REPUBLIC OF THE MARSHALL ISLANDS

Maritime Administrator

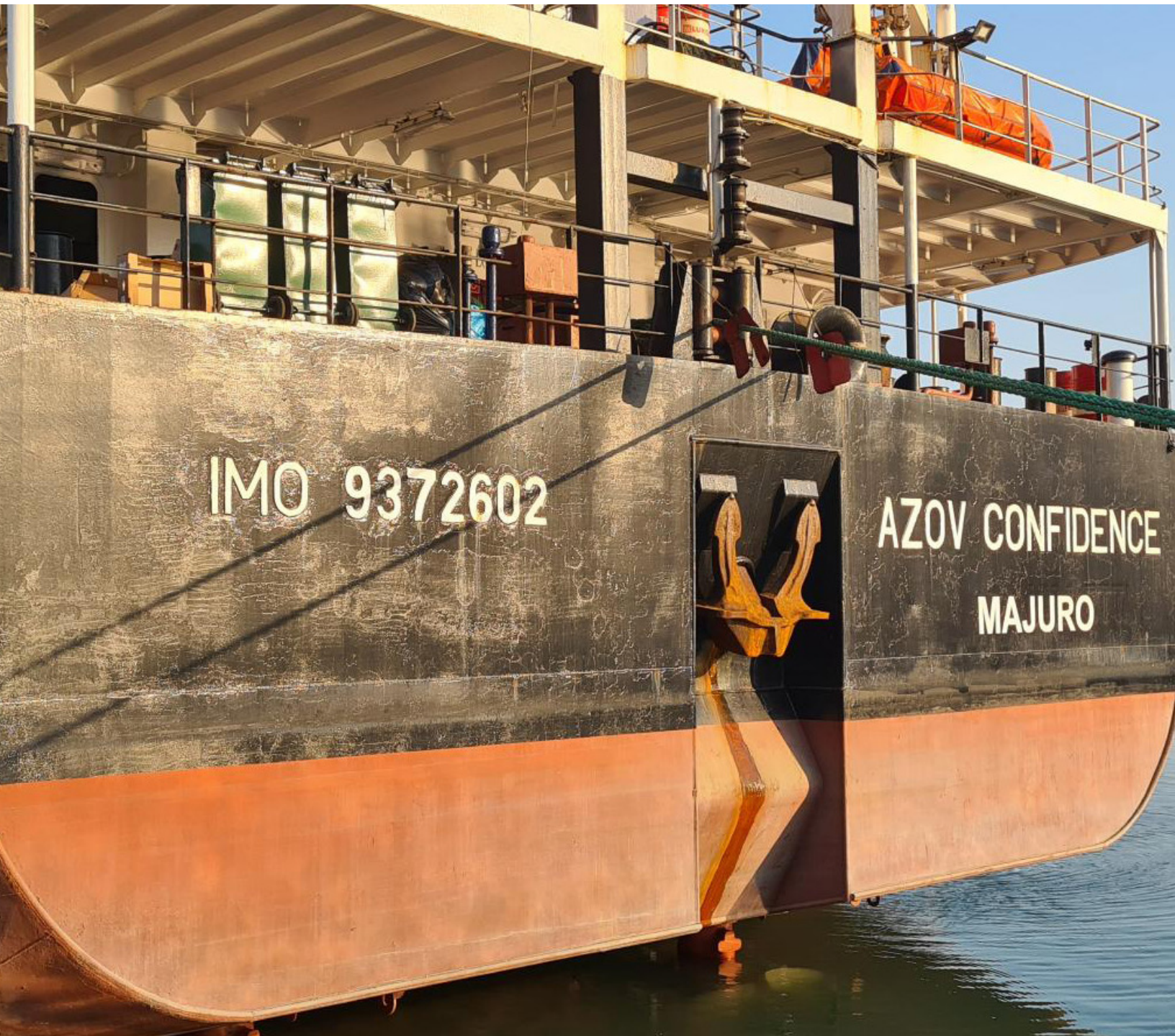
AZOV CONFIDENCE MARINE SAFETY INVESTIGATION REPORT

Fatal Engine Room Casing Fire

Black Sea | 2 November 2022

Official Number: 9828

IMO Number: 9372602



Published by: Republic of the Marshall Islands Maritime Administrator on 17 October 2024

DISCLAIMER

In accordance with national and international requirements, the Republic of the Marshall Islands Maritime Administrator (the "Administrator") conducts marine safety investigations of marine casualties and incidents to promote the safety of life and property at sea and to promote the prevention of pollution. Marine safety investigations conducted by the Administrator do not seek to apportion blame or determine liability. While every effort has been made to ensure the accuracy of the information contained in this Report, the Administrator and its representatives, agents, employees, or affiliates accept no liability for any findings or determinations contained herein, or for any error or omission, alleged to be contained herein.

AUTHORITY

An investigation, under the authority of the Republic of the Marshall Islands laws and regulations, including all international instruments to which the Republic of the Marshall Islands is a Party, was conducted to determine the cause of the casualty.

Maritime Administrator

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LIST OF ABBREVIATIONS AND ACRONYMS

2/E . . . . . Second Engineer

3/E . . . . . Third Engineer

3/O . . . . . Third Officer

ASD . . . . . Able Seafarer Deck

°C . . . . . Degrees Celsius

C/E . . . . . Chief Engineer

C/O . . . . . Chief Officer

CO_2 . . . . . Carbon Dioxide

cSt . . . . . Centistoke

DPA . . . . . Designated Person Ashore

DWT . . . . . Deadweight Tonnage

HFO . . . . . Heavy Fuel Oil

IMO . . . . . International Maritime Organization

m . . . . . Meter

MG . . . . . Marine Guideline

MGO . . . . . Marine Gas Oil

MRCC . . . . . Maritime Rescue Coordination Centre

No. . . . . Number

OOW . . . . . Officer of the Watch

PA . . . . . Public Address

PMS . . . . . Preventative Maintenance System

PPE . . . . . Personal Protective Equipment

SAR . . . . . Search and Rescue

SMS . . . . . Safety Management System

UTC . . . . . Coordinated Universal Time

DOCUMENTS CITED

A.852(20) . . . . . Guidelines for a Structure of an Integrated System of Contingency Planning for Shipboard Emergencies

FSS Code . . . . . International Code for Fire Safety Systems

ISM Code . . . . . International Management Code for the Safe Operation of Ships and for Pollution Prevention

MLC, 2006 . . . . . Maritime Labour Convention, 2006

SOLAS . . . . . International Convention for the Safety of Life at Sea, 1974

STCW Code . . . . . International Convention for Seafarers' Training, Certification, and Watchkeeping Code

PART 1: EXECUTIVE SUMMARY

On 2 November 2022, the Republic of the Marshall Islands-registered general cargo ship AZOV CONFIDENCE departed Samsun, Republic of Türkiye (hereinafter, "Türkiye") on a ballast voyage to Novorossiysk, Russian Federation (hereinafter, "Russia").

At 2055[1] a thermal oil low pressure alarm, located in the Engine Control Room, initiated a chain of events resulting in the C/E jumping overboard from the Aft Mooring Deck. Following a thermal oil leak on the blind flange connected to the thermal oil system, which triggered the alarm identified by the C/E, the C/E proceeded to the compartment to investigate the thermal oil leak and in doing so, manually adjusted the blind flange threaded bolts to secure the leaking thermal oil. Moments later, pressurized thermal oil ignited in vicinity of the thermal oil blind flange, engulfing the C/E. The C/E took evasive action resulting in him jumping over the guardrails and into the sea below.

The thermal oil heating system connected to the main engine remained operational while the C/E attempted to rectify the leaking blind flange. This deviation from PMS procedures resulted in the eventual fire caused by pressurized thermal oil spraying onto an adjacent hot surface and igniting.

The firefighting effort conducted by the attending crewmembers was unplanned. The immediate actions of the crewmembers fighting the fire with portable fire extinguishers was effective and the fire was extinguished. However, shipboard firefighting procedures were not followed, resulting in increased risk in the event the fire could not be contained and extinguished.

The SAR operation was initiated utilizing the ship's rescue boat and shoreside SAR assets. The search for the C/E, led by the Turkish Coast Guard, continued for eight hours however the C/E could not be located.

1 Unless otherwise stated, all times are ship's local time (UTC +3).

PART 2: FACTUAL INFORMATION

The following Factual Information is based on the information obtained during the Republic of the Marshall Islands Maritime Administrator's (the "Administrator's") marine safety investigation.

Ship particulars at the time of the incident: *see* chart to right.

At the time of the incident, AZOV CONFIDENCE, managed by Sarfo Denizcilik ve Ticaret A.S. (the "Company"), was a general cargo ship built in 2007 *(see Figure 1)* and registered with the Republic of the Marshall Islands on 17 January 2022.

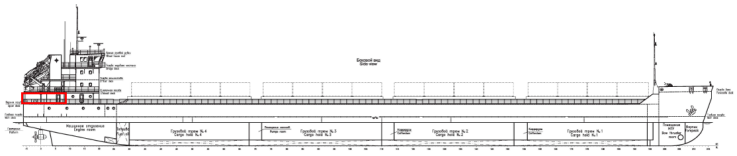

Figure 1: General Arrangement Plan of AZOV CONFIDENCE, with the upper deck indicated in red.

Engine Room Casing

AZOV CONFIDENCE has two Engine Room Casing compartments. Adjacent to the Engine Room Casing compartments are several storerooms, cabins, and mechanical spaces. The starboard Engine Room Casing compartment is located in the aft section of the accommodation block. Access to the starboard Engine Room Casing is via the aft mooring station *(see Figure 2)*.

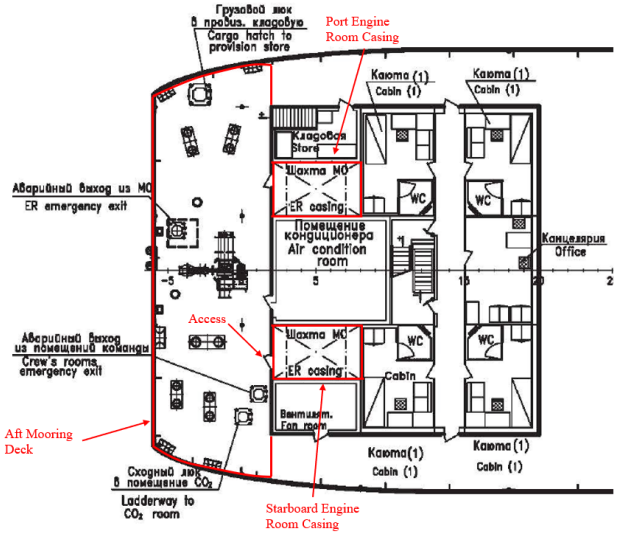

Figure 2: AZOV CONFIDENCE upper deck arrangement aft.

SHIP PARTICULARS

Vessel Name
AZOV CONFIDENCE

Registered Owner
Azov Confidence
Shipping Corporation

ISM Ship Management
Sarfo Denizcilik ve Ticaret A.S.

Flag State
Republic of the Marshall Islands

IMO No.	Official No.	Call Sign
9372602	9828	V7A5220

Year of Build	Gross Tonnage
2007	6,529

Net Tonnage	Deadweight Tonnage
2,590	8,003

Length x Breadth x Depth
135.12 x 18 x 8.5 m

Ship Type
General Cargo

Document of Compliance Recognized Organization
Bureau Veritas

Safety Management Certificate Recognized Organization
Bureau Veritas

Classification Society
Bureau Veritas

Persons on Board
13

AZOV CONFIDENCE has a port and starboard Thermal Oil Economizer (hereinafter "Economizer") each located above the Engine Room on the Upper Deck within the respective port and starboard Engine Room Casing compartments *(see Figure 2)*.

Economizer

The Economizer is a heat exchanger used to recover heat from exhaust gases from the ship's main engine to heat MGO and HFO to improve engine efficiency. The system was manufactured in 2005 and installed on board in 2007. The port and starboard Economizers are symmetrical and are designed to heat MGO and HFO in order to bring the viscosity of the oil below 20 cSt[2] for achieving proper atomization of the fuel. Once the MGO and HFO has reached the necessary temperature, it is recirculated back into the fuel delivery line to the main engine.

Hot exhaust gas generated from the combustion of oil used by the main engine passes through each Economizer. Cold MGO and HFO are circulated through concentric coils within each Economizer until the fuel reaches the required temperature. The amount of MGO and HFO passing through the Economizer is controlled automatically to ensure the optimum amount of oil is delivered, as required by the main engine, based on demand.

The closed loop system uses centrifugal pumps to circulate the MGO and HFO from the settling tank to the Economizers and return the heated thermal oil to the fuel pumps. The thermal oil system *(see Figure 3)* operates between 1-6 bar[3] and after passing through the Economizer has a temperature of approximately 180°C. The body of the Economizer is provided with incombustible insulation, which is protected by a galvanized steel jacket. A thermal survey used to identify any gaps in the thermal insulation of the Economizer had not been undertaken by the Company on either the port or starboard Economizers.

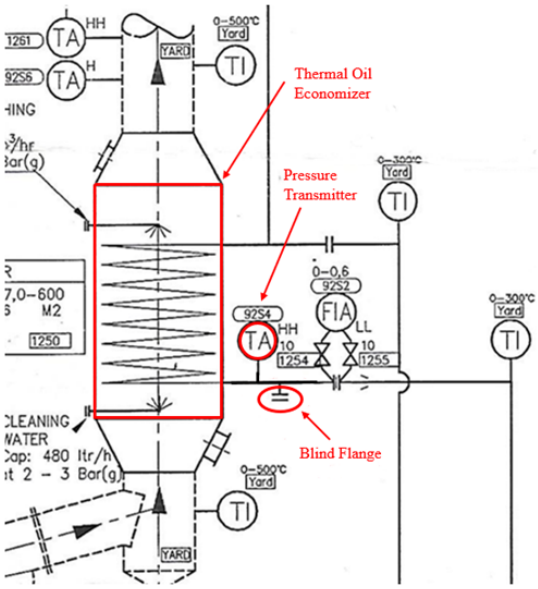

Figure 3: Thermal Oil System schematic.

2 A common unit of measure for viscosity of oil.

3 Bar is a metric unit of pressure.

A thermal oil return line carries circulated thermal oil around the system, via the Economizer. The thermal oil system pressure is obtained from the pressure transmitter switch located after the blind flange. The purpose of the blind flange is to enable the oil from the system to be drained in order to conduct maintenance.

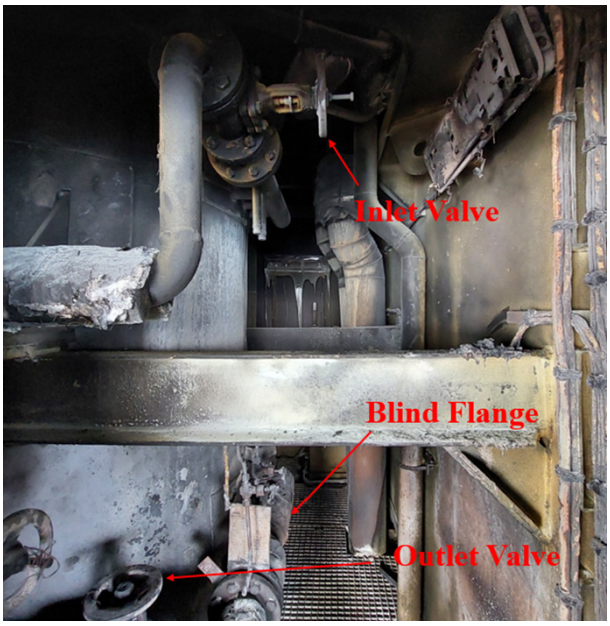

Figure 4: Thermal oil inlet and outlet valves.

The inlet and outlet valves located on the Thermal Oil System *(see Figure 4)* control the flow by obstructing the thermal oil. To stop the flow of thermal oil from entering the Economizer, the inlet valve should be closed, and the outlet valve should be opened. Residual thermal oil may remain within the thermal oil system when the inlet valve is closed and the outlet valve is open.

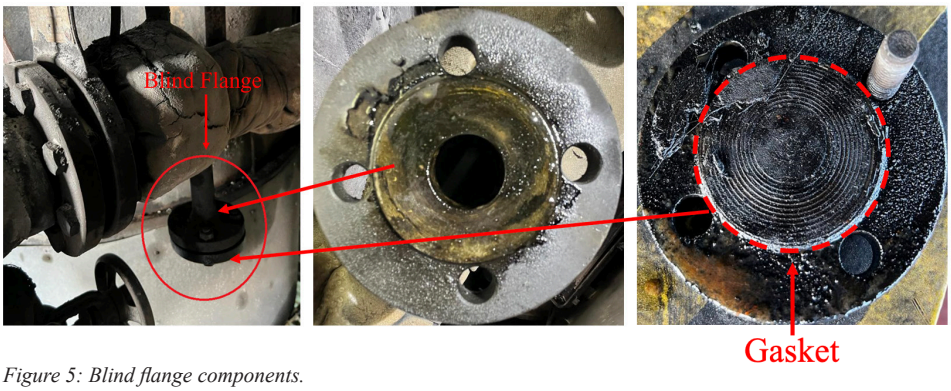

Figure 5: Blind flange components.

The blind flange *(see Figure 5)* contains a gasket which provides a mechanical seal preventing unauthorized release of thermal oil. The thermal oil pressure transmitter measures the pressure of the circulating thermal oil. If the pressure is outside of operating parameters, the pressure transmitter will indicate on the thermal oil alarm panel located in the Engine Control Room *(see Figure 6)*.

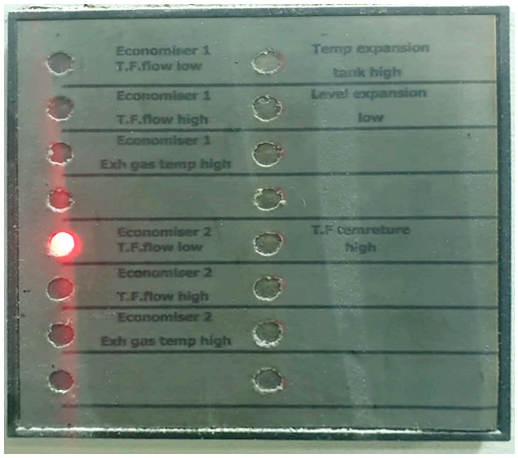

Figure 6: Low pressure alarm (illuminated) for the starboard Economizer.

The blind flange gasket *(see Figure 5)* was constructed from high purity natural flake graphite. It is commonly used as a basic material for manufacturing gaskets for use in the marine industry. The data sheet supplied by the manufacturer stipulated that the service limitation of the graphite sheet should not exceed less than -200°C or greater than +3000°C at a maximum pressure of 30 bar. The standard operating temperature and pressure of the thermal oil circulated through the Economizer is 180°C and between 1-6 bar. There is no indication that the thermal oil exceeded these parameters on 2 November 2022.

The service life of the blind flange gasket is not documented within the manufacturer's data sheet. The manufacturer's data sheet does not provide recommendations or stipulations for replacement and states that the graphite sheet "can serve for a long time even under harsh working conditions and a very low maintenance cost."

Narrative

At 1920 on 2 November 2022, the 8,003 DWT, AZOV CONFIDENCE departed the port of Samsun, Türkiye on a ballast voyage to Novorossiysk, Russia. At 2000, a short time after departure, the C/E started his watch.

Also at 2000, the 3/O relieved the C/O on the Bridge as OOW. The Bridge was manned with an OOW and no Lookout.[4] The Master was located in his Cabin.

Shortly after 2000, the C/E was conducting rounds within the Engine Room and noticed oil on the deck plates directly beneath the starboard Engine Room Casing compartment above. The C/E checked the Thermal Oil Heating System Alarm panel located in the Engine Control Room which indicated a low pressure alarm on the starboard Economizer *(see Figure 6)*.

The C/E and 3/E proceeded to investigate the source of the thermal oil leak and low pressure alarm in the starboard Engine Room Casing. At this time, the C/E did not inform the Master, C/O, or OOW of an oil leak or that he and the 3/E intended to enter the starboard Engine Room Casing compartment.

4 *See* STCW Code, Section A/VIII, Part 4-1 for all the principles particular to navigational watches that are addressed.

Upon entering the starboard Engine Room Casing via the Aft Mooring Deck access, the C/E identified that the source of the oil was coming from the thermal oil blind flange *(see Figure 7)*. He proceeded to secure the source of the thermal oil by closing the inlet valve on the thermal oil system and opening the outlet valve *(see Figure 4)*, restricting the flow of thermal oil to the Economizer.

The C/E commenced manipulating the threaded nut arrangement on the blind flange *(see Figure 5)* to stop the thermal oil leak.

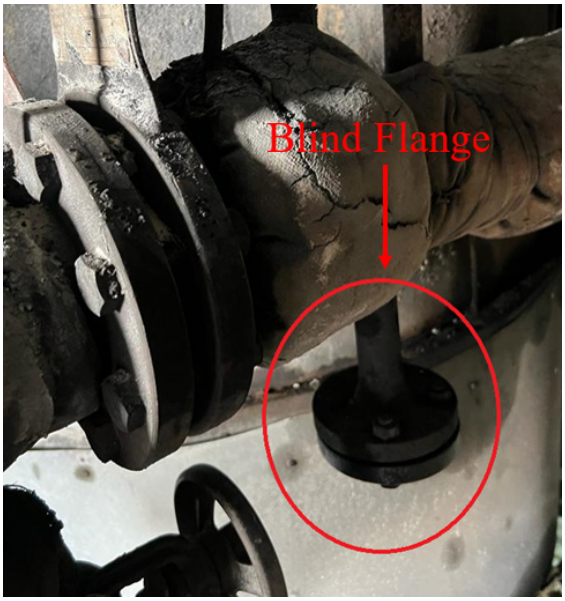

Figure 7: Blind flange location.

The pressure and temperature within the thermal oil system increased due to the closed position of the inlet valve and open position of the outlet valve. The increase in pressure and temperature resulted in pressurized thermal oil escaping the blind flange, filling the starboard Engine Room Casing with atomized thermal oil.

At approximately 2055, the atomized thermal oil ignited resulting in the rapid spread of flames, which engulfed the C/E. Wearing only coveralls and safety shoes, the C/E was reported to have been overcome by the flames. The OOW reported seeing flames and dense smoke emanate from the upper deck in vicinity of the Aft Mooring Deck.

The OOW immediately called the Master who proceeded to the Bridge. Upon arrival, the Fire Control Panel was alarming, indicating a fire on board. The 3/O briefed the Master on the situation, followed by the Master relieving the 3/O as OOW. The 3/O was instructed by the Master to proceed to the Officer Deck with a portable fire extinguisher and commence fighting the fire.

The C/O was located inside the accommodation area, and on passing an open upper deck door, the C/O met the 3/E who was running past the same upper deck door. The 3/E informed the C/O that there was a fire in the starboard Engine Room Casing and that the C/E had jumped overboard and into the sea. The C/O proceeded to the Bridge to brief the Master on the situation.

The Master made a PA announcement informing the crew of a fire in the starboard Engine Room Casing compartment and instructed the crew to extinguish the fire.

The ASD1, ASD2, ASD3, and ASD4 were located in their respective cabins at the time of the PA announcement. The ASD1, ASD2, and ASD4 left their cabins and proceeded to the scene of the fire, each with a portable fire extinguisher, and commenced an initial attack on the fire. The ASD3 left his cabin and proceeded to the Forecastle to don a firefighter's outfit[5] before returning to the Aft Mooring Deck. When the ASD3 arrived at the Aft Mooring Deck at 2110, the fire in the starboard Engine Room Casing had been extinguished by the ASD1, ASD2, and ASD4 using portable fire extinguishers.

The 3/O returned to the Bridge and informed the Master that the fire in the starboard Engine Room Casing had been extinguished.

The Master initiated SAR protocol by sending a distress message to MRCC Samsun who responded by taking On-scene Command for the SAR of the missing C/E. The Master reduced speed of AZOV CONFIDENCE and ordered the rescue boat to be made ready. AZOV CONFIDENCE's rescue boat was launched and soon thereafter was joined by a Turkish Coast Guard vessel and SAR helicopter.

At 0505 on 3 November 2022, the SAR operation was suspended without locating the C/E. The Turkish Coast Guard requested that AZOV CONFIDENCE return to Samsun Road anchorage.

Post-fire Condition of the Upper Deck

The majority of the fire damage was located within the starboard Engine Room Casing. Visible carbon deposits were identified immediately upon entry to the compartment *(see Figure 8)*. Carbon deposits can be seen closest to the Economizer and on the aft bulkhead adjacent to the door. The burn pattern on the steel structural girder provides a clear indication that the flames were located in the vicinity of the Economizer and not near the starboard bulkhead.

Carbon deposits were clearly visible on the underside of the pipework and that of the pipework immediately surrounding the Economizer.

5 FSS Code Chapter 3, Section 2 defines a firefighter's outfit as "consisting of a set of personal equipment and a breathing apparatus. Personal equipment shall consist of protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam. Boots of rubber or other electrically non-conducting material; rigid helmet; electric safety lamp; and axe."

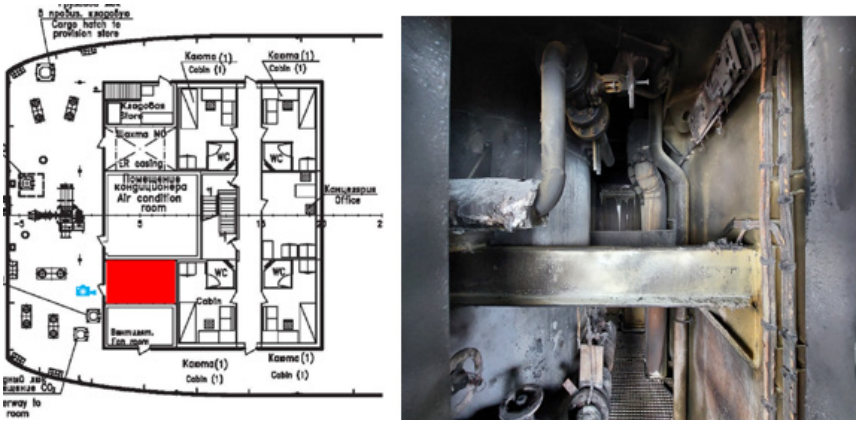

Figure 8: Starboard Engine Room Casing General Arrangement Plan (left) and Economizer (right).

Heat transfer damage was evident throughout the compartment. Plastic fixtures and fittings had melted and cabling towards the rear of the compartment was heavily damaged compared to cabling immediately on entry and on the starboard bulkhead.

Outside the starboard Engine Room Casing, the aft accommodation block bulkhead exhibited heavy damage from smoke and heat *(see Figure 9)*. The bulkhead indicated that heat and smoke originating from the fire escaped through the entrance and spread onto the Aft Mooring Deck. Plastic fixtures and fittings in close proximity to the starboard Engine Room Casing had melted from the intensity of the heat from the fire. Significant carbon deposits were visible towards the upper portion of the bulkhead which is consistent with an oil-based fire. Blistering of paint was also present indicating intense heat over a short period of time.

Figure 9: Starboard Engine Room Casing entrance and aft bulkhead.

Smoke and heat damage to the surrounding area outside the starboard Engine Room Casing was present. Carbon deposits were visible up to approximately 10 m from the entrance to the starboard Engine Room Casing. Fire damage decreased with distance from the origin of the fire within the starboard Engine Room Casing *(see Figure 10)*.

Figure 10: Aft Mooring Deck bulkhead.

All material damage was confined to the starboard Engine Room Casing and Aft Mooring Deck with no additional damage to other decks or adjacent compartments.

AZOV CONFIDENCE's Fire Control Plan

AZOV CONFIDENCE's fire control plan was approved by Bureau Veritas and details the fire protection arrangements provided on board *(see Figure 11)*.

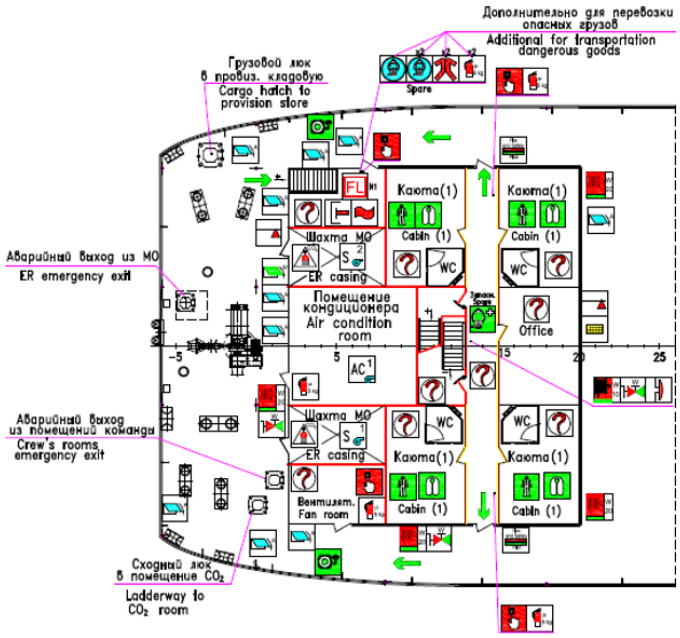

Figure 11: Fire control plan for AZOV CONFIDENCE's upper deck.

The internal bulkheads surrounding the starboard Engine Room Casing were "A-60" class divisions.[6] The aft bulkhead and hinged door separating the external Aft Mooring Deck and the starboard Engine Room Casing is a "C" class division.[7]

Within the starboard Engine Room Casing compartment was located a remote CO_2 release station and supply ventilator. On the external bulkhead outside the compartment was a fire hydrant and a 20 m water fire hose and nozzle.

A fixed fire detection and fire alarm system was installed in accordance with SOLAS II-2, regulation 7. One smoke detector was located within the starboard Engine Room Casing on the ship's main deck and a further smoke detector was located within the Engine Room. One heat detector was located within the Engine Room and starboard Engine Room Casing respectively. The fire alarm system provides audible and visual warnings throughout the upper deck when the fire detection system is activated.

AZOV CONFIDENCE Crew

AZOV CONFIDENCE had a complement of 13 crewmembers meeting the required Minimum Safe Manning Certificate issued by the Administrator.

All involved seafarers held the appropriate Republic of the Marshall Islands-issued seafarer documentation for their positions on board.

Experience of AZOV CONFIDENCE crewmembers:

RANK	TIME ON BOARD AZOV CONFIDENCE	TIME IN RANK	TIME WITH COMPANY	TOTAL TIME AT SEA
Master	4 months	30 years	9 years	40 years
C/O	5 months	5 years	5 years	10 years
C/E	2 months	10 months	7 years	11 years
3/O	27 days	2 days	3 years	5 years
3/E	1 month	2 years	4 years	6 years
ASD1	2 months	15 years	10 years	15 years
ASD2	2 months	3 years	3 years	3 years
ASD3	1 month	10 years	10 years	10 years
ASD4	1 month	4 years	4 years	4 years

The Administrator found no indication that crewmembers involved with this incident failed to receive the amount of rest mandated by the STCW Code, Section A-VIII/1, paragraphs 2 and 3, and MLC, 2006, regulation 2.3.

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6 SOLAS Chapter II-2 regulation 3 defines "A" class divisions as those constructed of steel or other equivalent material, suitably stiffened, and insulated with non-combustible materials such that the average temperature of the unexposed side will not rise more than 140°C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180°C above the original temperature, within 60 minutes, and constructed to prevent the passage of smoke and flame for at least one hour.

7 SOLAS Chapter II-2 regulation 3 defines "C" class divisions as those which are constructed of non-combustible materials but are not required to be rated for the prevention of heat transfer nor passage of smoke or flames.

The C/E's most recent physical examination certificate was issued on 8 June 2022. He was found fit for duty without any restrictions.

No evidence of emergency preparedness[8] could be provided during the course of the Administrator's investigation. Crewmembers were unable to demonstrate adequate records indicating that monthly firefighting drills had been conducted in accordance with SOLAS, Chapter III, regulation 19.

PART 3: ANALYSIS

The following Analysis is based on the above Factual Information.

Cause and Origin

A damage assessment conducted within the starboard Engine Room Casing compartment determined that the source of the fire was in the immediate vicinity of the thermal oil blind flange located on the thermal oil system. The smoke and heat patterns observed surrounding the blind flange indicated that the fire was at its most intense in this area. Less damage was observed in the surrounding area as distance from the source increased.

The integrity of the thermal oil blind flange gasket likely failed following adjustment to the securing bolts of the base plate of the blind flange. The gap created during the tightening of the base plate likely resulted in the residual thermal oil escaping through the damaged gasket and igniting on an adjacent hot surface. There is no evidence to suggest that the gasket of the blind flange failed prior to the release of thermal oil.

A thermal survey conducted prior to the fire would likely have identified the location of any hot spots or exposed areas where the insulation material was insufficient and thermal oil, in atomized or liquid form, could realistically combust in an uncontained environment.

The damage sustained to the external surfaces of the Economizer and associated components rendered determining the exact source of the point of ignition unobtainable.

C/E's Cause of Presumed Death

The resulting ignition of atomized thermal oil encased the C/E resulting in his immediate evacuation from the starboard Engine Room Casing. It was reported that on exiting the compartment, the C/E was further engulfed in smoke and flames originating from the starboard Engine Room Casing. Within a matter of seconds, the C/E evaded the smoke and heat of the Aft Mooring Deck by jumping over the railings and into the water.

The cause of the C/E's presumed death could not be determined. Following extensive SAR efforts, he was not located following his going overboard from AZOV CONFIDENCE.

8 ISM Code, Part A, article 8 requires the Company to establish programs for drills and exercises to prepare for emergency actions as detailed within A.852(20).

Thermal Oil System Operating Procedures

The thermal oil system was required to be isolated prior to undertaking any maintenance or defect rectification. To isolate the thermal oil system, the main engine is required to be shut down and sufficient time passed to allow the thermal oil system to cool down. The C/E elected to rectify the leak on the thermal oil blind flange without shutting down the main engine[9] or thermal oil system. The C/E's decision to secure the thermal oil circulating within the Economizer by closing the inlet valve and opening the outlet valve while simultaneously running the main engine, increased the temperature and pressure of the remaining oil within the thermal oil system. The increased oil pressure was released through the leaking blind flange.

Maintenance of the Thermal Oil System

The thermal oil system is required to undergo monthly maintenance in accordance with the documented PMS. The previous maintenance on the thermal oil system was conducted by service contractors on 22 June 2022 when AZOV CONFIDENCE was in a maintenance period. It was stated within the Company investigation report that the engineering crewmembers had confidence in the serviceability of the thermal oil system and as such, no maintenance was required to be conducted. There is no record of any Company audit being conducted on board between 22 June 2022 and the time of the fire on 2 November 2022 verifying that the maintenance required was conducted.

The condition of the mechanical seal between the base plate and the fixed plate of the blind flange, separated by the gasket, could not be known at the time of the incident. The last known physical condition was verified on 22 June 2022.

Firefighting and Search Operation

Over the PA system the Master ordered all crewmembers to fight the fire on the Aft Mooring Deck. ASD1, ASD2, and ASD4 vacated their cabins and collected fire extinguishers while enroute to the scene of the fire. The ASDs were the first on scene and independently commenced fighting the fire with portable extinguishers. The residual thermal oil which remained within the system after closing of the inlet valve had likely been consumed by the fire enabling the ASDs to extinguish any remnants of the fire within the starboard Engine Room Casing within 15 minutes.

The shipboard firefighting training manual[10] incorporated within the SMS required crewmembers to be mustered before commencing firefighting efforts. The purpose of mustering the crewmembers is to determine the number of crewmembers that may be injured or rendered incapacitated by a fire, and those who may still be located within a compartment or compartment adjacent to a fire. The three ASDs who proceeded to the scene of the fire had not been briefed on the exact location, severity of the fire, whether necessary isolations had been made within the compartment, or whether any crew remained inside the starboard Engine Room Casing. Further, none of the individuals who attended the scene of the fire wore the appropriate PPE to attack an oil-based fire.

The firefighting effort was ultimately successful in extinguishing the fire. Insufficient preliminary coordination of the firefighting effort resulted in crewmembers providing an immediate response without sufficient backup of replacement

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9 There was no indication that a risk to safety of navigation existed, requiring propulsion to be maintained.

10 SOLAS Chapter II-2, regulation 15/2.3 requires the training manual to explain general fire safety practice and precautions; general instructions on fire-fighting activities and fire-fighting procedures.

firefighters wearing firefighter's outfits,[11] to maintain a continuous aggressive attack on the fire. Had the fire escalated, the initial attack party[12] would likely have been beaten back allowing the fire to spread to adjacent compartments. Further, had a rescue been required due to one or more of the initial attack party being overcome by the fire, no immediate rescue resources would have been available.

No training records were available to review during the investigation. Crewmembers are required to participate in monthly fire drills to ensure thorough understanding of duties, required PPE, operation of equipment, operation of communications, and familiarity with location of firefighting equipment. It is not known why the Master did not muster the crewmembers prior to commencing firefighting efforts. Except for the Master and C/O, the majority of the remaining crewmembers had been on board AZOV CONFIDENCE less than two months.[13] It could be considered highly likely that the crewmembers were not familiar with general firefighting procedures and actions required prior to fighting a fire through lack of regular drills and training.

The Master was informed by the C/O that the C/E was missing. Without mustering the remaining crewmembers, the location of the C/E was not verified. AZOV CONFIDENCE's starboard rescue boat was launched, and the search of the surrounding waters commenced before being relieved by the Turkish Coast Guard SAR assets.

The Master was the only watchkeeper present on the Bridge once the 3/O had been relieved and instructed to proceed to fight the fire. The Master therefore could not fulfill the obligations under STCW A/VIII, regulation 4-1 for the purpose of "maintaining a continuous state of vigilance by sight and by hearing, as well as by all other means, with regard to any significant change in the operating environment." The use of the ship's signal lamp was not considered once it was reported that the C/E had jumped overboard. In order to use the signal lamp, additional manpower would have been required on the Bridge in order to maintain the functioning of the Bridge while simultaneously operating the signal lamp.

PART 4: CONCLUSIONS

The following Conclusions are based on the above Factual Information and Analysis and shall in no way create a presumption of blame or apportion liability.

The cause of the fire, which originated within the starboard Engine Room Casing on the upper deck, was determined to have originated from leaking thermal oil from the blind flange which ignited on an adjacent hot surface.

1. Causal factors that contributed to this very serious marine casualty include:
   (a) a deviation from maintenance procedures during defect rectification. The thermal oil system was required to be shut down prior to attending to a leak located on the blind flange;

11 ASD3 was the only crewmember wearing a firefighter's outfit.

12 ASD1, ASD2, and ASD4.

13 AZOV CONFIDENCE underwent a Republic of the Marshall Islands Annual Safety Inspection on 1 February 2023. The Flag State Inspector issued the following deficiency: Emergency generator fire drill was not conducted satisfactorily. Instructions and guidance were provided and the fire drill was repeated to the satisfaction of the attending inspector. The deficiency was rectified on 09 Feb 2023.

(b) the intensity of the fire and smoke which engulfed the C/E resulted in his egress from the starboard Engine Room Casing and Aft Mooring Deck to the nearest point of safety which was the sea; and

(c) the sufficiency of the thermal insulation surrounding the Economizer and associated components was not known prior to the point of ignition.

2. Additional causal factors that may have contributed to this very serious marine casualty include:

   (a) the Company PMS was not followed and therefore the integrity of the thermal oil system could not be known at the time of the thermal oil leak.

3. Additional issues that were identified but that did not contribute to this very serious marine casualty include:

   (a) onboard firefighting procedures were not followed resulting in crewmembers fighting the fire independently and without appropriate safety measures in place;

   (b) a Lookout was not stationed on the Bridge to assist the Master with the safe and effective management during the developing situation; and

   (c) required firefighting drills were not conducted resulting in crewmembers being unfamiliar with the necessary procedures and actions required to fight a fire.

PART 5: PREVENTIVE ACTIONS

In response to this very serious marine casualty, the Company has taken the following Preventive Actions:

1. A review was conducted of the Company's PMS and updated as necessary.
2. Training was conducted with all crewmembers into the maintenance of machinery equipment in accordance with the ship's SMS.
3. A review of the knowledge required by the C/E, 2/E, and 3/E into their roles and responsibilities concerning specific equipment was conducted.
4. Onboard technical inspections by Company Technical Managers were resumed at least once every three months.
5. Firefighting procedures to be reviewed and updated as required.
6. Further training to be provided to crewmembers with firefighting responsibilities.
7. Increase SMS internal audits to verify key duties and responsibilities.
8. Additional ship-shore fire drill to be conducted and verified by DPA.
9. Learnings identified during the course of this investigation were shared throughout the fleet for future learning.

PART 6: RECOMMENDATIONS

The following Recommendations are based on the above Conclusions and in consideration of the Preventive Actions taken.

1. Based on the above Conclusions and in consideration of the Preventative Actions taken, it is recommended that the Company:
   (a) develop and maintain emergency shipboard response procedures;
   (b) establish a program to verify compliance of the PMS to ensure maintenance of equipment included within the PMS is being conducted;
   (c) establish, maintain, and verify firefighting training on board;
   (d) consider undertaking refresher training for all senior officers on board in advance firefighting techniques; and
   (e) conduct a thermal survey on the port and starboard Economizers and associated components to identify any exposed areas and replace, and/or install sufficient insulation material.

The Administrator's marine safety investigation is closed. It will be reopened if additional information is received that would warrant further review.