



UNITED STATES COAST GUARD

**REPORT OF THE INVESTIGATION
INTO THE
FIRE ON BOARD THE NORWEGIAN
FLAGGED RO-RO CARGO SHIP
HOEGH XIAMEN (O.N. 9431848) WHILE
MOORED AT BLOUNT ISLAND
IN JACKSONVILLE, FLORIDA ON JUNE 4,
2020**



U.S. Department of
Homeland Security

United States
Coast Guard



Commandant
United States Coast Guard

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16732/IIA #6968687
January 21, 2025

**FIRE ON BOARD THE NORWEGIAN FLAGGED RO-RO CARGO SHIP
HOEGH XIAMEN (O.N. 9431848) WHILE MOORED AT BLOUNT ISLAND
IN JACKSONVILLE, FLORIDA ON JUNE 4, 2020**

ACTION BY THE COMMANDANT

The record and the report of the investigation convened for the subject casualty were reviewed and approved by the Office of Investigations & Casualty Analysis (CG-INV) on March 23, 2022. The recommendations in the report are approved subject to the following comments and actions.

ACTION ON ADMINISTRATIVE RECOMMENDATIONS

Recommendation 1: Recommend Officer in Charge Marine Inspections (OCMI) forward this report to United States Pipeline and Hazardous Materials Safety Administration (PHMSA) for awareness and address any issues identified under 49 Code of Federal Regulations (CFR).

Action: The Coast Guard will provide a copy of this investigation report and recommendations to PHMSA for their consideration.

Recommendation 2: A Finding of Concern titled “Cargo Preparation Procedures Conformity with the International Maritime Dangerous Goods Code” has been submitted for release to address conditions identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

Action: A Finding of Concern on this topic was published on March 4, 2022, titled “Shipboard Firefighting Coordination between Shippers and First Responders” and can be view on the following website: https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/CG-5PC/INV/foc/USCGFOC_001-22.pdf?ver=NrK0du5X9OXqgqCu60cgbw%3d%3d

Recommendation 3: A Findings of Concern titled “Shipboard Firefighting Coordination Between Shippers and First Responders” has been submitted for release to address hazardous conditions identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

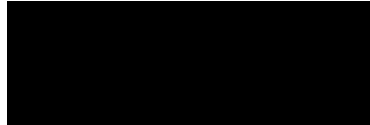
Action: A Finding of Concern on this topic was published on March 4, 2022, titled “Ensure Cargo Preparation Procedures Conform with The International Maritime Dangerous Goods Code” and can be view on the following website: https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/CG-5PC/INV/foc/USCGFOC_001-22.pdf?ver=NrK0du5X9OXqgqCu60cgbw%3d%3d

January 21, 2025

uscg.mil/Portals/9/DCO%20Documents/5p/CG-5PC/INV/foc/USCGFOC_002-22.pdf?ver=i2-Ry2EjjzZpppcTYmwTLQ%3d%3d

Recommendation 4: A Findings of Concern titled “Fixed Fire Suppression System Effectiveness” has been submitted for release to address hazardous conditions identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

Action: A Finding of Concern on this topic was not approved for publication because leveraging an already installed system should be part of the vessel’s fire fighting drills and Safety Management System.



E. B. SAMMS
Captain, U.S. Coast Guard
Chief, Office of Investigations & Casualty Analysis (CG-INV)

U.S. Department of
Homeland Security

United States
Coast Guard



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16732

MAR 24 2021

MEMORANDUM

From: [REDACTED]
M. R. Vlaun, CAPT
CG SECTOR Jacksonville

To: [REDACTED] LT

Subj: FORMAL MARINE CASUALTY INVESTIGATION CONCERNING *HOEGH XIAMEN* Fire June 4, 2020

Ref: (a) Title 46 United States Code, Chapter 63
(b) Title 46 Code of Federal Regulations, Part 4
(c) COMDTINST M1600010.A
(d) Navigation and Vessel Inspection Circular No. 05-17

1. Pursuant to the authority contained in reference (a) and (b), you are to convene a formal investigation consisting of the following members:

- Lieutenant [REDACTED], USCG, Lead Investigating Officer
- Mr. [REDACTED], USCG, Assistant Investigating Officer

2. In accordance with all applicable statutory and regulatory mandates, you will thoroughly investigate the fire that started aboard the *HOEGH XIAMEN* on June 4, 2020. Upon completion of the investigation, you will issue a report to me with the collected evidence, the established facts, and conclusions and recommendations. The investigation report shall be completed in accordance with 46 C.F.R. § 4.07-1. Conclusions and recommendations concerning commendatory actions or misconduct that would warrant further inquiry shall be referred to me under separate correspondence for consideration and action as appropriate. A daily summary of significant events shall be transmitted to CDR Rose while the Investigation is in formal session.

3. You will complete and submit your investigative report to me within 210 days of the convening date. If this deadline cannot be met, you shall submit a written explanation for the delay and notice of the expected completion date. You are highly encouraged to submit any interim recommendations intended to prevent similar casualties, if appropriate, at any point in your investigation.

4. The National Transportation Safety Board (NTSB) is also charged with the responsibility of determining the cause or probable cause of this casualty by the Independent Safety Board Act of 1974 (49 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.

#

U.S. Department of
Homeland Security

United States
Coast Guard



Commander
United States Coast Guard
Seventh District

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16732
15 Dec 2021

**MOTOR VESSEL HOEGH XIAMEN (IMO# 9431848), FIRE WHILE MOORED AT
BLOUNT ISLAND IN JACKSONVILLE, FLORIDA, ON JUNE 4, 2020**

ENDORSEMENT BY DISTRICT COMMANDER

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved. It is recommended that this marine casualty investigation be closed.

ENDORSEMENT ON RECOMMENDATIONS

Administrative Recommendation 1: Recommend this report is forwarded to the Pipeline and Hazardous Materials Safety Administration (PHMSA) upon CG-INV approval, so they may address any issues identified under 49 CFR.

Endorsement: Concur with this recommendation. Sharing this report will provide awareness to PHMSA to address issues identified.

Administrative Recommendation 2: Recommend approval and release of all Findings of Concern associated with this investigation.

Endorsement: Concur with this recommendation. Release of these Findings of Concern will address conditions identified with the intention of preventing these issues from contributing to future casualties.

Administrative Recommendation 3: Recommend this investigation be closed.

Endorsement: Concur with this recommendation.


J. D. Espino-Young
Captain, U.S. Coast Guard
Chief of Prevention, Coast Guard District Seven



16732

MAR 24 2021

**MOTOR VESSEL (M/V) HOEGH XIAMEN (O.N. 9431848), FIRE WHILE MOORED
AT BLOUNT ISLAND IN JACKSONVILLE, FLORIDA, ON JUNE 4, 2020**

ENDORSEMENT BY THE OFFICER IN CHARGE, MARINE INSPECTION

The record and the report of the investigation convened for 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. It is recommended that this marine casualty investigation be closed.

ENDORSEMENT/ACTION ON RECOMMENDATIONS

Safety Recommendation 1. Not applicable.

Administrative Recommendation 1.

1.1. Safety Recommendation: None

1.2. Administrative Recommendations:

1.2.1. Recommend this report is forwarded to the Pipe Line and Hazardous Material Safety Administration (PHMSA) upon CG-INV approval so they may address any issues identified under 49 CFR.

1.2.2. Recommend approval and release of all Findings of Concern associated with this investigation.

1.2.3. Recommend this investigation be closed.

Endorsement: Concur with all recommendations of this report.

Action: Following final approval of this investigation, Sector Jacksonville will forward a copy of this report to PHMSA. Recommend this investigation be closed.



Mark R. Vlaun
Captain, U.S. Coast Guard
Officer in Charge Marine Inspection

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**MOTOR VESSEL *HOEGH XIAMEN* (IMO# 9431848), FIRE WHILE MOORED AT
BLOUNT ISLAND IN JACKSONVILLE, FLORIDA, ON JUNE 4, 2020**

EXECUTIVE SUMMARY

On June 4, 2020 the *HOEGH XIAMEN* was moored at Blount Island in Jacksonville, Florida and completed loading cargo at approximately 1500 that afternoon. The cargo consisted of used vehicles of varying condition which were loaded onto the vessel over a two day period beginning on June 3 at 0800 and ending at approximately 1500 on June 4. At approximately 1445 on June 4, the Port Captain for the vessel conducted a round of deck 8 in order to estimate the space available for cargo loading at the next port. The Port Captain estimated room for approximately 60 more vehicles on deck 8, and then continued his rounds downward and exited the ship. The vessel's Second Mate conducted their round of deck 8 shortly after. The lashing and stowage condition of the vessel's cargo was noted on an annotated check sheet provided by the stevedores. This check sheet indicated that the lashing was adequate and 13 vehicles did not have their batteries disconnected on deck 8. The fire detection system for the cargo holds was turned off by the crew during cargo operations as per the vessel's safety management system.

At approximately 1500 when cargo operations were complete, the Chief Officer attempted to raise the main ramp that led to deck 5. This operation was unsuccessful, as the main wires that raise the ramp were not aligned correctly in the sheaves, and consequently the wire jumped and caused the Chief Officer to lower the ramp. The Chief Officer then proceeded to the weather deck to grease the wires. Once the Chief Officer was on the weather deck, the Chief Officer observed smoke coming from the deck 7 and 8 exhaust vents. The Chief Mate immediately called the bridge on his VHF radio to alert the vessel's Master. The fire detection panel for the cargo hold was then turned on and began to alarm for decks 7 and 8. The Master contacted the Coast Guard by radio to report the fire.

The Master then ordered all crew members to muster via VHF radio and sounded the fire alarm. The Chief Engineer began checking each deck for smoke, going down from deck 11. When the Chief Engineer opened the port door on deck 7 he was able to see fire coming from a car on deck 8 because it was a tween deck, which had cut outs that were typically used to lash vehicles down. The Chief Engineer then alerted the crew to the location of the fire. The electrician was ordered to close the ventilation, which was done with the automatic function, while other crewmembers secured ventilation manually. The fire team mustered and attempted to enter deck 8 but was overwhelmed by smoke. The Master then had the crew muster on the pier, leaving the bridge to muster with his crew because the VHF radios were no longer functioning due to rain damage and ambient noise. The Master ordered the Chief Mate and Chief Engineer to return to the vessel with him and discharge the fixed low pressure carbon dioxide (CO2) system. The Chief Engineer failed to discharge the CO2 on the first attempt from the CO2 room, and then went with the

Master and Chief Officer to the nearest fire station, where the Chief Engineer claims to have successfully discharged the CO2. The Master, Chief Engineer, and Chief Officer then returned to the pier.

Jacksonville Fire Rescue Department (JFRD) met the crew at the pier, boarded the vessel and entered decks 7 and 8 in an attempt to fight the fire. Upon entering deck 8, JFRD personnel saw a fire emanating from several cars in the aft portion, but eventually retreated from the deck following extreme heat and smoke exposure. JFRD personnel proceeded to the weather deck of the vessel and began manipulating cargo deck vents with the goal of increasing ventilation. JFRD personnel proceeding out of the vessel were injured due to three flash backs and explosions that occurred in rapid succession. JFRD began cooling the side shells of the vessel via fireboats until the contracted salvage company arrived on scene. The vessel burned from deck 7 and above through the weather deck, with deck 6 and below remaining intact. No crewmembers were hurt during the incident and a total of nine fire fighters from JFRD were injured. The fire was declared out on June 12, 2020 by the contracted salvage company. The vessel was later declared a total constructive loss.

Throughout its investigation, the Coast Guard determined the initiating event likely to be a material defect on one of the cars loaded on deck 8, although Coast Guard fire investigators could not determine a single ignition source. Causal factors contributing to this casualty were: 1) Failure of stevedores to disconnect all car batteries loaded onto the vessel 2) Failure of the crew to prevent cars from leaking fluids excessively and 3) Failure of the terminal to properly prepare vehicles for shipment. Together these casual factors culminate in a failure to implement the International Maritime Dangerous Goods Code (IMDG Code) throughout the supply chain, which led to the incident occurring.



16732
MAR 24, 2021

**MOTOR VESSEL (M/V) *HOEGH XIAMEN* (O.N. 9431848), FIRE WHILE MOORED AT
BLOUNT ISLAND IN JACKSONVILLE, FLORIDA, ON JUNE 4, 2020**

INVESTIGATING OFFICER'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 4.07, and under the authority of Title 46, United States Code (USC) Chapter 63.

1.2. The Investigating Officer designated HOEGH Technical Management INC, OCY Xiamen Limited, Grimaldi Deepsea S.p.A, Horizon Auto Logistics, and SSA Atlantic as parties-in-interest during this investigation in accordance with 46 CFR Subsection 4.03-10.

1.3. The Coast Guard was the lead agency for all evidence collection activities involving this investigation. The National Transportation Safety Board (NTSB) conducted a parallel investigation and assisted the Coast Guard during the investigation.

1.4. All times listed in this report are in Eastern Standard Time using a 24-hour format, and are approximate.

2. Vessel Involved in the Incident



Figure 1. Photograph of *HOEGH XIAMEN* provided by Coast Guard, taken on June 4, 2020

Official Name:	<i>HOEGH XIAMEN</i>
Identification Number:	IMO# 9431848
Flag:	Norwegian
Vessel Class/Type/Sub-Type	Ro-Ro Cargo Ship
Build Year:	2010
Gross Tonnage:	47,232 MT
Length:	182.80 m
Beam/Width:	31.53 m
Draft/Depth:	8 m
Main/Primary Propulsion: (Configuration/System Type, Ahead Horse Power)	Diesel Direct, 14,220 kW
Owner:	OCY XIAMEN Limited IMO# 6060875 Vault 17, Upper floor, Pinto Warf, Valetta Waterfront, Floriana, FRN 1913, Malta
Operator:	Hoegh Technical Management INC IMO# 6005091 7/F V Corporate Centre 125 L.P Leviste ST. Salcedo Village, 1227 Makatai City, Philippines

3. Deceased, Missing, and/or Injured Persons

Relationship to Vessel	Sex	Age	Status
N/A	N/A	N/A	N/A

4. Findings of Fact

4.1. The Incident:

4.1.1. Cargo loading of the *HOEGH XIAMEN* began at 0800 on June 3, 2020. Stevedores and longshoremen loaded vehicles that were driven, towed, and forklifted onboard. Cargo loading finished at 1445 on June 4, 2020.

4.1.2. At 1445, the vessel's Port Captain conducted inspection rounds of the cargo decks, including decks 7 and 8. The Second Mate conducted a round of deck 8 and noted normal conditions. The Port Captain departed the vessel at 1500 and the Chief Officer signed the vessel lashing procedure form, indicating cargo loading was complete.

4.1.3. The Chief Officer attempted to raise the stern ramp that led to the deck 5, but was unable to because the wires were not aligned in the sheaves correctly. The Chief Officer stated the wires "jumped". The Chief Officer then proceeded to the weather deck to correct the issue.

4.1.4. While on the weather deck the Chief Officer observed smoke coming from the cargo deck 7 and 8 exhaust vents. The Chief Officer then called on the radio to alert the Master.

4.1.5. The Master or the Chief Mate then turned on the fire detection system for the cargo holds at 1545, which subsequently alarmed. The Master then informed the crew to muster via VHF radio, sounded the fire alarm, and made an emergency call over the radio to the Coast Guard.

4.1.6. The Chief Engineer began checking each deck for fire in a descending order. The Chief Engineer stated he saw vehicles on fire in the aft portion of deck 8 from the port side access door to deck 7.

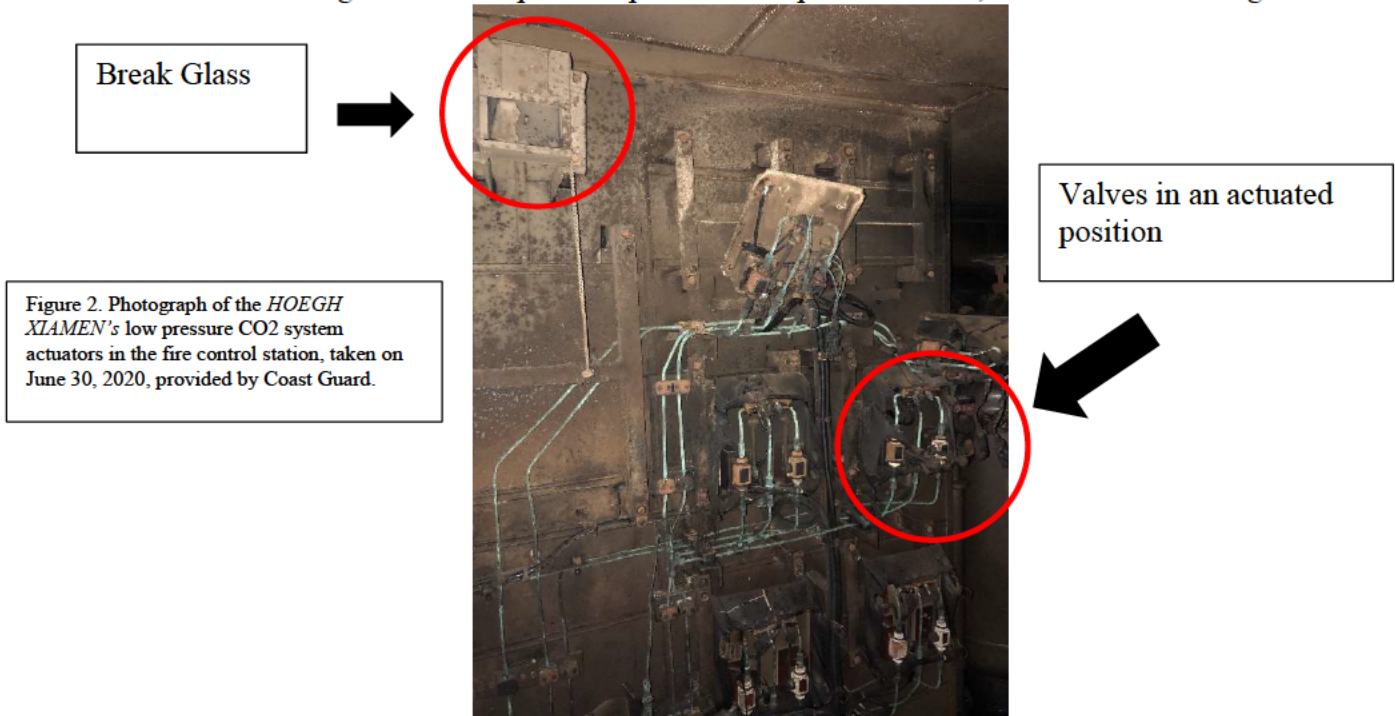
4.1.7. The vessel's fire team attempted to gain access to deck 8 but could not because they were overwhelmed by smoke.

4.1.8. The vessel's Electrical Engineer activated the remote actuators for ventilation dampers and crewmembers secured vents manually.

4.1.9. The Master then ordered the vessel crew to muster on the pier. The Master could not use his radio to contact the crew due to ambient noise and water damage from the rain. The Master left the bridge and gave instructions for the Chief Officer and Chief Engineer to return to the vessel with him to activate fixed firefighting.

4.1.10. The Chief Engineer proceeded to the fixed CO2 room and attempted to activate the system but failed on his initial attempt.

4.1.11. The Chief Engineer, Chief Officer, and Master then proceeded to the fire station on the weather deck and claimed to have successfully discharged the CO2 system to deck space 7 and 8. Due to the fire burning in excess of a week and low pressure CO2 holding tanks venting to the atmosphere to prevent over pressurization, Coast Guard investigators



were unable to determine if the fixed CO2 system was successfully discharged as described by the crew. Additionally, during the response by Jacksonville Fire Rescue Department (JFRD), the vents leading to decks 7 and 8 were reopened, which would have provided an additional ventilation route for any CO2 that may have been discharged.

4.1.12. The Chief Engineer, Chief Officer, and Master then proceeded off the vessel to the pier and were met by JFRD.

4.1.13. At 1830 JFRD boarded the vessel, entered deck 8 and began fighting the fire. The JFRD personnel stated they saw two cars in the aft portion of deck 8 on fire. JFRD Ladder 7 then proceeded to the weather deck.

4.1.14. JFRD Ladder 7 began to manipulate the vents for cargo decks with the intention of increasing ventilation.

4.1.15. Starting at 1840, subsequent to JFRD manipulating the cargo deck vents, three explosions/flash backs occurred. The second flash back injured nine JFRD fire fighters who were still on the vessel.

4.1.16. At 1842, the Coast Guard was notified that the vessel's Qualified Individual had been notified and the vessel's Non Tank Vessel Response Plan (NTVRP) was activated.

4.1.17. At 2030, JFRD began cooling the side shell of the vessel with fire boats.

4.1.18. At 0130 on June 5, 2020, Resolve Salvage and Rescue (Resolve) arrived on scene and started conducting fire and salvage operations.

4.1.19. At 0200, the engineering plant of the *HOEGH XIAMEN* shutdown.

4.1.20. At 1149, two more explosions occurred in the upper amidships portion of the vessel.

4.1.21. Post casualty drug and alcohol testing was carried out for the entire crew of the *HOEGH XIAMEN*. All crew drug and alcohol tests were [REDACTED].

4.1.22. At 1200 on June 12, 2020, the fire was declared out by the contracted salvage company, Resolve.



Figure 3. Deck 9 of the *HOEGH XIAMEN* taken on June 26, 2020, provided by the Coast Guard.



Figure 4. Deck 7 of the *HOEGH XIAMEN* taken on June 26, 2020, provided by the Coast Guard.

4.2. Additional/Supporting Information:

4.2.1. The *HOEGH XIAMEN* was carrying cargo of motor vehicles that were regulated under 74 SOLAS (2014) Ch. VII Reg. 7 and the IMDG Code. Motor vehicles have been assigned the hazardous material number UN3166 and have special provisions 312, 356, 961, 962, and 970 under the IMDG Code. IMDG Code special provisions 312, 356, 961, 962, and 970 provide relief from requirements of the IMDG when certain listed provisions are met, including the designation of certain shipboard areas as ro-ro cargo space by the Administration.

4.2.2. The consignment of vehicles was shipped by Grimaldi as “Used Unpacked Vehicles” non-hazardous cargo shipment.

4.2.3. The *HOEGH XIAMEN* had a cargo securing manual in place that was approved by the classification society DNV-GL, dated October 11, 2010.

4.2.4. Grimaldi Deepsea S.p.A had a policy in place providing instructions to the terminal and stevedore company on how to prepare cars for loading onto the vessel. The policy required vehicles to have at least 1/8 tank of gas. The policy also required vehicles to be spaced with 4 inches between side rear view mirrors and 12 inches bumper to bumper.



Figure 5. Spacing of vehicles on deck 5 of the *HOEGH XIAMEN* taken on June 11, 2020, provided by the Coast Guard.



Figure 6. Spacing between vehicles on deck 5 of the *HOEGH XIAMEN* taken on June 11, 2020, provided by the Coast Guard.

4.2.5. The vessel’s classification society DNV-GL conducted an ISM audit on June 3, 2020 and observed a fire drill by the vessel’s crew.

4.2.6. On June 4, 2020 it rained on Blount Island intermittently throughout the day.

4.2.7. Crewmembers and stevedores stated that the condition of vehicles being loaded onto the vessel included vehicles that operated under their own power, those that needed

Fluid leaking from loaded vehicles



Figure 7. Vehicles loaded on deck 1 of the *HOEGH XIAMEN* taken on June 21, 2020, provided by the Coast Guard.

to be towed, and vehicles that were transported by trailer and forklift onto the vessel. The crewmembers stated that the cars loaded onto the vessel as cargo often leak fluid during loading and that the crew could smell gasoline fumes.

4.2.8. Crewmembers on board the vessel *HOEGH XIAMEN* primarily communicated with each other by hand held VHF radio.

4.2.9. Investigating officers observed debris in vehicles loaded onto the vessel, including flammable materials. Investigating officers observed numerous 50 pound bags of marine sawdust on multiple cargo decks.



Figure 8. Bags of Marine Sawdust on deck 5 of the *HOEGH XIAMEN* taken on June 11, 2020, provided by the Coast Guard.

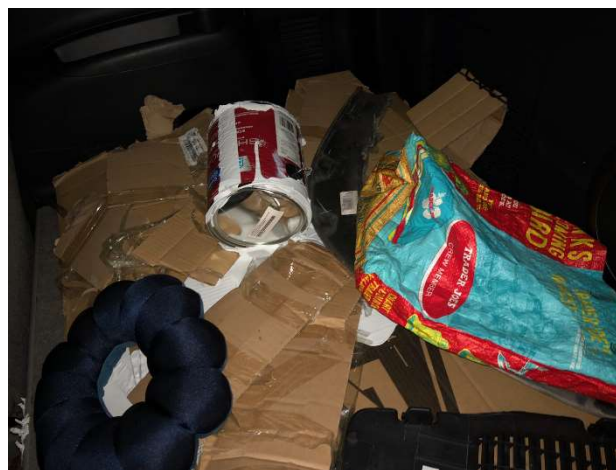


Figure 9. Paint and cardboard in a vehicle on deck 5 of the *HOEGH XIAMEN* taken on June 11, 2020, provided by the Coast Guard.

4.2.10. During cargo operations the crew had the ship's fire detection system in the cargo holds turned off. The crew stated this was standard procedure and that a crewmember was stationed on each deck during loading while the system was deactivated. The vessel also had SMS policies in place instructing the crew to turn the fire detection system off.

4.2.11. Stevedores stated that not all batteries were disconnected for vehicles on board. At least 58 batteries were not disconnected, as the Master or Chief Engineer signed a form from stevedores stating that 58 batteries were left connected.

Battery terminals
found connected.



Figure 10. A connected battery on a vehicle from deck 7 of the *HOEGH XIAMEN* taken on July 12, 2020, provided by the Coast Guard. The vehicle was originally towed onto the vessel by stevedores.

5. Analysis

- 5.1. **Failure to disconnect and protect all car batteries loaded onto the vessel.** The stevedores documented that a total of 58 vehicles loaded onto the vessel in Jacksonville did not have their batteries disconnected prior to being lashed and stowed for sea. During interviews stevedores stated that they were given instructions by Grimaldi Deepsea S.p.A, who was the vessel charterer at the time of loading, to disconnect all “tow and runner” car batteries when loaded. The instructions provided by Grimaldi to the stevedore company (Atlantic SSA) stated that there should be no exceptions to the battery disconnect policy. The acknowledgment by the vessel’s Master and Chief Officer that 58 vehicles did not have their battery disconnected is in violation of the policy provided by Grimaldi to the stevedores, as well as special provisions 961 and 962 of the IMDG Code because vehicles were also known by the crew to be leaking fluids. Coast Guard investigators observed leaking vehicles on non-fire affected decks during their investigation. The vessel’s crew knew the vehicles leaked fluid, therefore the exceptions to the IMDG Code for vehicle stowage as cargo did not apply to the vessel for this voyage. The failure to disconnect or prevent these batteries from short circuiting created a potential ignition source for the fire.

It was the responsibility of Horizon Auto Logistics to ensure that all car batteries were disconnected on vehicles that were designated as forklifts as per the instructions of Grimaldi. The Coast Guard conducted an inspection of vehicles that were offloaded from the vessel to determine their battery condition. A total of 2,040 vehicles were on the *HOEGH XIAMEN* at the time of the fire. Approximately half of the vehicles loaded were destroyed during the fire, leaving approximately 1,020 available for inspection to determine the condition of their battery connection. The Coast Guard sampled 50 forklift vehicles and found that 4 out of 50 had their battery still connected, indicating that approximately that 8% of forklift vehicles loaded onto the vessel had their batteries still

connected. Of the cars surveyed, 15 of the forklift sample were found to have disconnected battery cable lugs resting on or near unprotected battery terminal posts. This condition could have led to electrical arcing and is a possible ignition source. Using the given sample, it is reasonable to assume that approximately 17 vehicles were loaded with batteries still connected and 62 had battery cables resting near unprotected battery terminal posts.

Additionally, the Coast Guard conducted a similar analysis for towed cars, a total of 40 were sampled and 8 were found to have batteries connected. According to Grimaldi, a total of 166 tows were loaded onto the vessel, making the 40 sampled a statistically significant sample. Using the given sample, it is reasonable to assume that approximately 33 towed vehicles were loaded with batteries still connected.

The condition of the cars loaded on the vessel was used; many of which had clearly been in accidents and sustained high levels of damage. Damage to vehicles can result in the



Figure 11. A vehicle on deck 8 of the *HOEGH XIAMEN* taken on June 26, 2020, provided by the Coast Guard.

vehicle's wiring and electrical harnesses sustaining damage. Wires in contact with metallic surfaces creates a ground when energized. This electrical ground results in heat being generated at the point of the ground. It is likely that a damaged vehicle loaded onto the vessel had an electrical ground, short, or other similar condition. If the battery was not disconnected, this could have allowed current to flow through the damaged electrical system, and subsequently could have produced enough heat to start a fire. Because the fire burned in excess of seven days and at temperatures exceeding 1000° F, no specific source of the fire was able to be identified by the Coast Guard. However, it is likely the fire was ignited from an electrical short within a damaged vehicle with its battery still connected. Another possible source of ignition was that battery cable lugs resting on or near unprotected battery terminals could have provided a source of electrical arcing. This demonstrates a failure to protect car batteries against short circuiting in accordance with the IMDG Code special provisions 961 and 962, which mandates motor vehicle batteries be prevented against short circuiting, could have provided the source of the vessel fire.

- 5.2. **Failure of the crew to prevent vehicles from leaking fluids excessively.** A policy was in place to load vehicles onto the vessel four inches apart between side mirrors, and twelve inches from front to rear bumper. This policy was communicated by the charterer (Grimaldi Deepsea S.p.A) to the stevedores in order to maximize the amount of cargo loaded. Investigators observed many vehicles placed closer than the requirements provided by Grimaldi Deepsea S.p.A. This loading arrangement created several rows of vehicles loaded onto the vessel that investigators could not walk through or inspect easily. It is likely that because the cars were so tightly packed together, crewmembers could not walk

between vehicles, and not all vehicles were checked for leaking fluids. Upon boarding the vessel, investigators observed leaking fluids of various colors and smells on each deck unaffected by fire. During interviews, both the crew and stevedores stated that no vehicles were rejected for loading due to vehicle condition on either June 3 or 4. During interviews the crew of the vessel stated that the “vehicles always leak fluids”. Investigators observed numerous bags of saw dust on board, which the crew stated were used to clean leaking fluids from vehicles. According to the special provisions of the IMDG Code 961 and 962, when a motor vehicle is leaking fluid it must be classified as Class 9 Hazardous Material. The cargo manifest for the *HOEGH XIAMEN* did not have any vehicles labeled as hazardous material. It is likely that fluids from leaking vehicles provided a fuel source for the fire and allowed it to easily spread.

- 5.3. **Failure of the Horizon Auto Logistics and Grimaldi to properly prepare vehicles for shipment.** Horizon Auto Logistics employees stated during interviews that they were responsible for preparing vehicles for loading onto the vessel. The terminal manager and the operations and logistics manager for Horizon Auto Logistics stated that vehicles are received from shippers at the terminal and then prepared for shipment in accordance with the policies and procedures provided to them by the steamship line that is transporting the vehicles. The *HOEGH XIAMEN* was chartered by Grimaldi during the loading that occurred in the port of Jacksonville on June 3-4. The vehicles were loaded and prepared for shipment in accordance with Grimaldi’s instructions. The cargo manifest for the vessel was prepared in the vessel’s last port of call, Freeport, Texas, and the cargo manifest drafted in Jacksonville, Florida did not list the cargo as hazardous.

Per the IMDG Code, which was applicable to the *HOEGH XIAMEN* as per 74 SOLAS (2014) Ch. VII Reg. 7, motor vehicles have been assigned the hazardous material number UN 3166 and have IMDG Code special provisions 312, 356, 961, 962, and 970. The special exemption 961 of the code allows for the shipment of motor vehicles as exempted from the IMDG when stored in a deck or area identified by the vessels administration as a Ro-Ro space. One criteria for this exemption includes ensuring the vehicle shows no signs of leakage. The IMDG Code specifies that if vehicles are loaded that are leaking, then the provisions of the IMDG Code are applicable and certain other measures must be taken in order to ship the vehicles, including protecting the vehicle batteries against short circuit and limiting the fuel in the tanks. The crew of the *HOEGH XIAMEN* stated that a majority of the vehicles loaded onto the vessel leaked fluid, and investigators observed vehicles leaking fluid onboard the vessel. The procedures from Grimaldi to Horizon Auto Logistics stated vehicles that leak fluids should be rejected for shipment. It is likely that the vehicles observed leaking fluid on the vessel were leaking fluid prior to loading based upon the amount of vehicles observed to be leaking. Additionally, Horizon prepared the vehicles that were loaded onto the vessel in Freeport, Texas, which were also observed to be leaking by Coast Guard investigators. This indicates that the vehicles should have been prepared in accordance with special provision 962 of the IMDG Code. This provision states that vehicles loaded onto Ro-Ro vessels must have no more than one quarter full fuel tanks and that their batteries should have been protected against short circuiting.

Three types of vehicles were loaded onto the vessel and were classified as runners, tows, and forklift units (vehicles that had to be loaded onto the vessel via forklift). The terminal manager for Horizon Auto Logistics stated the terminal employees check the gasoline level for runners. In accordance with the instructions provided by Grimaldi, which are not

consistent with IMDG Code requirements, all units must have at least 1/8 tank of gas. During the interview of the terminal manager conducted by the Coast Guard, the terminal manager stated that vehicles that arrive with more than 1/8 tank of gas are allowed to be loaded onto the vessel as they have gasoline in excess of the minimum level required by Grimaldi. The terminal manager further stated that the tows and forklift vehicles are not checked for gasoline levels, as the vehicles cannot be started. Additionally, during the offload of the unaffected cargo, investigators were able to determine that gasoline was present in two of the “forklift” vehicles, one of which had 3/8 tank of gas.



Figure 12. A vehicle from deck 5 of the *HOEGH XIAMEN* taken on July 9, 2020. The car was designated a forklift and has approximately 3/8 tank of gas, provided by the Coast Guard.

During the interview conducted by the Coast Guard, the terminal manager for Horizon Auto Logistics stated that in accordance with Grimaldi and Horizon’s policy for receiving vehicles, any vehicles that had personal effects inside of them should be rejected

Figure 13. A vehicle from deck 5 of the *HOEGH XIAMEN* taken on July 9, 2020. The car was loaded with personal effects and ammunition, provided by the Coast Guard.



Investigators observed numerous vehicles loaded onboard the *HOEGH XIAMEN* that contained items such as cardboard, personal effects, ammunition, and paint cans. The presence of these additional items increased the fire load in the vessel's cargo hold, and could have presented an additional fire source.

The failure of Grimaldi to draft their cargo receiving instructions in accordance with the IMDG Code allowed vehicles to be loaded onto their vessels in multiple ports throughout the country to have gasoline onboard in excess of the one quarter requirement of the IMDG Code. Additionally, Horizon Terminals failed to identify and reject vehicles that leaked fluid and contained unregulated and flammable items in them. It is also evident that it was common practice for the crew to load leaking vehicles onto the *HOEGH XIAMEN*, as investigators observed 50 pound bags of marine saw dust and rags on numerous cargo decks, which the crew stated they used to clean up leaking fluids from vehicles. Because Horizon Terminal followed the procedures provided by Grimaldi, some vehicles loaded on the vessel had more than a quarter tank of gasoline. In addition, the vessel's fire load was increased because Horizon Terminal failed to reject vehicles that had additional items in them. The failure of Horizon Auto Logistics to properly prepare the vehicles for shipment in accordance with the IMDG Code could have led to the fire having more fuel than should have been allowed by regulation.

6. Conclusions

6.1. Determination of Cause:

6.1.1. The initiating event for this casualty was the failure to prepare the vessel's cargo in accordance with the IMDG Code. Causal factors leading to this event were:

- 6.1.1.1. Failure to disconnect vehicle batteries of vehicles loaded onto the vessel.
- 6.1.1.2. Failure of the crew to adequately check vehicles for leaking fluids.
- 6.1.1.3. Failure of the Horizon Auto Logistics and Grimaldi Deepsea S.p.A to prepare vehicles for shipment in accordance with the IMDG Code.

6.1.2. Following the improper loading and stowage of vehicles onboard the *HOEGH XIAMEN*, it is likely that a vehicle caught fire in the aft portion of deck 8, which led to the fire spreading to further decks. Causal factors leading to this event were:

6.1.2.1. Failure of the crew to turn on the fire detection system for the cargo holds following completion of cargo operations. During interviews it was determined that it was common practice for the crew of the *HOEGH XIAMEN* to disable the fire detection system during cargo operations in order to prevent false alarms from vehicle exhaust. The safety management system of the ship also instructed the crew to do so, but required crew to man each deck while the fire alarm was inactive. If the crew of the *HOEGH XIAMEN* had immediately turned their fire detection system on upon completion of cargo loading and prior to crew leaving the decks, the crew could have been alerted to the presence of the fire earlier and prevented it from becoming out of control.

6.1.2.2. Failure of the *HOEGH XIAMEN* crew's VHF radios. The crew of the *HOEGH XIAMEN* primarily communicated with VHF radios. During the day of the incident it rained intermittently. The Chief Officer stated when he first noted the fire, he could not contact the vessel's Master initially because the radio had been affected by rain. Additionally, the Master was forced to leave the bridge to communicate with the crew, as communicating with radios was not effective due to the rain and ambient noise. If the crew had been equipped with weather resistant VHF radios, they could have coordinated firefighting operations more efficiently and possibly prevented the fire from becoming out of control.

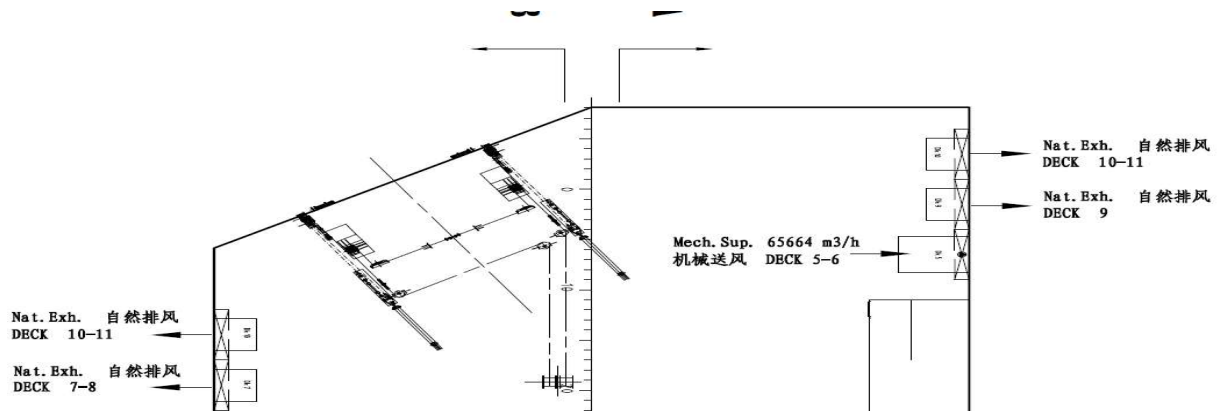
6.1.2.3. Lack of effective fire extinguishing agent. The *HOEGH XIAMEN* was equipped with a low pressure CO₂ system as its primary means of fixed firefighting in the cargo deck areas. Successful and safe use of CO₂ is highly reliant on good training and specialized knowledge, which may not be held by shore based personnel. Control of ventilation, boundary cooling and temperature monitoring sometimes needs to be sustained for days when CO₂ is used as an extinguishing medium. CO₂ is also dangerous as a firefighting medium due to its classification as an asphyxiate gas, making exposure potentially deadly to crew and firefighting personnel. While there are pros and cons to any firefighting system; water based systems, particularly water mist systems, are now widely used in shipboard firefighting. These systems generally provide an enhanced level of safety without creating an additional threat to human life or ship stability. If the *HOEGH XIAMEN* had been equipped with a water mist system, it may have prevented the fire from becoming out of control.

6.1.3. Following the fire, the vessel's crew turned over firefighting efforts to Jacksonville Fire Rescue Department (JFRD). The fire fighters boarded the vessel and opened ventilation to decks 9, 10, and 11 which caused the first re-flash. Causal factors leading to this event were:

6.1.3.1. Lack of shipboard firefighting training for JFRD fire fighters. The total amount of firefighters who responded to the fire onboard the *HOEGH XIAMEN* was 122 personnel and 55 fire trucks. Once onboard the vessel, the initial fire team made an entry to deck 8 and conducted an initial firefighting response, but due to car spacing, heat, and smoke could not extinguish the fire. The firefighters then

sought to increase ventilation to the vessel decks, opening up ventilation ducts that ventilated decks 9, 10, and 11, which had previously been closed by the vessel's crew. Once the vents were opened, air could flow into the upper decks, which caused the fire to spread and become out of control. If the firefighters from JFRD had been trained in shipboard firefighting, they likely would not have opened ventilation to the additional decks, minimizing the potential for the fire to spread.

Figure 14. Vents for decks 9, 10, and 11 of the *HOEGH XIAMEN*'s excerpt from the vessels ventilation drawing provided by HEOGH Technical Management INC. Note deck 10 and 11 have a common vent. Below: photo of top deck vents taken on July 13, 2020, provided by Resolve.



6.1.4. The fire re-flashed a second time following the vents being opened. Causal factors leading to this event were:

6.1.4.1. No defense exists to mitigate the second reflash. Once the vents to the decks above the fire were opened the fire became out of control.

6.1.5. An explosion occurred on the vessel in the aft port quarter. Causal factors leading to this event were:

6.1.5.1. No defense exists to mitigate the explosion that occurred in the port quarter of the vessel. Once the vents to the decks above the fire were opened the fire became out of control.

6.1.6. At approximately 0200 on June 5, 2020, the vessels engineering plant shutdown. Causal factors leading to this event were:

6.1.6.1. No defense exists to prevent the engineering plant from shutting down. The crew had left the vessel due to excessive heat and explosions.

6.1.7. An explosion occurred on the vessel in the upper amidships portion of the *HOEGH XIAMEN*. Causal factors leading to this event were:

6.1.7.1. No defense exists to mitigate the explosion in the upper amidships portion of the vessel. Once the vents to the decks above the fire were opened the fire became out of control.

6.1.8. An explosion occurred on the vessel approximately amidships of the *HOEGH XIAMEN*.

6.1.8.1. No defense exists to mitigate the explosion amidships of the vessel. Once the vents to the decks above the fire were opened the fire became out of control.

6.2. Evidence of Act(s) or Violation(s) of Law by any Coast Guard Credentialed Mariner Subject to Action Under 46 USC Chapter 77: No crewmembers involved in this incident possessed a merchant mariner credential issued by the United States.

6.3. Evidence of Act(s) or Violation(s) of Law by U.S. Coast Guard Personnel, or any other person: There were no acts of misconduct, incompetence, negligence, unskillfulness, or violations of law by Coast Guard employees or any other person that contributed to this casualty.

6.4. Evidence of Act(s) Subject to Civil Penalty: The policy drafted by Grimaldi Deepsea S.p.A, and implemented by Horizon Auto Logistics and its crews, is potentially in violation of the IMDG Code and 49 CFR.

6.5. Evidence of Criminal Act(s): This investigation did not identify violations of criminal law.

6.6. Need for New or Amended U.S. Law or Regulation: The investigation did not identify the need for a new law or regulation.

6.7. Unsafe Actions or Conditions that Were Not Causal Factors: The lack of initial communication between JFRD and the salvage and firefighting company contracted through the Non Tank Vessel Response Plan (NTVRP) could have contributed to hazardous firefighting actions that were taken by the untrained shore side firefighters. Though the NTVRP was activated in accordance with required timelines, more effective communication between the NTVRP parties and the local shore side firefighters could have increased safety and coordination during the initial response.

7. Actions Taken Since the Incident

7.1 Findings of Concern:

7.1.1. A Findings of Concern titled “Cargo Preparation Procedures Conformity with the International Maritime Dangerous Goods Code” has been submitted for release to address conditions identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

7.1.2. A Findings of Concern titled “Shipboard Firefighting Coordination Between Shippers and First Responders” has been submitted for release to address hazardous conditions identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

7.1.3. A Findings of Concern titled “Fixed Fire Suppression System Effectiveness” has been submitted for release to address hazardous conditions identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

7.2. On December 1, 2020 the Coast Guard issued marine safety alert 06-20 regarding cargo preparation and stowage on Ro-Ro type vessels.

8. Recommendations

8.1. Safety Recommendation:

8.1.1. No safety recommendations are included with this report.

8.2. Administrative Recommendations:

8.2.1. Recommend Officer in Charge Marine Inspections (OCMI) forward this report to PHMSA for awareness and address any issues identified under 49 CFR.

8.2.2. Recommend this investigation be closed.

[REDACTED]
[REDACTED]
Lieutenant, U.S. Coast Guard
Investigating Officer