to transfer ramp tank ballast to port, and resulted in a port list that was greater than the previous starboard list and a dynamic shifting of cargo and flood water.

The port list, combined with the offset of the lube oil suction bellmouth 22" to starboard of centerline, resulted in the loss of lube oil suction and subsequent loss of propulsion at around 6:00 AM.

Coast Guard and ABS plan review for EL FARO's lube oil system did not consider the worst case angle of inclination in combination with the full range of lube oil sump operating levels specified in the machinery operating manual. This led the crew to operate with a lube oil sump level within the operating range specified on the Coast Guard and ABS approved drawing, but below the 27" operating level, which was the only level reviewed by ABS.

The Master and C/E did not have a complete understanding of the vulnerabilities of the lube oil system design,

specifically the offset suction. This lack of understanding hampered their ability to properly operate the ship in the prevailing conditions.

TOTE's lack of procedures for storm avoidance and vessel specific heavy weather plans containing engineering operating procedures for heavy weather contributed to the loss of propulsion.

Event #5: EL FARO sank

The loss of propulsion resulted in the vessel drifting and aligning with the trough of the sea, exposing the beam of the vessel to the full force of the sea and wind.

Even after securing the scuttle to Hold 3, water continued to flood into cargo holds through ventilation openings, and also likely between cargo holds through leaking gaskets on large watertight cargo hold doors.

The EL FARO crew did not have adequate knowledge of the ship or ship's systems to identify the sources of the flooding, nor did they have equipment or training to properly respond to the flooding.

Even though EL FARO met applicable intact and damage stability standards as loaded for the accident voyage, the vessel could not have survived uncontrolled flooding of even a single cargo hold given the extreme wind and sea conditions encountered in Hurricane Joaquin.

Event #6: All 33 Persons Aboard EL FARO Are Missing and Presumed Deceased

A lack of effective training and drills by crew members, and inadequate oversight by TOTE, Coast Guard and ABS, resulted in the crew and riding crew members being unprepared to undertake the proper actions required for surviving in an abandon ship scenario.

After 5:43 AM on October 1, the Master failed to recognize the magnitude of the threat presented by the flooding into the hold combined with the heavy weather conditions. The Master did not take appropriate action commensurate with the emergent nature of the situation onboard EL FARO, including alerting the crew and making preparations for abandoning ship.

When the Master made the decision to abandon ship, approximately 10 minutes before the vessel sank, he did not make a final distress notification to shore to update his earlier report to TOTE's Designated Person Ashore that they were not abandoning ship. This delayed the Coast Guard's awareness that EL FARO was sinking and the crew was abandoning ship, and impacted the Coast Guard's search and rescue operation.

Although EL FARO's open lifeboats met applicable standards (SOLAS 60), they were completely inadequate to be considered as an option for the crew to abandon ship in the prevailing conditions.

The Coast Guard's existing Search and Rescue equipment

and procedures were unable to effectively mark and track a deceased EL FARO crew member for eventual recovery. As a result the crew member remains missing and unidentified.

Safety Recommendations

Recommendation #1 – High Water Alarms. It is recommended that Commandant direct a regulatory initiative to require high water audio and visual alarms, capable of providing audible and visual alarms on the navigation bridge, in cargo holds of dry cargo vessels. Furthermore, it is recommended that Commandant work with the International Maritime Organization (IMO) to amend the applicability of SOLAS Chapter II-1/25 (2015 consolidated) to include all new and existing multi-hold cargo ships.

Recommendation #2 – Ventilators and Other Hull Openings for Cargo Ships. It is recommended that Commandant direct a review of U.S. regulations, international conventions, and technical policy to initiate revisions to ensure that all ventilators or other hull openings, which cannot be closed watertight or are required to remain normally open due to operational reasons such as continuous positive pressure ventilation, should be considered as down-flooding points for intact and damage stability. Additionally, fire dampers or other closures protecting openings required to remain normally open due to operational reasons such as continuous positive pressure ventilation should not be considered weathertight closures for the purpose of the

applicable Load Line Convention. These changes should apply to new and existing vessels.

Recommendation #3 – Addressing Safety Concerns Related to Open Lifeboats. It is recommended that Commandant initiate a Legislative Change Proposal and direct a regulatory initiative to eliminate open top gravity launched lifeboats for all oceangoing ships in the U.S. commercial fleet. As an immediate interim safety measure, it is recommended Commandant direct all Officers in Charge of Marine Inspection (OCMIs) to conduct a concentrated inspection campaign on all existing vessels outfitted with gravity launched open lifeboats, including a Coast Guard supervised launching and underway operational test of every lifeboat in service. This concentrated inspection campaign should also ensure that companies have adequately identified and addressed the hazards related to operating with open top gravity launched lifeboats in their identified Safety Management System (SMS) risks.

Recommendation #4 – Indicators for Watertight Closures on Bridge Alarm Panels. It is recommended that Commandant direct a regulatory initiative to require open/close indicators on the bridge of all existing cargo ships, for all watertight closures that are identified as watertight on the conditions of assignment for assignment of load line form for unmanned and cargo spaces. Furthermore, it is recommended that Commandant work with the IMO to amend the applicability of paragraph 3 of SOLAS II-1/13-1 (2015 consolidated) to include all existing cargo ships. This change would require open/close indicators on the bridge of all existing cargo ships, for all watertight closures (e.g., doors, scuttles, fire dampers) that are identified as watertight on the conditions of assignment for assignment of load line form for unmanned compartments and cargo spaces.

Recommendation #5 – Requirement for Closed Circuit Television (CCTV) Camera Installation in Stowage Areas. It is recommended that Commandant direct a regulatory initiative to require the installation of CCTV cameras to monitor unmanned spaces from the bridge cargo vessels, such as cargo holds and steering compartments. Furthermore, it is recommended that Commandant work with the IMO to create a new requirement to install and utilize CCTV cameras, or other similar technology, in cargo stowage areas on cargo ships.

Recommendation #6 – Vessel Weight Change Tracking. It is recommended that Commandant direct a regulatory initiative to require that a company maintain an onboard and shore side record of all incremental vessel weight changes, to track weight changes over time so that the aggregate total may be readily determined.

Recommendation #7 – Approval of Software for Cargo Loading and Securing. It is recommended that Commandant direct a regulatory initiative to require review and approval of software that is used to perform cargo loading and securing calculations. Furthermore, it is recommended that Commandant work with the IMO to implement international requirements for review and approval of such software.

Recommendation #8 – Review and Approval of Stability Software. It is recommended that Commandant update policy to address Coast Guard review and approval of stability software, and delegate review and approval authority to ACSs, where appropriate. This should include establishing specific policy and assigning technical requirements for review and approval of stability software by the Coast Guard, which may be required to review and

approve such software for vessels that do not fall under the Alternate Compliance Program (ACP) or Navigation and Vessel Inspection Circular (NVIC) 3-97 authorities.

Recommendation #9 – Float-free Voyage Data Recorder (VDR) Equipped with an Emergency Position Indicating Radio Beacon (EPIRB). It is recommended that Commandant direct a regulatory initiative to require that all VDR capsules be installed in a float-free arrangement, and contain an integrated EPIRB for all domestic vessels currently required to be equipped with a VDR. Furthermore, it is recommended that Commandant work with the IMO to amend SOLAS V/20 (2015 consolidated) to require this VDR configuration for existing vessels.

Recommendation #10 – Locating and Marking Objects in the Water. It is recommended that Commandant direct an examination of the reliability rate of SLDMBs and other similar technology used during Coast Guard Search and Rescue operations. Additionally, the Coast Guard should develop pre-deployment protocols to conduct circuit testing on beacons prior to deploying them on-scene.

Recommendation #11 – Attachable Beacon for Assisting in Relocating Search Objects that are Initially Unrecoverable. It is recommended that Commandant identify and procure equipment that will provide search and rescue units the ability to attach a radio or Automated Identification System/strobe beacon to a found search object that is not immediately retrievable. This beacon should be able to be quickly activated and attached to the object, and have a lanyard of sufficient length to keep the beacon on the surface of the water if the object sinks below the surface.

Recommendation #12 – Personal Locator Beacon Requirement. It is recommended that Commandant direct a regulatory initiative to require that all Personal Flotation Devices on oceangoing commercial vessels be outfitted with a Personal Locator Beacon.

Recommendation #13 – Anonymous Safety Reporting to Shore for Ships at Sea. It is recommended that Commandant direct the development of a shipboard emergency alert system that would provide an anonymous reporting mechanism for crew members to communicate directly with the Designated Person Ashore or the Coast Guard while the ship is at sea. The system would be in place to report urgent and dire safety concerns that are not being adequately addressed onboard the ship or by shore based company resources in a timely manner.

Recommendation #14 – National Oceanographic and Atmospheric Administration (NOAA) Evaluation of Forecast Staffing and Products for Maritime Interests. It is recommended that Commandant request that NOAA evaluate the effectiveness and responsiveness of current National Weather Service (NWS) tropical cyclone forecast products, specifically in relation to storms that may not make landfall but that may impact maritime interests. To improve service to marine stakeholders the evaluation should consider the inclusion of past track waypoints for the tropical system for a period of 48 hours and a graphical depiction of the forecast model track of the best performing prediction models.

Recommendation #15 – Clarification of Flag State Expectations for SMS Implementation. It is recommended

that Commandant direct the development and implementation of policy to make it clear that the Coast Guard has a shared responsibility to assess the adequacy of a company's SMS. This responsibility includes, but is not limited to, assessing identified risks and contingency plans (as described in IMO Resolution A.1072(28)), and ensuring that the duties, authorities, and qualifications of the Designated Person Ashore and other shore side management who support vessel operations while underway are specifically described.

Recommendation #16 – Damage Control Information for Existing Cargo Vessels. It is recommended that Commandant direct a regulatory initiative to require that all cargo ships have a plan and booklets outlining damage control information. Furthermore, it is recommended that Commandant work with the IMO to amend the applicability of SOLAS Chapter II-1/19 (2015 consolidated), to apply to all existing cargo ships, ensuring these ships have the damage control information.

Recommendation #17 – Ship Specific Damage Control Competency. It is recommended that Commandant direct a regulatory initiative to update 46 CFR to establish damage control training and drill requirements for commercial, inspected vessels. Furthermore, it is recommended that Commandant work with the IMO to amend SOLAS to establish similar requirements.

Recommendation #18 – Evaluation of Mariner Training Institutions and Coast Guard Merchant Mariner Credentialing Process. It is recommended that Commandant direct a review of the EL FARO VDR transcript and this Report of Investigation, specifically focusing on the effectiveness of the Coast Guard credentialing exams and third party provided

training including navigation simulators, heavy weather avoidance, cargo lashing/securing, stability, damage control, and bridge resource management. The Coast Guard should use the review to identify potential areas and competencies needing improvement and expeditiously develop a plan to implement those findings into the mariner credentialing process.

Recommendation #19 – Electronic Records and Remote Monitoring of Vessels at Sea. It is recommended that Commandant direct a regulatory initiative to require electronic records and periodic electronic transmission of records and data to shore from oceangoing commercial ships. This requirement would include records such as bridge and engine room logs, Standards of Training Certification and Watchkeeping (STCW) records, significant route changes, critical alarms, and fuel/oil records. The regulation should ensure Coast Guard access to these records regardless of their location. Furthermore, it is recommended that Commandant work with the IMO to amend SOLAS to require this same electronic transmission of records from all oceangoing commercial ships.

Recommendation #20 – Prevention Training Course for Prospective Coast Guard Sector Commanders and Deputies. It is recommended that Commandant explore adding an OCMI segment to Training Center Yorktown's Sector Commander Indoctrination Course for prospective officers who do not have the Prevention Ashore Officer Specialty Code, OAP-10. The recommended OCMI training segment would be similar to the additional Search and Rescue (SAR) Mission Coordinator Course that is currently required for prospective Sector Commanders and Deputies who lack previous SAR experience.

Recommendation #21 – Coast Guard Oversight of ACSs that Conduct ACP Activities. It is recommended that Commandant update NVIC 2-95 and Marine Safety Manual Volume II to require increased frequency of ACS and Third Party Organizations (TPOs) direct oversight by attendance of Coast Guard during Safety Management Certificate and Document of Compliance audits. Additionally, the Coast Guard shall perform a quality audit specific to the ACS representation and performance on U.S. flag vessels. The Coast Guard personnel conducting the oversight should be fully trained and certified to conduct audits, and given clear authority to issue non-conformities to a vessel, company, or ACS.

Recommendation #22 – ACP Efficiency and Manageability. It is recommended that Commandant direct a regulatory initiative to revise 46 CFR § 8.430 in order to eliminate the use of U.S. Supplements that currently exist for each ACS authorized to conduct all delegated activities. The regulatory revision should clarify that ACS personnel shall default to 46 CFR requirements in circumstances identified in the Critical Ship Safety Systems Table in the Federal Register on February 13, 1998 (63 FR 7495).439

Recommendation #23 – ACS Accountability and Transparency. It is recommended that Commandant establish and publish an annual report of domestic vessel compliance. This report shall include domestic vessel no-sail rates for each type of inspected subchapter, and a methodology for associating a Coast Guard-issued no-sail control action with an ACS, for vessels found to have deficiencies or major non-conformities that were misclassified, or not previously identified during an ACS-led inspection or survey.

Recommendation #24 – ACS Surveyor Performance and Interactions with OCMI. It is recommended that Commandant direct the implementation of a policy requiring that individual ACS surveyors complete an assessment process, approved by the cognizant OCMI, for each type of delegated activity being conducted on behalf of the Coast Guard. The assessment shall ensure vessel surveys and audits meet the Coast Guard marine inspection standard. If an OCMI determines that an ACS surveyor's performance is substandard, that OCMI should be given the authority to revoke the Surveyor's authority to conduct surveys on their behalf.

Recommendation #25 – Competency for Steamship Inspections. It is recommended that Commandant direct a study to explore adding a Steam Plant Inspection course to the Training Center Yorktown curriculum. The course should be required for Coast Guard Marine Inspectors and made available to ACS surveyors who conduct inspections on behalf of the Coast Guard. The steam inspection course could serve as an interim measure until an Advanced Journeyman Course covering steam vessel inspections is implemented (please see Recommendation #26).

Recommendation #26 – Competency for Marine Inspections and ACS Surveyors Conducting Inspections on Behalf of the Coast Guard. It is recommended that Commandant direct the addition of an Advanced Journeyman Inspector course to the Training Center Yorktown curriculum. The course should cover ACS oversight, auditing responsibilities, and the inspection of unique vessel types. The course should be required for senior Coast Guard Marine Inspectors and made available to ACS surveyors who conduct inspections on behalf of the

Coast Guard.

Recommendation #27 – Coast Guard Major Conversion Determinations for Vessels. It is recommended that Commandant direct the review of policies and procedures for making and documenting major conversion determinations, including use of the Precedence Principle.

Recommendation #28 – Intact and Damage Stability Standards Review. It is recommended that Commandant direct a review of current intact and damage stability standards to improve vessel survivability in extreme wind and sea conditions.

Recommendation #29 – Applying Intact and Damage Stability Standards to Existing Cargo Vessels. It is recommended that Commandant direct a regulatory initiative to require that all existing cargo vessels meet the most current intact and damage stability standards.

Recommendation #30 – Third Party Oversight National Center of Expertise. It is recommended that Commandant consider creation of a Third Party Oversight National Center of Expertise to conduct comprehensive and targeted oversight activities on all third party organizations and ACSs that perform work on behalf of the Coast Guard. The Center of Expertise should be staffed with Subject Matter Experts that are highly trained inspectors, investigators, and auditors with the capability and authority to audit all aspects of third party organizations. As an alternative, the Coast Guard could add a new Third Party Oversight Office at Coast Guard Headquarters with a similar staffing model as the proposed Center of Expertise. The new Third Party Oversight Office could function similar to the Traveling Inspector Office and report directly to the Assistant Commandant for Prevention

Policy.

Recommendation #31 – Technical Review of Critical Propulsion System Components. It is recommended that Commandant immediately review a representative sample of existing engineering system plans and implement a policy to ensure future Coast Guard or ACS reviews of such plans consider the full designed operating range when reviewing design elements for critical propulsion system components (e.g., the operating range for lube oil systems should ensure satisfactory function for the full range of allowable oil sump levels and vessel lists.)

Administrative Recommendations

Administrative Recommendation #1 – Acquiring DNA Sample for Identification of Human Remains. It is recommended that Commandant direct the development and implementation of Coast Guard policy for the collection of DNA samples by Coast Guard personnel when deceased individuals are unable to be recovered during Search and Rescue cases or post-incident marine casualty investigations. These DNA samples could be used to provide identification of human remains.

Administrative Recommendation #2 – VDR Performance Standards. It is recommended that Commandant direct a regulatory initiative to require that all VDRs capture all communications on ship's internal telephone systems. Furthermore, it is recommended that Commandant work with the IMO to amend SOLAS and update performance

standards to ensure that all VDRs capture these two-way internal ship communications.

Administrative Recommendation #3 – VDR Data and Audio Access. It is recommended that Commandant initiate a Legislative Change Proposal to amend 46 U.S.C. Chapter 63, to ensure that, notwithstanding NTSB statutory authority, the Coast Guard has full access and ability to use VDR data and audio in marine casualty investigations, regardless of which agency is the investigative lead.

Administrative Recommendation #4 – MISLE Documentation of Deficiencies that the OCMI Refers to an ACS. It is recommended That Commandant require the addition of specific MISLE data fields for documenting deficiencies that the OCMI refers to an ACS for correction. The deficiency with a written report documenting corrective action has been completed or the condition has been appropriately record in the Class database. This will ensure that vessel compliance history is documented and accessible to Coast Guard Marine Inspectors and investigators.

Enforcement Recommendations

Recommendation #1 – TOTE Services Violations. It is recommended that Sector Jacksonville initiate civil penalty action against TOTE Services for the following offenses:

- Failure to comply with work-rest requirements detailed in 46 U.S.C. § 8104 and 46 CFR § 15.1111 for EL FARO crew members on multiple dates prior to the accident voyage.
- Failure to comply with emergency procedures for special personnel detailed in 46 CFR § 199.180. Specifically,

- Polish ship rider Mr. Marek Pupp testified that the continued to work on EL FARO during the emergency muster and abandon ship drills.
- Failure to notify Coast Guard or ABS of repairs to primary lifesaving appliances that were conducted on September 28, 2015 just prior to EL FARO's departure from Jacksonville on the accident voyage.
 - Failure to notify the Coast Guard or ABS of repairs to EL FARO's main propulsion boiler superheating piping on August 24, 2015.

Based on the findings of this investigation, the MBI does not recommend any administrative or punitive action against any Coast Guard personnel. The MBI does not recommend any suspension or revocation action against any credentialed mariner. Additionally, the MBI does not recommend criminal prosecution against any person or entity.

The Coast Guard Marine Board Investigation Report can be accessed along with other investigation documents at the following link <http://www.news.uscg.mil/News-by-Region/Headquarters/El-Faro-Marine-Board-of-Investigation/>.