Marine Safety Investigation Unit

Transport Malta

SAFETY INVESTIGATION REPORT

202502/043 REPORT NO.: 03/2026 February 2026

MV *ZEPHYR VENTURE*

Progressive flooding of the engine-room while at anchor, in position 02° 57.4' N 080° 31.8' E
27 February 2025

SUMMARY

On 21 February 2025, while *Zephyr Venture* was en route to Guayaquil, a corrosion-induced leak from the port sea-chest strainer housing was identified. Temporary repairs were carried out. After anchoring on 24 February, further maintenance and painting were undertaken.

On 27 February, while additional tasks were in progress, the high-level bilge alarms activated, and crew members discovered seawater entering the engine-room through the open strainer housing. The port sea-chest valve was also open, allowing progressive flooding.

By the time the valve was fully closed, approximately 400 tonnes of seawater had flooded into the engine-room, causing extensive damage to machinery, electrical equipment, and auxiliary systems. The safety investigation concluded that flooding occurred because the sea-chest valve inadvertently opened while its strainer housing was still open.

Taking into consideration the change in Flag and management of the vessel, the MSIU has issued no safety recommendations.

FACTUAL INFORMATION

The vessel

Zephyr Venture (**Figure 1**) was a Maltese-registered bulk carrier of 26,411 gt. It was built at Qingshan Shipyard in the People's Republic of China in 2017. At the time of the incident, the vessel's registered owners were Diderot Financement 23 SNC[1], and was managed by Intership Navigation Co. Ltd. of Greece. Det Norske Veritas (DNV) acted as the classification society and the recognised organisation, in terms of the International Safety Management (ISM) Code.

Zephyr Venture had an overall length of 189.98 m, a moulded breadth of 29.99 m, and a summer displacement of 53,551.80 mt, corresponding to a summer draft of 10.70 m. The vessel was fitted with five cargo holds, having a combined grain capacity of 55,299.80 m^3. Propulsive power was provided by a MAN B&W 5S50ME-B9.3, five-cylinder slow speed internal combustion diesel engine, producing 6,050 kW at 99 rpm. This drove a single, fixed pitch propeller, enabling the vessel to reach a service speed of 14.0 knots.

Manning

The Minimum Safe Manning Certificate of *Zephyr Venture* stipulated a crew of 14 persons. At the time of the occurrence, there were 19 crew members serving on board. The crew members were Polish and Filipino nationals. English was the working language.

All the crew members joined the vessel at Rio Grande, Brazil on 15 November 2024, bar for the chief officer, the chief engineer, the electro-technical officer, one able-bodied seafarer, one ordinary seafarer and one messman, who all joined on 19 January 2025, and one fitter, who had been on board since 27 May 2024.

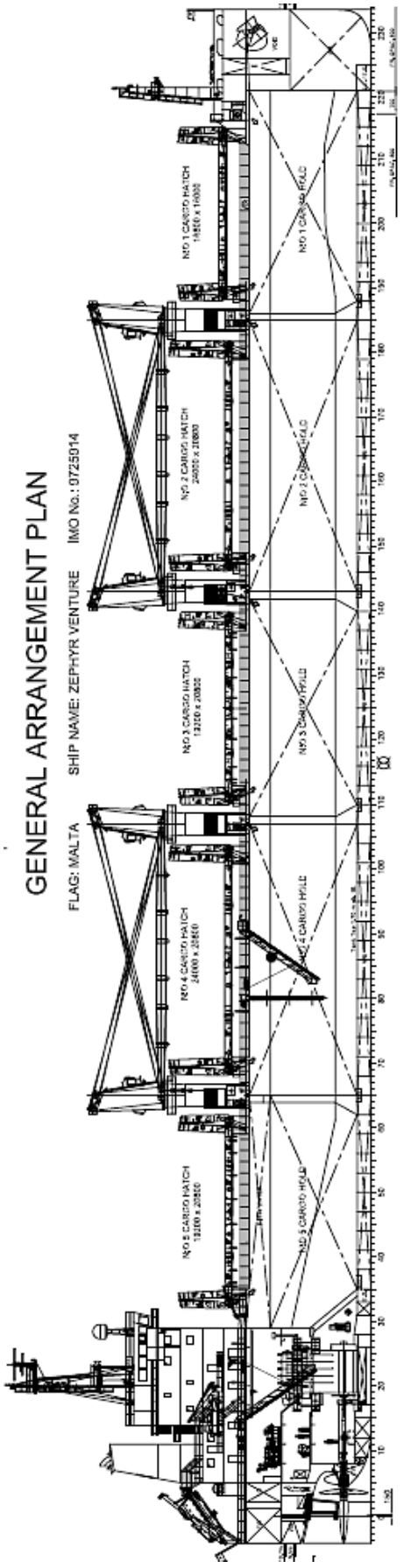

Figure 1: MV *Zephyr Venture*

[1] *Zephyr Venture*'s owners changed on 23 May 2025. The vessel is no longer under the Malta flag since November 2025.

Course of events

On 21 February 2025, whilst *Zephyr Venture* was *en route* from Rio Grande, Brazil, to Guayaquil, Ecuador, the engine-room crew members observed a leak in the port side sea chest strainer housing (**Figure 2**).

Figure 2: The leaking strainer housing

On further inspection, the crew members found that the leak was caused by corrosion in the strainer housing. Temporary repairs were carried out to arrest the leak after the necessary hot work permit and risk assessment were completed on 22 February 2025.

On 24 February 2025, the vessel arrived and anchored at Guayaquil outer anchorage, awaiting berthing instructions to unload its cargo. At anchor, the crew members proceeded with the maintenance works on the corroded areas of the strainer housing, following which, a coat of paint was applied to the internal area of the housing.

On the morning of 27 February, the second engineer was assigned several tasks, including the supervision of the application of a second coat of paint on the internal area of the port side sea chest strainer housing, and checks to the nitrogen pressure of the hydraulic accumulator[2] for the remote control valves' operating system.

[2] The hydraulic accumulator was in the engine-room workshop.

To manage his workload, the second engineer assigned the paint coating task to the two oilers and then proceeded to carry out other tasks. After completing several of the other tasks, the second engineer refilled the hydraulic accumulator with nitrogen, and put it back into operation. Meanwhile, the oilers had already applied a second coat of paint to the strainer housing and left it to dry.

Shortly after, at about 1422, a series of high-level alarms for the engine-room bilges activated. The crew members proceeded down to the bottom platform to investigate and to their disbelief and shock, they found water gushing out of the open port side sea chest strainer housing (**Figure 3**).

Figure 3: The open strainer housing (photograph taken after the sea chest valve was shut)

The second engineer soon joined on site and, realising that the sea chest valve[3] was open, rushed to the engine-room workshop, to

[3] The sea chests valves were hydraulic, double-acting, butterfly valves, which could also be operated manually, using the emergency hand pumps located in the engine-room workshop. Valve remote controls were in the water ballast control room (upper deck) and the bridge.

operate the emergency hand pump and close the valve.

Moments later, a black-out happened, which was soon followed with the automatic starting of the emergency diesel generator.

Meanwhile, one of the crew members had made his way to the water ballast control room. There, he observed that the remote valve control computer was indicating that all hydraulic valves, including those of the sea chests, were open. Attempts to remotely close the valve were unsuccessful as the computer did not respond. It was only after restarting the computer that the remote controls could be activated. However, the sea chest valve had been almost closed by the emergency hand pump, at about 1435.

By this time, the engine-room was flooded with about 400 metric tonnes of water[4].

The water level had reached a height of about 1.5 m above the bottom platform (**Figure 4**), *i.e.*, about mid-height of the main engine crankcase doors.

Following the initial assessment of the situation inside the engine-room, it was decided that the crew members should first pump out the clear, lower levels of the water, using a portable, air-driven diaphragm pump, followed by the emergency bilge eductor. They stopped pumping out the clear water on the morning of 28 February and then transferred the rest of the water to a water ballast tank. They also managed to restore normal electrical power to the vessel.

On 26 April, the vessel was towed to its designated berth, for cargo operations, following completion of which, it was towed to the inner anchorage for repairs and cleaning.

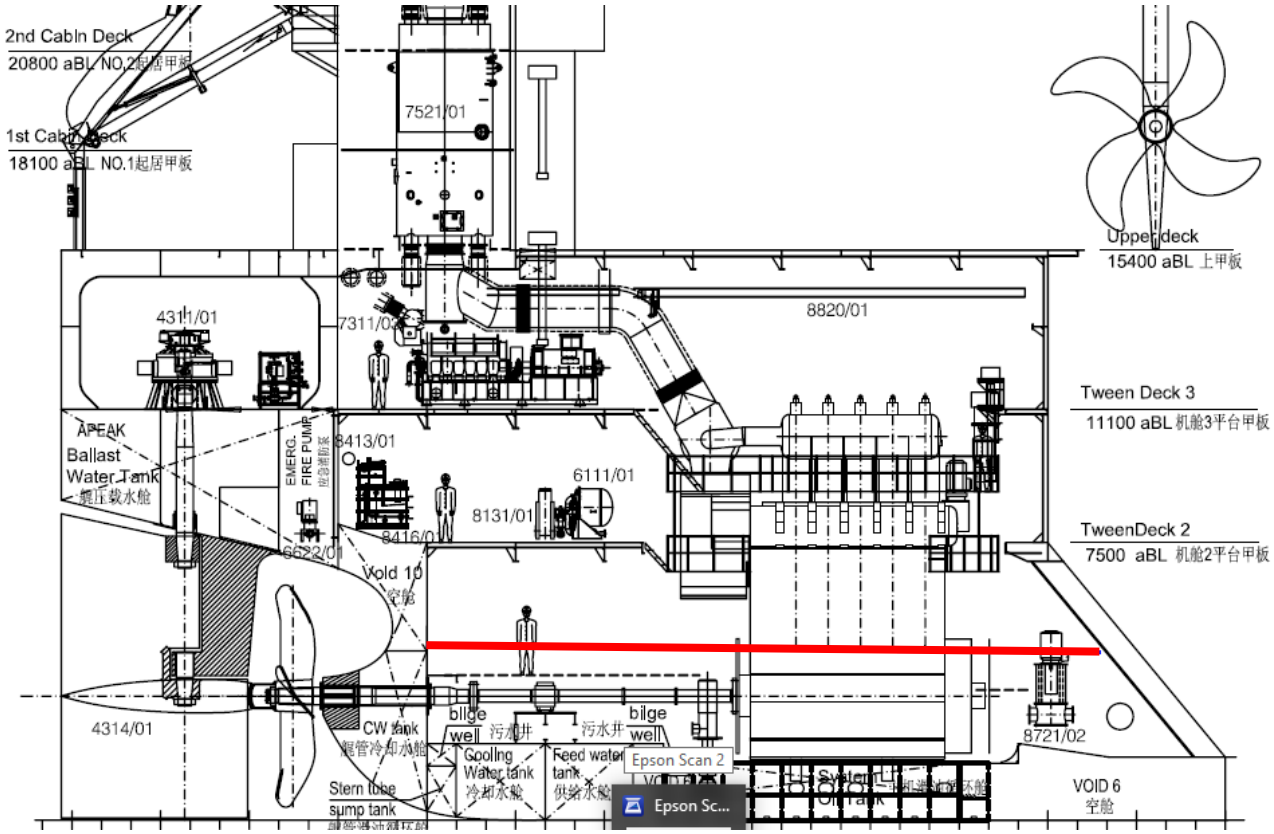

Figure 4: The approximate height to which the engine-room had flooded (red line)

[4] The flooding rate of water into the engine-room was therefore approximately 2,000 mt hr^{-1}.

Extent of water damage

A damage survey was carried out by a DNV surveyor at Guayaquil on 13 March 2025, while the vessel was at anchor. The flooding **(Figure 5**) had caused severe corrosion of various components of the main engine (**Figure 6**), rendering it out of service until permanent repairs were carried out by shore service technicians. Additionally, several motors, electrical cables, and the insulation on the bulkheads and pipes in the flooded areas were damaged, while cracks were observed on the lower tube plates of the auxiliary boiler.

The extensive and necessary repair and cleaning jobs in the engine-room were eventually completed by shore service technicians on 27 May 2025, following which, sea trials were carried out to confirm the satisfactory operation of the vessel.

Environment

At the time of the accident, calm seas were recorded. A Westerly gentle breeze was blowing. No swell was recorded. Visibility was good and the air and sea temperatures were 31 °C and 28 °C respectively.

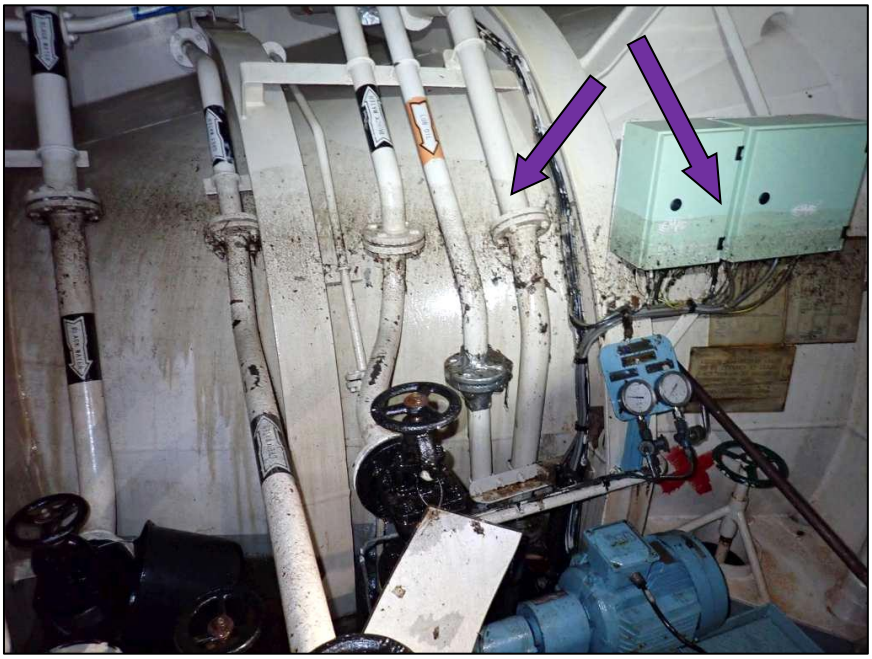

Figure 5: High water marks in the engine-room following completion of the pumping operation

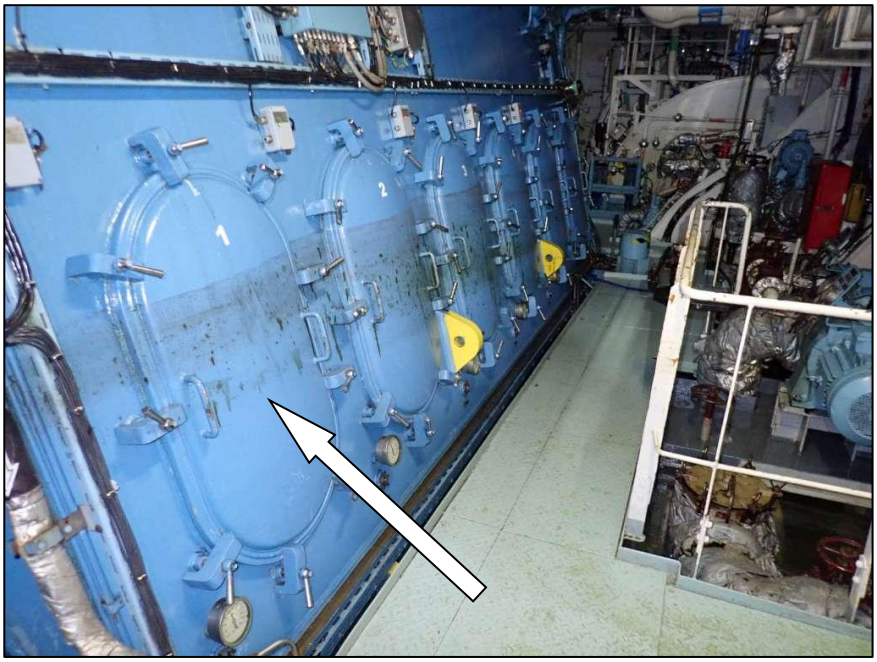

Figure 6: High water marks reaching the main engine crankcase doors

ANALYSIS

Aim

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, and to prevent further marine casualties or incidents from occurring in the future.

Immediate cause of the flooding

The safety investigation confirmed that the immediate cause of the flooding was the opening of the port side sea chest valve (**Figure 7**), whilst the strainer housing was also open.

Figure 7: Port side sea chest, showing the cover secured in place

Hydraulic control system behaviour leading to engine-room flooding

Review of the hydraulic schematic for the remotely operated sea-chest valves (**Figure 8**) showed that solenoid-operated valve (**X**) was designed to activate automatically whenever hydraulic-oil pressure was detected. Solenoid-operated valve (**X**) had no manual-control capability and therefore, it relied entirely on system pressure for its operation.

The position of the solenoid-operated valve (**X**) in **Figure 8** corresponded to its normal state when the hydraulic pumps were shut down. Unless it had been intentionally isolated, solenoid-operated valve (**X**) would transition to the open position as soon as a pump was started, enabling remote control of the sea-chest valves. When the pumps were stopped, solenoid-operated valve (**X**) automatically returned to the closed position, interrupting the hydraulic enabling signal and preventing any further remote operation.

For the sea-chest valves to open, activation of solenoid-operated valve (**X**) was therefore a necessary precondition; without hydraulic flow and the consequent opening of solenoid-operated valve (**X**), the valves could not be driven from their closed position.

The directional control valve (**Y**) incorporated a mechanical latch that allowed it to retain its last selected position even after system depressurisation. The position of the directional control valve (**Y**) shown in **Figure 8** represented its normal state with the sea-chest valves shut. This latch provided operational stability.

When the strainer housing was opened for maintenance, the port-side sea-chest valve was known to be shut. Thus, for the valve to open and flooding to occur, both the activation of solenoid-operated valve (**X**) and a change of state in the directional control valve (**Y**) would have been required.

While the safety investigation considered the possibility of an intermittent electrical or hydraulic fault causing the directional control valve (**Y**) to operate, it also could not exclude inadvertent operation of the directional control valve (**Y**) during or following the accumulator maintenance.

If directional control valve (**Y**) had been unintentionally operated while solenoid-operated valve (**X**) was active, the resulting opening of the sea-chest valves would have allowed seawater to enter the engine-room

through the open port-side strainer housing, leading to the observed flooding.

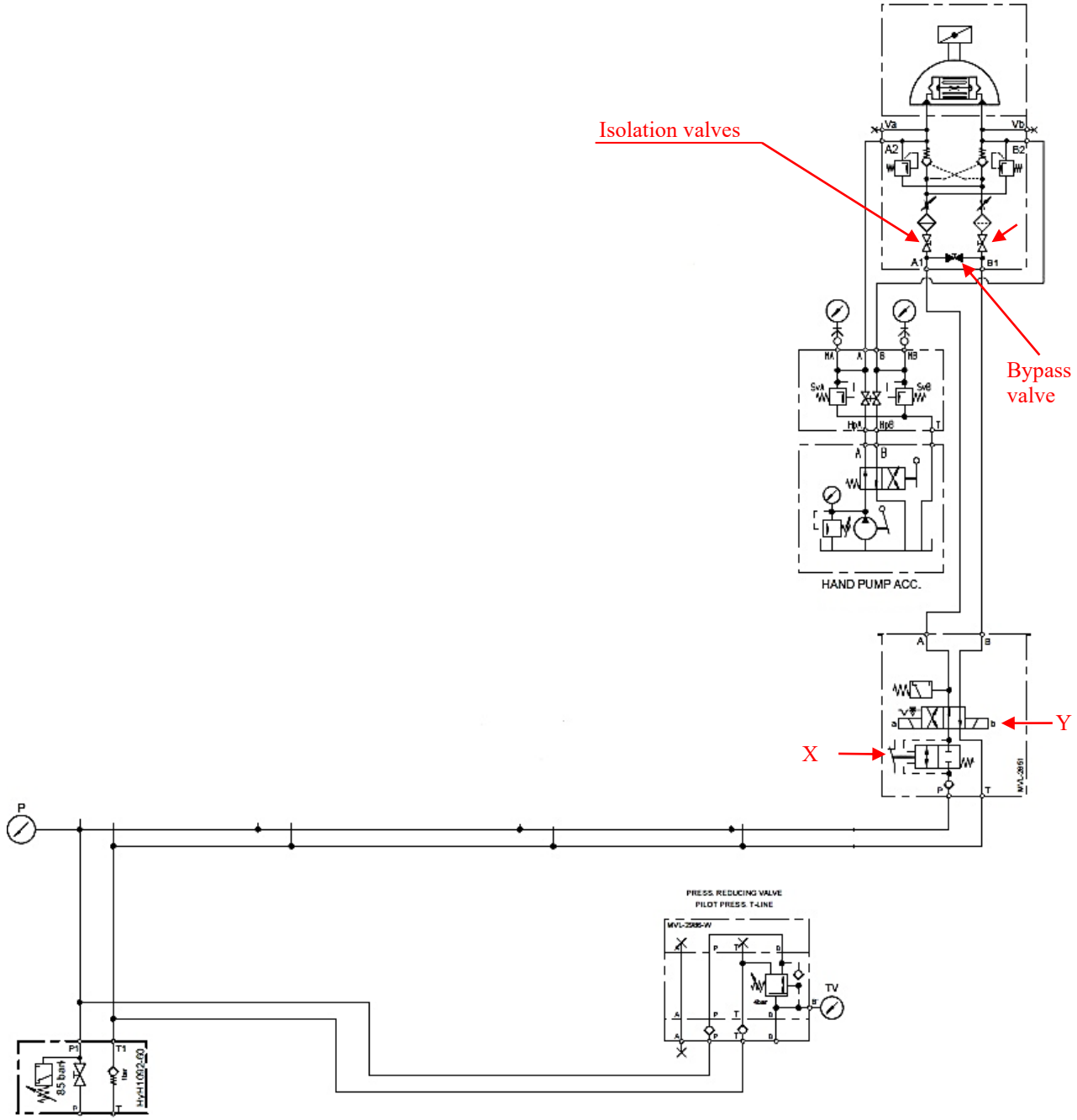

Figure 8: Diagram of the hydraulic, remote-controlled valves for the port and starboard side sea chests

A preventive barrier system

Opening the bypass valve and closing the isolation valves (**Figure 8**) would have enabled the operation of both the solenoid-operated valve (**X**) and directional control valve (**Y**) without altering the actual physical position of the sea-chest valve, regardless of whether the valve was open or closed. In this configuration, the bypass and isolation valves effectively served as a functional preventive barrier system, ensuring that hydraulic control signals could be managed without creating an unintended valve movement.

However, this procedure had neither been addressed in the risk assessment, nor were the bypass and isolation valves operated prior to the maintenance tasks. Therefore, the bypass valve remained closed and the isolation valves open. It was highly likely that the crew members did not recognise the need to operate the valves when preparing to open the port-side sea-chest strainer housing, or were unaware of the purpose and significance, particularly given the relatively short period they had been on board prior to this flooding incident.

From a human factors' perspective, this aligns with well-documented patterns of erroneous action, *i.e.*, crew members acted in accordance with their local rationality, based on the information available to them, their recent experience, and the cues they perceived at the time. Rather than deliberate mistakes, such actions may occur when crew members, *inter alia*, have incomplete system understanding, or unclear feedback about the consequences of specific control positions.

In this context, the safety investigation believed that the omission to open the bypass valve (and the isolation valves remaining open) were consistent with a plausible misunderstanding of system behaviour, rather than intentional deviation from procedure.

Human performance and system resilience in engine-room operations

Although the immediate cause of the flooding was the inadvertent opening of the port sea-chest valve while its strainer housing was also open, the occurrence also provided insight into how engine-room operations normally succeed under demanding conditions. Ships' engineers routinely balance maintenance, supervision, and system monitoring within a complex and dynamic environment. Their ability to improvise, exchange information, and make timely judgements generally ensures the reliable continuation of operations at sea.

In this case, the same adaptive qualities that often contribute to smooth performance (*i.e.*, initiative, multi-tasking, and reliance on experience) also created circumstances in which a single control interaction had wider, unforeseen consequences. The sequence of hydraulic adjustments and maintenance actions required continuous mental coordination of multiple system states, without immediate feedback from the valve control interface. The event therefore reflected the narrow boundary between successful adjustment and inadvertent disruption in tightly coupled technical systems.

Moreover, the crew's subsequent actions illustrated effective problem-solving under pressure. The prompt identification of the flooding source, manual closure of the sea-chest valve, and systematic management of bilge pumping and electrical recovery contained the situation and prevented injury or further damage. These actions highlighted the vessel's inherent capacity to recover from abnormal conditions, a quality often overlooked when attention centres solely on initiating causes.

Viewed from a cognitive standpoint, the occurrence underscored the importance of how individual crew members constructed and maintained an understanding of system status. Research on situation awareness and

human performance shows that people at the sharp end continually adjust their actions within the boundaries of acceptable practice, to maintain both efficiency and safety. All these adjustments would depend on cues, feedback, and shared communication, which help crew members align their perception of system conditions with the actual state of the plant.

When these cues are either delayed or ambiguous (as may occur during maintenance on automated control systems), minor differences / gaps between expected and actual conditions can develop and give rise to unintended outcomes. It was clear for the safety investigation that the evolving events on board *Zephyr Venture* reflected both the vulnerabilities and the strengths of human performance in real operational contexts.

At the same time, the occurrence highlighted the system's inherent ability to extend and adapt under strain. Despite initial surprise, shock, and the subsequent consequences, the crew members maintained control through flexible coordination and local problem-solving. Such adaptive capacity allows complex systems to absorb disturbances and recover essential functions before irreversible loss of control occurs.

The occurrence clearly illustrated how safety in complex operations is a dynamic non-event, emerging from the interaction of human judgement, procedural structure, and system design, rather than from any single factor alone.

CONCLUSIONS

1. The immediate cause of the flooding was the opening of the port side sea-chest valve while its strainer housing was open.
2. The directional control valve (**Y**) had a mechanical latch to ensure that the valve retained its last operational state (closed in this case). The safety investigation considered the possibility of an intermittent electrical or hydraulic fault causing the directional control valve (**Y**) to operate, but it also could not exclude inadvertent operation of directional control valve (**Y**) during or following the accumulator maintenance.
3. The hydraulic control system allowed the directional control valve (**Y**) to open only when the solenoid-operated valve (**X**) changed state; conditions that could occur unintentionally during maintenance.
4. The closed bypass valve and open isolation valves resulted in a missing key preventive functional barrier system, potentially due to the crew members misunderstanding their purpose.
5. The opening of the bypass valves and the closing of the isolation valves were not addressed in the risk assessment.
6. Despite the initiating erroneous actions, the crew members' rapid diagnosis, manual intervention, and coordinated response demonstrated strong system resilience and effective human performance under pressure.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION[5]

Following the occurrence, the Company conducted an internal investigation in terms of Section 9 of the ISM Code and circulated a summary of its findings across its fleet of vessels.

The Company further enforced its 'Lock out – Tag Out' procedures and reminded crew members serving on board Company vessels to adhere to the Company's procedures on job planning, risk assessments and permits to work.

SAFETY LESSONS

This occurrence highlighted the importance of ensuring that maintenance activities are supported by clear system awareness, effective communication, and appropriate isolation measures. It demonstrated how simultaneous tasks and competing demands can create conditions in which system stata are misunderstood or overlooked.

The event reinforced the need for robust job planning, and familiarisation with relevant equipment. It also illustrated the value of well-coordinated crew members' actions, which contributed significantly to controlling and mitigating the situation, once the progressive flooding was discovered.

[5] **Safety actions and recommendations shall not create a presumption of blame and / or liability.**

SHIP PARTICULARS

Vessel Name:	MV *Zephyr Venture*
Flag:	Malta
Classification Society:	Det Norske Veritas (DNV)
IMO Number:	9725914
Type:	Bulk Carrier
Registered Owner:	Diderot Financement 23 SNC*
Managers:	Intership Navigation Co. Ltd.
Construction:	Steel – Double bottom
Length Overall:	189.99 m
Registered Length:	186.62 m
Gross Tonnage:	26,411
Minimum Safe Manning:	14
Authorised Cargo:	Dry cargo in bulk

VOYAGE PARTICULARS

Port of Departure:	Rio Grande, Brazil
Port of Arrival:	Guayaquil, Ecuador
Type of Voyage:	International
Cargo Information:	33,000 mt of wheat, in bulk
Manning:	19

MARINE OCCURRENCE INFORMATION

Date and Time:	27 February 2025, at 1420 LT
Classification of Occurrence:	Serious Marine Casualty
Location of Occurrence:	Guayaquil outer anchorage
Place on Board	Engine-room
Injuries / Fatalities:	None
Damage / Environmental Impact:	Severe damages to the main engine, and several other engine-room machinery and equipment
Ship Operation:	At anchor; maintenance
Voyage Segment:	Anchored
External & Internal Environment:	Daylight; clear sky with good visibility. Westerly gentle breeze; calm sea with no swell. Air and sea temperatures: 31 °C and 28 °C, respectively.
Persons on board:	19

* Until 23 May 2025. The vessel is no longer registered in Malta since November 2025.