ACCIDENT REPORT

Report on the investigation

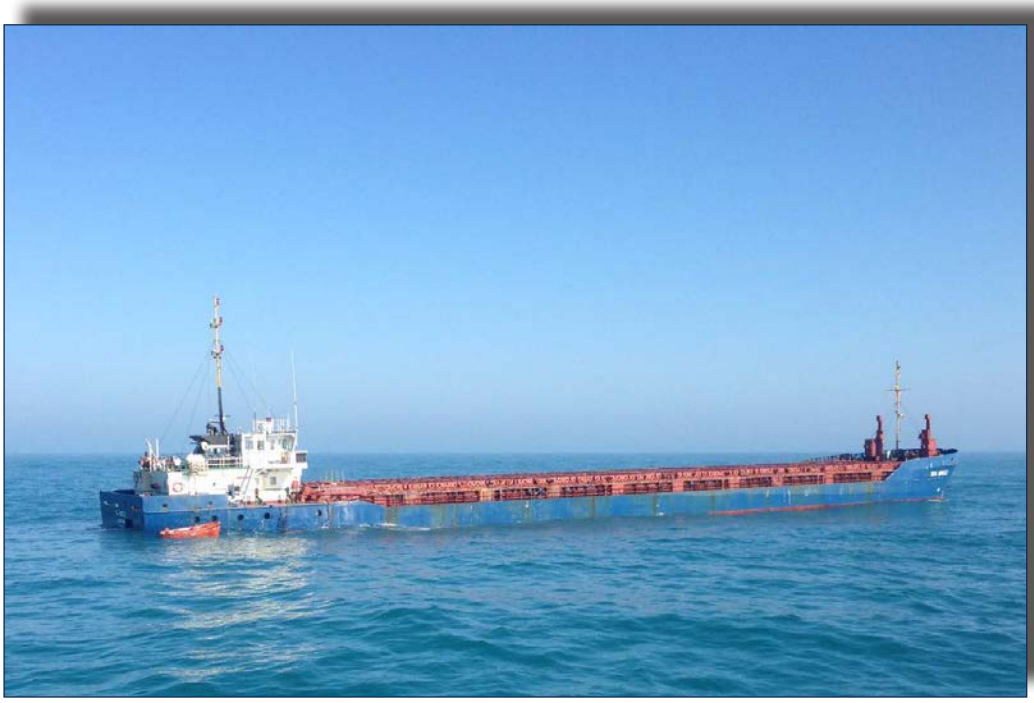
into the flooding and abandonment

of the general cargo ship

Sea Breeze

11.6nm off Lizard Point, Cornwall

9 March 2014



MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 14/2015 JUNE 2015

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AB	-	Able seaman
ARPA	-	Automatic Radar Plotting Aid
BMSR	-	Barbados Maritime Ship Registry
BSM	-	British Steamship Management P&I Association (Bermuda) Ltd
CoC	-	Certificate of Competency
DOC	-	Document of compliance
DPA	-	Designated Person Ashore
DSC	-	Digital Selective Calling
GL	-	Germanischer Lloyd
HMS	-	Her Majesty's Ship
ISM Code	-	International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code)
ISPS Code	-	International Ship and Port Facility Security Code
KML	-	Keynvor Morlift Ltd
l/m	-	litres per minute
LR	-	Lloyd's Register
m	-	metre
MCA	-	Maritime and Coastguard Agency
MLC	-	Maritime Labour Convention
MoU	-	Memorandum of Understanding
MRCC	-	Maritime Rescue Co-ordination Centre
OOW	-	Officer of the Watch
P&I	-	Protection & Indemnity
PSCI	-	Port State Control Inspection
RN	-	Royal Navy

RNLI	-	Royal National Lifeboat Institution
RS	-	Russian Maritime Register of Shipping
SAR	-	Search and Rescue
SMC	-	Safety Management Certificate
SMM	-	Safety Management Manual
SMS	-	Safety Management System
SOLAS	-	International Convention for the Safety of Life at Sea 1974, as amended
SOSREP	-	Secretary of State's Representative for Maritime Salvage and Intervention
t	-	tonne
UTC	-	Universal Co-ordinated Time
VHF	-	Very high frequency

TIMES: all times used in this report are UTC unless otherwise stated

SYNOPSIS

At 0654 on 9 March 2014, the master of *Sea Breeze*, a Barbados registered general cargo vessel, contacted the Maritime Rescue Co-ordination Centre at Falmouth to report that the vessel's engine room was flooding. The vessel was on passage from Raynes Jetty, Llanddulas, Wales to Shoreham, West Sussex, with a cargo of limestone. A ballast pump in the vessel's engine room was being maintained, when water began to enter the space. The crew were unable to stem the flow and the engine room was evacuated.

The Maritime Rescue Co-ordination Centre Falmouth issued a "Mayday" Relay on behalf of *Sea Breeze* and lifeboats from Lizard and Falmouth were tasked along with a helicopter from the Royal Naval Air Station Culdrose. Several vessels responded to the call and *HMS Tyne* proceeded to the scene to provide assistance.

Salvage pumps were put on board from both of the lifeboats and the helicopter, but the water level in *Sea Breeze*'s engine room could not be controlled. Following reports of water ingress into the cargo hold all six crew abandoned *Sea Breeze* onto the Falmouth lifeboat.

Sea Breeze's owners contracted salvors, who were able to stabilise the flooding and bring the vessel under tow.

The MAIB investigation established that the valve actuator gearbox on a sea water isolating valve in the ballast system was defective such that someone operating the valve might believe the valve was shut when it was not. The valve position indicator was working but it had not been checked prior to work being started on the ballast pump. When the pump was removed the engine room flooded through the 15cm diameter ballast main.

The Barbados Maritime Ship Registry has taken action to improve its ability to track and monitor the survey and inspection status of its registered vessels.

A recommendation has been made to the managers of *Sea Breeze*, Shipmar Co Ltd, which is designed to improve the application of its safety management system across the company and its fleet.

Recommendations have also been made to Lloyds Register to: improve its guidance to surveyors on the conduct of ships side valve surveys; and to propose to the International Association of Classification Societies that its requirements should be amended to include a function test of the actuator mechanism of ship's side valves during special surveys.

Image courtesy of Claus Schäfe

Sea Breeze

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *SEA BREEZE* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Sea Breeze*
Flag	Barbados
Classification society	Lloyd's Register
Classification Society (ISM + ISPS)	Russian Register
IMO number/fishing numbers	8906250
Type	General cargo ship
Registered owner	Camrose Shipping Limited
Manager(s)	Shipmar Co. Limited
Construction	Steel
Year of build	1989
Length overall	87.7m
Registered length	84.92m
Gross tonnage	1959
Minimum safe manning	6
Authorised cargo	None
VOYAGE PARTICULARS	
Port of departure	Raynes Jetty, Llanddulas, North Wales
Port of arrival	Shoreham
Type of voyage	Coastal
Cargo information	2750 tonnes of limestone
Manning	6
MARINE CASUALTY INFORMATION	
Date and time	9 March 2014 0654
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	11.6 nm ESE of Lizard Point
Place on board	Engine room
Injuries/fatalities	None
Damage/environmental impact	Constructive total loss/no pollution
Ship operation	On passage
Voyage segment	Mid-water
External & internal environment	Light airs, good weather, good visibility
Persons on board	6

1.2 NARRATIVE

Sea Breeze departed Raynes Jetty, Llanddulas, Wales at 0620 on 7 March 2014 with a cargo of 2750 tonnes of graded, crushed limestone. The vessel initially went to anchor to allow the crew of six to rest after cargo operations had been completed, and left the anchorage at 1330 bound for Shoreham, West Sussex.

At 0400 UTC (0600 ship's time[1]) on 9 March 2014 the master took over the bridge watch from the chief officer. The master and the chief officer maintained a 6 on 6 off watchkeeping routine at sea. The ship's heading was controlled by the autopilot and the weather was good with slight seas and a long low swell. Following the watch handover the chief officer went to his cabin to rest.

At approximately 0630 the chief engineer, motorman and the able seaman (AB) went to the engine room to change the mechanical seal on the port main ballast pump, which was situated forward of the main engine below the engine room bottom plates. The mechanical seals of both of the vessel's main ballast pumps had been leaking and the same three crew members had changed the mechanical seal on the starboard ballast pump 1 week earlier. There was no written procedure for this task and no risk assessment or permit to work had been completed prior to the job being started.

Having isolated the electrical breaker for the ballast pump, the chief engineer went to isolate the pump from the ballast system and the sea water inlet. This involved closing the bilge and ballast manifold suction valves, the ballast pump's discharge valve and the single isolating butterfly valve between the port sea chest and the port ballast pump, valve A104 port **(Figure 1)**. Assisted by the AB the motorman then removed the horizontally mounted electric motor from the ballast pump. He then slackened and removed the pump's suction and discharge flange bolts to enable the pump to be lifted onto the bottom plates so as to facilitate access to the mechanical seal.

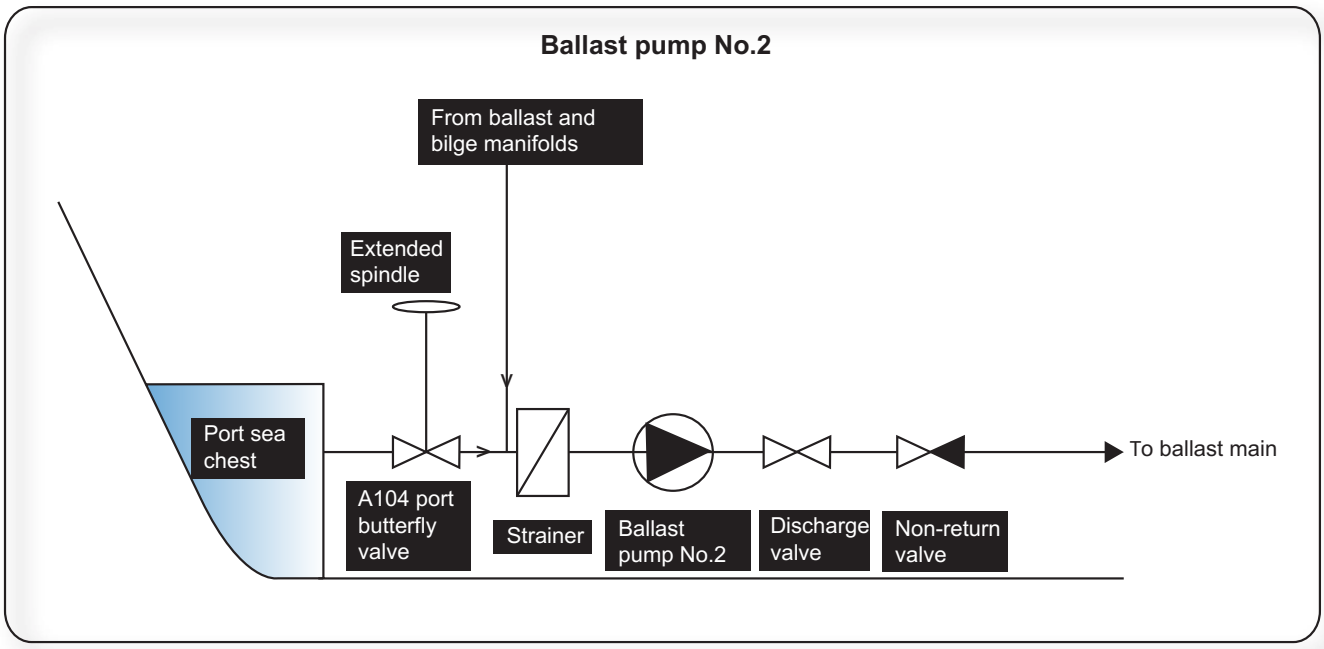

Figure 1: Port ballast system schematic

[1] *Sea Breeze* kept Ukrainian time on board, UTC+2

A little water was seen to flow out of the 15cm diameter pipework as the flange bolts were removed, but when the pump was lifted clear of the pipework this became a full bore torrent of water from the pump's suction pipe. Initially the three crew tried to stem this flow of water using rags and wooden chocks, but this action had little effect. None of the crew inspected the position indicator on valve A104 port **(Figure 2)** or made any attempt to confirm that this or any of the other valves were fully closed.

Figure 2: Valve A104 port position indicator

The engine room began to flood quickly. The chief engineer sent the motorman to inform the captain and instructed the AB to collect an electric submersible pump from the forward store, while he went to start the bilge pump. However, before he could configure the bilge system, he was distracted by the rising bilge water coming into contact with the running, port generator's flywheel. Concerned by the prospect of the sea water coming into contact with the alternator's windings, he left the bilge pump to stop the generator.

When the chief engineer stopped the running generator, the emergency generator started automatically and provided electrical power for limited electrical services.

The water level in the engine room continued to rise rapidly, and once it was over the engine room floor plates the chief engineer stopped the main engine locally in an attempt to minimise damage to the engine. He did not have time to enter the control room and so was unable to advise the master of his intention to stop the main engine.

The master went from the bridge to the engine room entrance to assess the rate of flooding and, realising the gravity of the situation, he returned to the bridge and sounded the general alarm. On hearing the alarm the remaining two crew, the chief officer - who had been sleeping, and the AB/cook, who had been in the galley, mustered on the bridge.

Following the master's assessment of the engine room and believing the flooding to be beyond control, the chief engineer then evacuated the engine room.

The AB returned from the forward store with the submersible pump and rigged it from the main deck to pump out the engine room via the forward engine room emergency escape hatch. However, electrical power was being provided by the emergency generator, which did not supply the socket to which he had connected the pump, so he was not able to operate the pump.

At 0654 the master made a Very High Frequency (VHF) radio call to the Maritime Rescue Co-ordination Centre (MRCC) at Falmouth, stating that *Sea Breeze*'s engine room was flooding and that the vessel was in danger of sinking. The master then ordered all six crew to don their lifejackets and prepare the vessel's rescue boat for evacuation.

No consideration was given to the vessel's stability with a flooded engine room, nor were soundings of tanks or additional checks made to identify further areas of flooding. The master collected the vessel's logbooks and damage control plans and the six crew mustered on deck and launched *Sea Breeze*'s rescue boat from its position on the vessel's starboard aft side.

MRCC Falmouth advised the master by VHF that two Royal National Lifeboat Institution (RNLI) lifeboats were proceeding to the scene, and he decided to await their arrival before abandoning the vessel. Neither of *Sea Breeze*'s two liferafts were deployed.

1.3 THE RESCUE

MRCC Falmouth broadcast a "Mayday" relay on behalf of *Sea Breeze* at 0702 and tasked the RNLI all-weather lifeboats from Lizard and Falmouth and Royal Navy helicopter R193, based at Royal Naval Air Squadron Culdrose to assist. Several merchant vessels responded to the call and *HMS Tyne*, a Royal Navy vessel in the vicinity, offered assistance and proceeded to the scene.

The Lizard RNLI lifeboat was the first to arrive on scene at 0740, and its coxswain assessed the situation. Helicopter R193 arrived on scene soon after, followed by the Falmouth RNLI lifeboat. Two RNLI crew transferred onto *Sea Breeze* from each lifeboat and began rigging salvage pumps they had brought with them. R193 landed its winchman on board and a further salvage pump was lowered from the helicopter. By 0809 three salvage pumps had been rigged on board *Sea Breeze* to pump from the engine room forward emergency escape hatch.

HMS Tyne arrived on scene at 0820 and was tasked by MRCC Falmouth to take the role of on scene commander.

The three salvage pumps proved ineffective and the engine room water level continued to rise, with the vessel settling by the stern. At 0829 the RNLI crew reported to MRCC Falmouth that the water was a few centimetres from the engine room deckhead.

At 0831 the RNLI crew on board *Sea Breeze* reported to MRCC Falmouth that they suspected water was entering the cargo hold. Concerned that the bulkhead separating the engine room and cargo hold might have failed, MRCC Falmouth instructed the RNLI crew on board *Sea Breeze* to abandon the vessel. This message was relayed to *Sea Breeze*'s crew and R193 recovered its winchman back on board the helicopter. The Falmouth RNLI lifeboat came alongside *Sea Breeze* and evacuated the six crew and the four RNLI volunteers. The three salvage pumps were also removed.

R193 then transferred *Sea Breeze*'s master to *HMS Tyne* to assist with the salvage operation. The remaining five crew were taken ashore to Falmouth and passed into the care of the Seaman's Mission.

1.4 THE SALVAGE

At 1134, following instruction from the Maritime and Coastguard Agency (MCA) Duty Counter Pollution and Salvage Officer, the tug *Vortex* arrived on scene to stand by *Sea Breeze*.

Marine contractor Keynvor Morlift Ltd (KML) was awarded the contract to tow *Sea Breeze* by the vessel's owners, Camrose Shipping Ltd (Camrose). The KML tug *Tennaherdhya* was in Falmouth and, once this agreement had been reached, salvage personnel were embarked and the tug left port. *Tennaherdhya* arrived on scene at 1524 **(Figure 3)** and the salvage crew boarded *Sea Breeze* to assess the vessel's condition while KML arranged for more assets, including a dive team and dive support vessel, to be deployed.

Figure 3: *Sea breeze*, condition as salvors arrived

At 1545 a line was made fast between the tug *Tennaherdhya* and *Sea Breeze* in order to pull *Sea Breeze* head to wind and so reduce rolling. The tug *Vortex* was then released by the MCA and returned to Falmouth. The salvors carried out an initial assessment of *Sea Breeze*. The emergency generator was not running when they boarded and they discovered that in addition to the engine room now being fully flooded, the lower deck of the vessel's accommodation was partially submerged **(Figure 4)**.

At 1750 *HMS Tyne* was released from the role of on scene commander and *Sea Breeze*'s master was transferred from *HMS Tyne* to the tug *Tennaherdhya*.

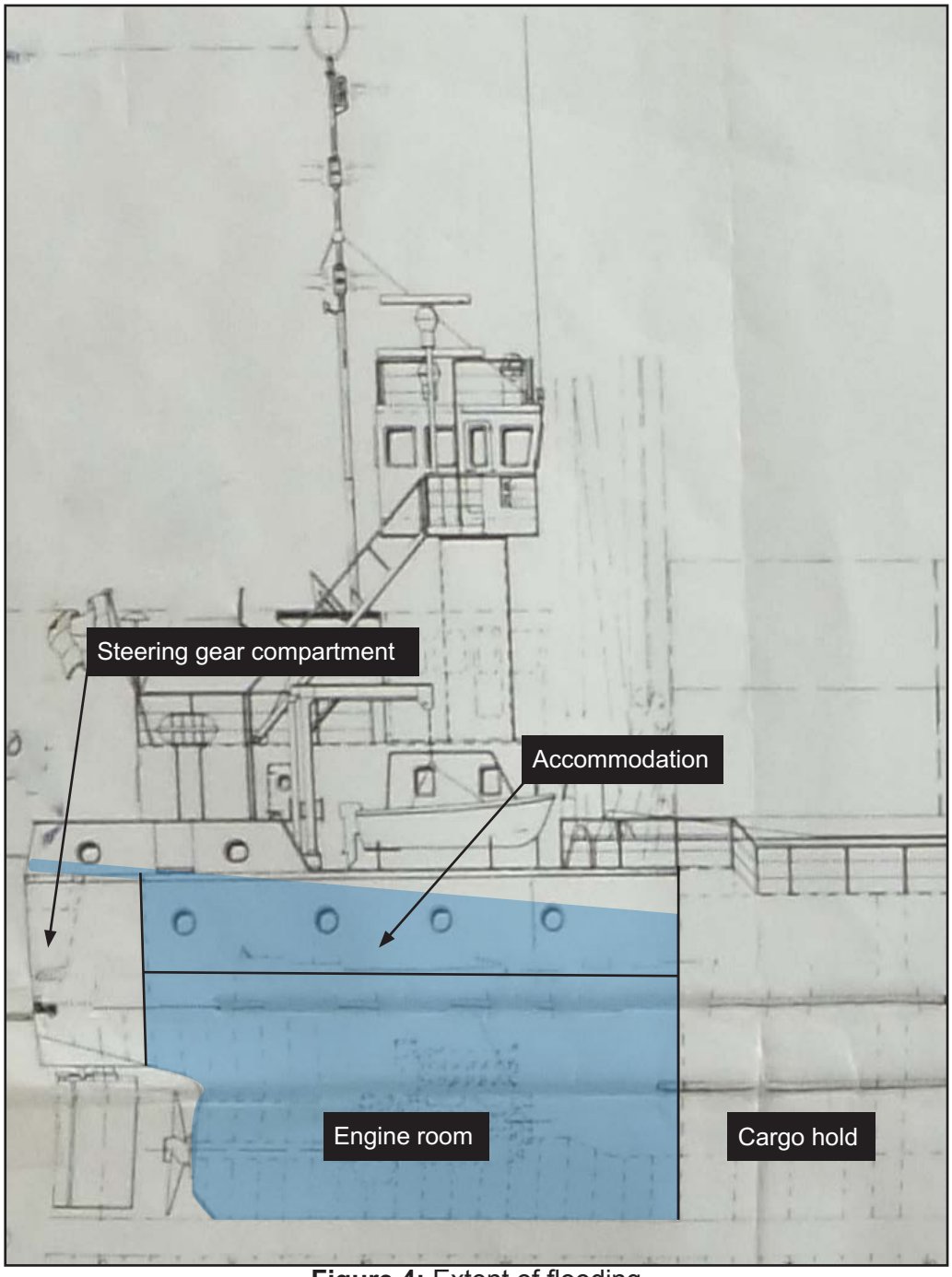

Figure 4: Extent of flooding

The KML salvage crew on board *Sea Breeze* rigged four portable, electrically-driven pumps, each with a maximum pumping rate of 200 litres per minute (l/m) and a larger, diesel-driven pump capable of a maximum of 500l/m to take suction from the engine room forward emergency escape hatch. Pumping from the engine room began at 1919.

Pumping continued throughout the evening as *Tennaherdhya* slowly towed *Sea Breeze* towards St Austell Bay in search of more sheltered waters. Once in sheltered waters, the intention was for divers to assess the underwater hull with a view to stemming the water ingress from the outside.

Despite the pumping, the water level in *Sea Breeze*'s engine room failed to drop until a further salvage pump with a maximum capacity of 5400l/m was rigged just after midnight.

At 0700 on 10 March the water level in the engine room was chest height and, with the salvage pumps still operating, the salvors entered the engine room via the forward emergency escape hatch to identify the source of the water ingress. They made their way to the ballast main at the forward end of the engine room and, working from starboard to port across the ballast main, they checked all the valves to ensure they were closed. At the port end of the ballast main the salvors located an extended spindle valve **(Figure 5)**, subsequently identified as valve A104 port. The valve wheel was initially stiff to turn but, with a little effort, it freed up and was turned until it felt fully closed. The salvors immediately noted that the water level in the engine room began to drop more rapidly.

The salvors found the main engine room access watertight door open, and they relocated the smaller electric salvage pumps to pump water from the accommodation spaces.

Diving operations commenced soon after 0700. The port side sea chest was filled with expanding foam but attempts to apply an external patch to the strainer inlet were unsuccessful.

Sea Breeze was anchored in St Austell bay at 2100 on 10 March. While at anchor, divers used a canvas fothering patch to cover the port side sea suction inlet, and the remaining water in the engine room was pumped into the port side aft wing ballast tank to minimise pollution.

A representative from the Barbados Maritime Ship Registry (BMSR) attended *Sea Breeze* on 12 March while the vessel was at anchor, to inspect the vessel. KML commissioned a surveyor from R Pearce & Co to carry out a condition survey of the vessel on 13 March and the SOSREP also arranged for an MCA Marine Casualty Officer to attend and survey the vessel on 19 March. Both these surveys raised concerns about the structural integrity of *Sea Breeze*.

SOSREP directed that the port of Fowey should accept *Sea Breeze*, and *Tennaherdhya* towed the vessel to the port where, with the assistance of harbour tugs, it was berthed on the evening of 19 March. The master, who had remained with the vessel throughout, was then repatriated along with the five other crew, who had remained ashore since the day of the accident.

On 21 March, while alongside in Fowey, BMSR removed *Sea Breeze* from its register.

Over the following days, contractors removed approximately 770 tonnes of contaminated water from *Sea Breeze*'s engine room and ballast tanks. The vessel was then assessed to be in a stable condition, with both cargo and bunkers

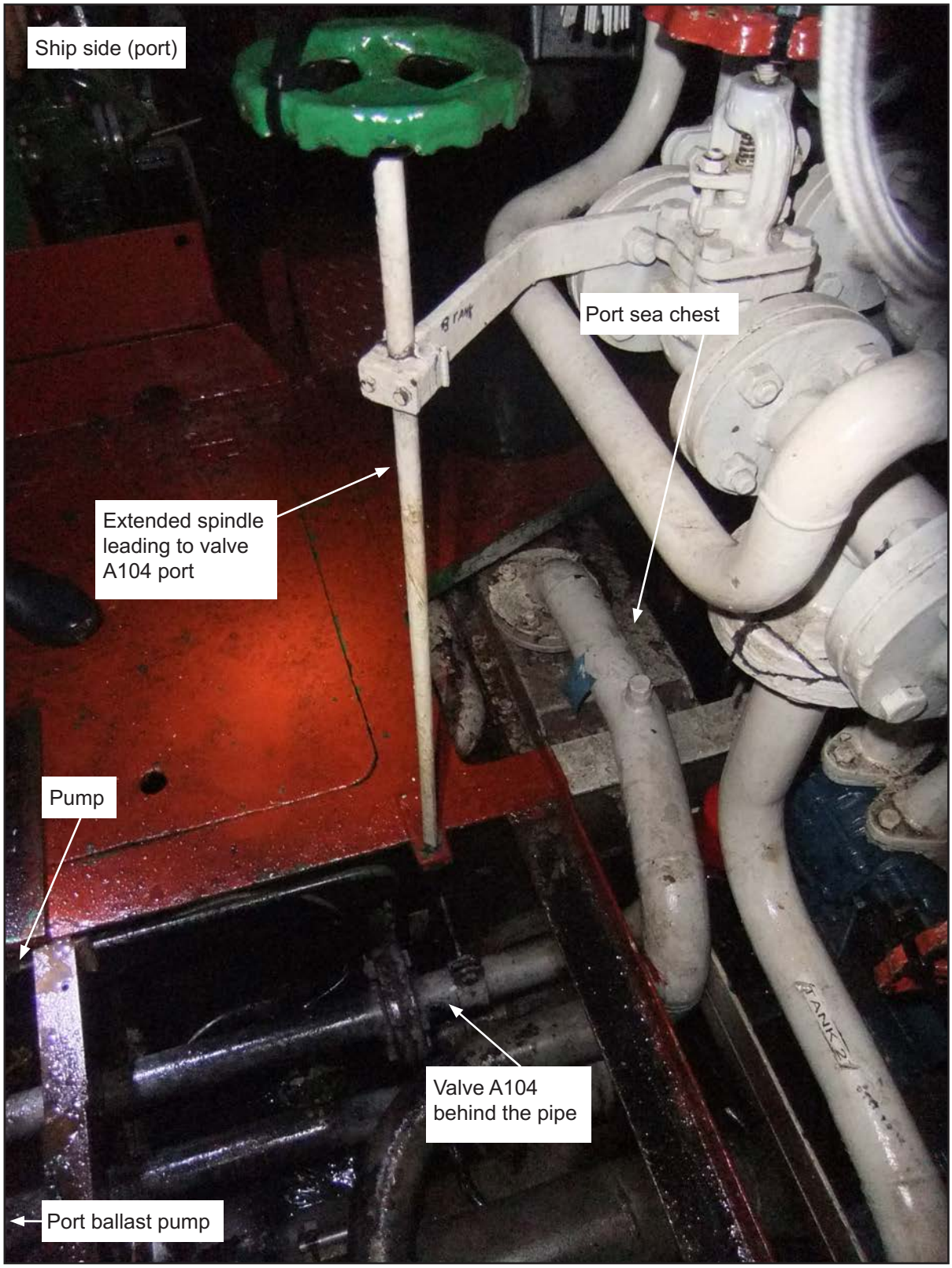

Figure 5: Valve A104 port in situ

remaining on board. The vessel's owners and managers ceased contact with the MCA and KML, who had not been paid for their salvage works. On 24 April, the MCA arranged for *Sea Breeze* to be towed to admiralty moorings on the River Fal at Truro.

On 30 January 2015, following no further contact from the owners, the MCA obtained permission from the courts for *Sea Breeze* to be sold.

1.5 BALLAST PUMP MAINTENANCE

At the time of the accident, maintenance work was being carried out on the port side ballast pump. *Sea Breeze* had two identical, electrically-driven ballast pumps, one on each side of the engine room, each with a maximum pumping capacity of 150m^3/hour. The starboard ballast pump **(Figure 6)** was also designated as an emergency bilge pump and general service pump. *Sea Breeze* had 15 dedicated ballast tanks, with a combined capacity of 1504t.

When the chief engineer joined the vessel 9 days before the accident, the mechanical seals for both ballast pumps had been leaking and, as a result, pumping rates were poor. It was taking between 10 and 24 hours to pump out the vessel's ballast tanks when 5 hours should have been sufficient. The chief engineer had prioritised repairing the pumps and had requested and received replacement mechanical seals from Shipmar.

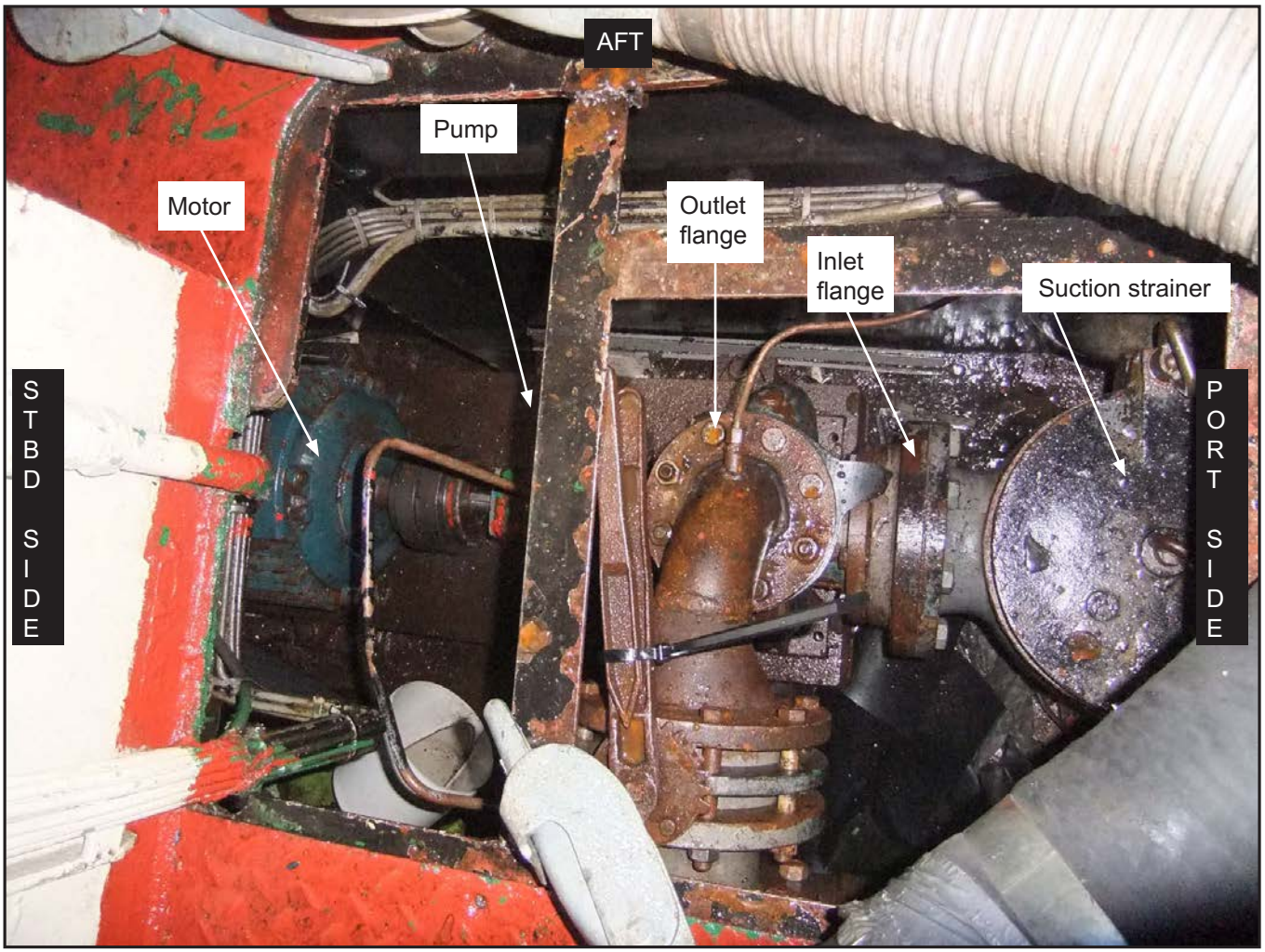

Figure 6: Starboard ballast pump viewed from above

On 3 and 4 March, while *Sea Breeze* was on passage from Moerdijk to Liverpool, the chief engineer, motorman and AB had replaced the mechanical seal on the starboard ballast pump. Both pump's shafts were known to be worn in way of their mechanical seals but the replacement of the seal on the starboard pump had successfully stopped the leakage.

Sea Breeze had been designed and built under the requirements of SOLAS and Germanischer Lloyd (GL) rules, with single valve isolation between the sea chest and the ballast pumps.

Between the isolation valves and each of the ballast pumps was a strainer, on top of which was a bleed nut. These nuts not only facilitated bleeding air out of the strainer following maintenance but also enabled water pressure at the strainer to be released prior to maintenance on the system. There was no evidence that the bleed nut on the port strainer had been opened prior to work being started on the port ballast pump flanges.

1.6 RATE OF FLOODING

Flooding into *Sea Breeze*'s engine room occurred through a 15cm diameter pipe. Once the flange between the ballast pump and the sea water inlet pipe from the sea chest had been separated, water began to enter the engine room.

The sea water inlet was 4.5m below sea level when the flooding started. If valve A104 port had been fully open, water ingress through the 15cm pipe would have been in the region[2] of 6500l/m.

1.7 SALVAGE PUMPING RATES

The two diesel salvage pumps utilised on board *Sea Breeze* by the RNLI lifeboats each had a maximum pumping rate of 788l/m. The salvage pump supplied by the Navy helicopter had a maximum pumping rate of 770l/m, giving a combined maximum pumping rate of approximately 2350l/m. The combined effect of these three pumps was insufficient to reduce the level of flooding in *Sea Breeze*'s engine room.

Pumps utilised by the salvors included 4 electrically-driven submersible pumps each with a maximum pumping rate of 200l/m, a diesel-driven pump with a maximum pumping rate in the region of 500l/m and a large capacity diesel-driven pump with a maximum pumping rate of 5400l/m, giving a combined maximum pumping rate of 6700l/m. It took approximately seven hours for this pumping capacity to lower the water level in *Sea Breeze*'s engine room to a level at which the salvors could access the bilge and ballast system valves.

1.8 DAMAGE SUSTAINED

The flooding caused considerable damage to *Sea Breeze*'s engine room and accommodation spaces. The engine room, including the main engine, generators, auxiliary equipment and the vessel's main electrical distribution switchboard suffered complete immersion in sea water.

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[2] This approximation is based on a 15cm (150mm) diameter hole, at the vessel's loaded draught and calculated using the formula $Q=CD\ X\ A\sqrt{2gH}$ where Q = the rate of water ingress in m^3 per second, CD = Co-efficient of discharge (0.62), A = area of pipe section (m^2), g = acceleration due to gravity (9.81m/s^2) and H = head of water. The answer is then multiplied by 1.025 to account for the density of sea water.

The watertight door leading from the engine room to the accommodation spaces had not been closed when the engine room was evacuated, leading to *Sea Breeze*'s accommodation also being partially submerged. The crew cabins, galley and mess room suffered extensive damage. Bulkheads, deckheads and all associated electrical systems, insulation and fire protection had also been damaged.

1.9 THE CREW

1.9.1 General

Sea Breeze had a crew of six Russian nationals, employed by Camrose, all of whom held the required STCW certification for their rank. Their length of contract varied depending on rank, with the master, chief engineer and chief officer signed on for 4 month contracts and the AB, AB/cook and motorman signed on for 6 month contracts. All contracts could be extended by up to 1 month.

The working language on board was Russian, although the vessel's official documents and logbooks were completed in English. The ship's safety management manual (SMM) was written in both English and Russian. The master and chief officer spoke conversational English and the rest of the crew had a basic level of English, sufficient for their roles on board.

1.9.2 Master

The master was 47 years old and had been on board *Sea Breeze* for 4 months. He had been at sea for 23 years and held a Russian masters' licence for river and sea navigation and an STCW II/2 certificate of competency (CoC), valid for use on ships of less than 3000t without ARPA, for 2 years.

This was his first trip on *Sea Breeze* but he had sailed on similar vessels as mate and then master for the last 5 years. In 2012, he completed STCW refresher training in personal survival techniques, fire-fighting, elementary first-aid and personal safety and social responsibility. Additional courses undertaken in 2012 included refresher training in proficiency in survival craft and rescue boats, radar observing and plotting and medical first-aid.

1.9.3 Chief engineer

The chief engineer was 63 years old and had been on board *Sea Breeze* for 9 days. He had been at sea for 45 years and had been sailing as chief engineer since 1981. He held an STCW III/2 CoC as chief engineer.

This was his first trip on *Sea Breeze*, but he had sailed on many similar general cargo vessels as chief engineer in the past. On joining the vessel, he had received a 30 minute verbal handover from the previous chief engineer that had been limited to the starting and stopping of the main engine and the generators. He was responsible for all ballasting operations on the vessel, but operation of the ballast system was not covered during this handover.

1.9.4 Motorman

The motorman was 38 years old and had been on board for 9 days. This was his first contract on board *Sea Breeze*. He had been at sea for 18 years working in engine rooms but had spent the last 16 years working on board large deep sea fishing vessels.

He held qualifications as an engine room motorman and had revalidated his STCW basic safety training in 2011, at the Baltic Fishing Fleet State Academy.

1.9.5 Able bodied seaman

The AB was 44 years old and had been on board for 4 months; it was his first contract on board *Sea Breeze*. He had been at sea since 1989 and had sailed as AB for the previous 15 years. He had been working on larger vessels until 2013 but the last vessel on which he worked had been similar in size to *Sea Breeze*.

He held an STCW qualification to support a navigation watchkeeper and had carried out refresher training on his mandatory STCW basic safety courses in 2012.

1.9.6 Safe manning certificate

In 2004 the BMSR issued the minimum safe manning document to *Sea Breeze*'s previous owners, and it was amended in 2013 to indicate the vessel's new name. It required *Sea Breeze* to carry a master, navigational watchkeeping officer, engineer watchkeeping officer, two navigational watch ratings and an engine room watch rating. *Sea Breeze* was restricted to operate within the limited European area and to within 200 miles of a safe port of refuge.

The watch routine on board *Sea Breeze* consisted of the master conducting the 0600-1200 and 1800-0000 watches, and the chief officer the 0000-0600 and 1200-0600 watches. The AB and AB/cook were qualified to provide lookout duty during the hours of darkness. The chief engineer and motorman did not keep watches but worked during the day and as required depending on the ship's schedule.

1.9.7 Crew training

The company's safety management system (SMS) as presented in the Safety Management Manual (SMM) on board *Sea Breeze* and, in line with SOLAS requirements, stated that when more than 25% of crew were changed then an emergency drill was to be held within 24 hours.

No emergency drill had been held on board following the 50% crew change when the chief engineer, chief officer and motorman had all joined *Sea Breeze* at Moerdijk, the Netherlands, on 27 February.

Although the drill record book and logbook entries showed that drills had taken place, these records were found to have been falsified and the required training had not occurred. The chief engineer and motorman had not attended any form of emergency drill while on board *Sea Breeze*.

1.10 THE VESSEL

Sea Breeze was built by Damen Shipyards in the Netherlands as a “combi coaster 125” in 1989, one of 26 built by the yard between 1984 and 1993. Initially built as *Mindful*, the vessel was later renamed *Christa K* and then *Sea Hawk*.

Sea Breeze had been owned by various companies and operated under several Flag State administrations and classification societies in the 24 years since it was built. *Sea Hawk* was registered in Barbados in 2006 and classed with Lloyd’s Register (LR) in 2007, and the vessel remained with flag and class when it was purchased by Camrose in June 2013 and renamed *Sea Breeze*.

Sea Breeze carried a variety of dry bulk cargoes such as limestone, salt, steel, grain, pot ash and clinker in its single cargo hold. The vessel was certified to carry containers although no container securing equipment was carried on board at the time of the accident.

Sea Breeze had no regular trading pattern. Cargoes were arranged through the vessel’s managers, Shipmar Co. Ltd of Moscow (Shipmar). The vessel traded throughout North West Europe and the Baltic with occasional trips to the Mediterranean, and had visited 17 ports in the 3 months preceding the accident. The previous cargo of steel had been loaded in Moerdijk, Netherlands and discharged at Liverpool. *Sea Breeze* then transited to Raynes Jetty, Landdulas to load limestone, which was to be shipped to Shoreham, West Sussex.

1.10.1 Camrose Shipping Ltd

Sea Breeze was purchased by Camrose from Northern Coasters UK Ltd in June 2013. Camrose was a single vessel trust company based in the Marshall Islands, owned by KDM Shipping Ltd.

In addition to being the registered owners, Camrose sourced and provided the crew for *Sea Breeze*.

1.10.2 KDM Shipping Ltd

KDM Shipping Ltd (KDM) was based in Kiev, Ukraine and operated 10 dry bulk cargo vessels that traded on Russian rivers and in the Black, Caspian and Mediterranean seas. KDM also owned river passenger vessels and a ship repair facility in the Ukraine and provided technical management for its fleet. However, the technical and safety management of *Sea Breeze* was delegated to Shipmar.

1.10.3 Shipmar Co. Ltd

Shipmar was a ship management company based in Moscow, Russia. The company owned and operated one vessel and managed four others, including *Sea Breeze*.

In addition to providing the technical and safety management of *Sea Breeze* for Camrose, Shipmar also arranged all the vessel’s cargo charters. Although Shipmar had responsibility for the day to day technical management of *Sea Breeze*, KDM was kept apprised of all of the decisions made regarding the vessel’s operation.

Shipmar was responsible for *Sea Breeze*'s compliance with the ISM Code and held a full term document of compliance (DOC) issued by the Russian Maritime Register of Shipping (RS) in September 2013.

1.10.4 Barbados Maritime Ship Registry

In 2006 *Sea Breeze*, then called *Sea Hawk*, was surveyed to ensure the vessel met the requirements of the BMSR prior to being accepted onto the registry. BMSR's procedures required that all its vessels be inspected by one of its appointed representatives annually at, or within 3 months of, the anniversary of registration.

Sea Breeze had not been inspected by a representative of BMSR since 11 September 2012, when the vessel was still named *Sea Hawk*. The inspecting surveyor's comments from that inspection concluded with the statement:

> *Ship is in good condition for its age and well maintained.*

No arrangement had been put in place for an annual survey that was, at the time of the accident, 6 months overdue.

Following the accident a representative of BMSR inspected *Sea Breeze* and the vessel was subsequently removed from the register on 21 March 2014.

1.10.5 Condition of the vessel

Notwithstanding the damage caused by the flooding, *Sea Breeze* was found to be in poor material condition following the accident, and there was little evidence of systematic preventative maintenance having been carried out on board.

R Pearce & Co completed a survey on behalf of the salvors, KML, and the SOSREP made arrangements for an MCA Marine Casualty Officer to inspect the vessel. Both these surveys indicated potentially serious issues with the material condition of *Sea Breeze*.

An assessment of the vessel was commissioned by the MAIB, specifically to examine its material condition and sea worthiness prior to the accident, as opposed to damage resulting from the accident. A copy of this condition assessment is included at **Annex A** and concludes:

> *A number of conditions were sighted during survey which would render the vessel out of Class and unseaworthy in its present condition and probably prior to the flooding incident. Included in these is the defective anchor windlass brake, the various main watertight deck cracks, temporary patches covering unconfirmed corrosion/steel perforations giving rise to a loss of water tight integrity, further confirms the vessel having been unseaworthy pre-casualty.*[sic]

On 13 February 2014, *Sea Breeze*'s master wrote to the vessel's designated person ashore (DPA) at Shipmar, advising that the vessel could not be operated normally until the following defects had been rectified:

1. *Repair of hatch covers in order to stop leaks.*

2. *Repair of hydraulic system of hatch covers.*

3. *Repair of the main storage fuel tanks No.10 and No.13 for the purpose of leakage control.*

4. *Find and repair the cause of water leakage into the inside areas of the vessel.*

5. *Examination of the steering system in relation to a strong wobbling of the rudder spindle.*

6. *Sanding and painting of the hold and bottom of the hatch covers.*

No action was taken by Shipmar regarding these defects and the master wrote again to the DPA following an interim Maritime Labour Convention (MLC) inspection completed on 28 February 2014 (paragraph 1.10.6) informing him of MLC defects and expanding his earlier defect list to include:

1. *Refit of footboards of the port side gangway bridge to the port side foredeck.*

2. *Inspection of the forepeak compartments for identification and rectification of leaks. It is supposed that there are a number of places of water entry into the compartments.*

3. *Repair of the brake band of the port anchor winch (damage of brake band due to excessive corrosion). The anchor is currently in unusable condition.*

4. *Replacement of 2 hawser reels on the stern. Corrosion damage.*

5. *Repair of the foremast. A part of it is rusted through and taped up with insulating tape. Welding work is required.*

6. *Repair of ballast pumps. Replacement of some of their parts and repair of shafts (excessive corrosion) – 2 pieces.*

7. *Rectification of leakage into engine room from the accommodation deck. Leaks are in three places: Over the main switchboard; over the diesel generator; and over the fuel separator. In these places the decking of the accommodation should be lifted.*

8. *Repair the stern mooring roller. It has been cut off, with just the stand remaining.*

Following the accident, the master emailed a further defect list that included all the items listed previously and added a number of others that had come to light during the emergency.

Neither the master nor the owner advised Class of any defects.

1.10.6 Classification Society

Sea Breeze had been classed by LR since 2007 although the vessel's International Safety Management Code (ISM) and International Ship and Port Security (ISPS) certificates were issued by RS. At the time of the accident, the vessel had no outstanding conditions of class[3].

A LR surveyor attended *Sea Breeze* on 28 February 2014 in Rotterdam to carry out an interim MLC inspection. Within the scope of this MLC inspection the surveyor recorded several deficiencies, including a major non-conformity[4], although this was downgraded prior to the vessel's departure following assurances from Shipmar's general manager, who was on board for the inspection. The follow-up MLC inspection was to have been completed in May 2014.

Although outside the scope of the MLC inspection, the attending surveyor recorded that the vessel's maintenance was not to an acceptable standard and discussed the issue with both the master and Shipmar's general manager.

Sea Breeze's annual class survey was due by 30 March 2014, 3 weeks after the accident. No arrangements had been made to complete this survey.

1.10.7 Port state control inspection

The vessel had undergone 37 Port State Control Inspections (PSCIs) under the Paris Memorandum of Understanding protocol (Paris MOU)[5] between 1998 and 2014, and had been detained on three occasions.

The Paris MOU categorises vessels into high, standard or low risk based on a scoring and weighting system that takes into account the vessel type, previous detentions, flag, class, vessel age and company performance. It also indicates the type of port state inspection due: initial inspection, more detailed inspection, expanded inspection or concentrated inspection campaign.

These details are maintained by Paris MOU member states on a computer database known as THETIS, which updates vessels' scores daily. The THETIS database indicates to Port State administrators when inspections are due on vessels visiting ports within their jurisdiction, based on the vessel's risk profile. The inspection and selection scheme within THETIS determines the scope, frequency and priority of inspection. Overriding or unexpected factors may also trigger an inspection outside of these parameters.

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[3] Requirements to the effect that specific measures, repairs and surveys are to be carried out within a specific time limit in order to retain class

[4] Non-conformity means an observed situation where objective evidence indicates the non-fulfilment of a specified requirement.

[5] The Paris MOU on port state control is an organisation consisting of 27 participating maritime administrations and covers the waters of the European coastal states and the North Atlantic basin from North America to Europe. The mission is to eliminate the operation of sub-standard vessels through a harmonized system of port state control. Annually more than 18000 inspections take place on board foreign vessels in the Paris MoU ports, ensuring that these vessels meet international safety, security and environmental standards, and that crew members have adequate living and working conditions. The basic principle is that the prime responsibility for compliance with the requirements laid down in the international maritime conventions lies with the vessel's owner/operator. Responsibility for ensuring such compliance remains with the Flag State.

Sea Breeze was categorised by THETIS as a 'standard risk' and, as such, would be indicated as due for inspection every 10 to 12 months. Since it had been inspected in January 2014, THETIS would not have highlighted the vessel as due for an inspection until November 2014.

High risk vessels would expect to be inspected every 5-6 months and low risk vessels between 24-36 months after the last inspection within the Paris MOU region.

Since being bought by Camrose, *Sea Breeze* had undergone two PSCIs under the Paris MOU. These inspections resulted in the two highest defect counts in the vessel's history.

- In September 2013, an inspection in Bremen, Germany identified 14 deficiencies, 12 of which were required to be rectified prior to departure from port (code 17[6] deficiencies).

- In January 2014, an inspection in Riga, Latvia identified 10 Code 17 deficiencies that were to be rectified before departure **(Annex B)**.

1.10.8 Insurance

Sea Breeze was not insured for hull and machinery loss or damage. Protection and Indemnity (P&I) insurance was provided by The British Steamship Management P&I Association (Bermuda) Ltd (BSM).

BSM had provided P&I insurance for *Sea Breeze* since 13 December 2013 and, in February 2014, it commissioned a condition survey[7] to establish the vessel's risk profile. This was carried out in Bridport, UK on 2 Feb 2014.

The attending surveyor recorded that: '*The vessel complied fairly well with general marine industry standards' and recorded the vessel's condition as 'In apparent good order, cosmetic maintenance poor in way of hatch coamings and external decks. Cargo hold bulkheads and undersides of hatch lids are rusted and have flaking paint.*'

The survey included an ultrasonic hatch tightness test, which showed that none of the hatches tested were watertight.

1.10.9 Safety management system

Sea Breeze had a safety management certificate (SMC) issued by RS on behalf of BMSR following an ISM audit in Riga, Latvia on 12 January 2014. This audit had resulted in ten non-conformities and one observation being raised. The master had written to the DPA suggesting actions to be taken to address these non-conformities that were all due to have been closed out by 12 February 2014.

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[6] A code 17 defect: Master instructed to rectify deficiency before departure. Application: this code is used in case the nature of a deficiency requires rectification before the vessel proceeds.

[7] Condition surveys are commissioned by insurers to determine whether a vessel conforms to acceptable standards. A condition survey will only inspect and comment on items required by the insurer and is not as detailed or in-depth as a structural survey.

The non-conformities relevant to the circumstances of this accident included:

Non-conformity	Actions suggested by master	Investigation findings
There is no objective evidence that the risk assessment of critical operations has been carried out	*To fill in the risk assessment forms, to put a date of the last assessment and the signatures of DPA and master. If the master is the only person responsible for the risk assessment, then the forms should be amended in order to eliminate the requirement of the DPA's signature.*	No completed risk assessments were available on board.
Poor knowledge of the crew members of the company policy	*The crew members were answering the questions hesitatingly, despite the fact that they had been familiarised with the company policy once they had arrived on the vessel. An additional crew meeting will be held in order to explain them the company policy.*	No record of any additional crew training or familiarisation was available.
There are no records that the master addressed the crew in order to motivate them to follow the company policy.	*I suggest that the DPA should develop and add a 'Safety Forum' form to the company's list of forms. The master will have to hold it once a month, with the compulsory discussion of the company policy matters.*	No record of any ship's safety committee meeting having been held was available on board.
The training manual from the mess room is not translated into Russian.	*It is necessary to translate the booklet into Russian or to change the main working language on the ship.*	No crew training manual in Russian was found on board.
The ship's emergency file is not complete.	*There is no such file on board at all. A folder in accordance with the Shipboard Emergency Plan will be created. It will also need to be translated into Russian.*	No such file was available on board.
There is no paperwork available on board of the ship verifying the company's response to the non-conformity report.	*I hereby request the DPA to develop and introduce a 'Non-conformity report' form as a part of the SMS package. To introduce a procedure of the Vessel/Company interaction regarding addressing non-conformity reports, required corrective actions and execution of those actions. The master will have to fill in this form not only after external inspections but, in every case when a non-conformity was revealed by the master himself or was reported by a crew member. The form will be considered an official report of the master to the company.*	No such forms were available on board.

The Shipmar supplied SMM was the basis of the vessel's ISM compliant safety management system. The SMM was a generic manual, written in both Russian and English and was used throughout Shipmar's managed fleet. Though not vessel specific, it included procedures for shipboard operations along with emergency checklists.

All six crew had signed the familiarisation section of the vessel's SMM to confirm that they had read and understood its contents. However, only the master was aware of the vessel's DPA and his role.

The 'Flooding' and 'Abandon Ship' checklists **(Annex C)** listed the company's requirements for dealing with these emergencies. Neither was referred to or used during the accident. During the investigation, all the emergency checklists filed ready for use on the bridge were found with the boxes for each task already ticked.

1.10.10 Maintenance

The SMM designated the chief engineer as being responsible for maintenance, stating that maintenance could be performed by the crew or shore-based organisations, and that a planned maintenance system for critical equipment and systems should be maintained. No such system was in use and no records of any maintenance were kept.

The SMM designated the chief officer as being responsible for the condition of the vessel's hull, decks, superstructure, spaces and facilities and the maintenance of records of all defects. Apart from the brief lists of defects sent by the master to the DPA (see section 1.10.5), no such records were kept.

1.11 PREVIOUS ACCIDENTS

1.11.1 Structural failure and foundering of the general cargo ship Swanland

At 0200 on 27 November 2011, the 34 year old Cook Islands registered general cargo vessel *Swanland* experienced catastrophic structural failure in poor weather while on passage from Raynes Jetty, Llanddulas, Wales to Cowes, Isle of Wight. It was carrying a cargo of limestone. The vessel sank about 17 minutes later with the loss of six crew.

Swanland and *Sea Breeze* were both on passage from Raynes Jetty, loaded with limestone and were similar in size and layout.

The MAIB investigation (Report No 12/2013) identified that the upper part of *Swanland*'s structure had failed in the midships region, on both port and starboard sides.

Along with significant loading issues, the investigation found that:

- The lack of maintenance and oversight of Swanland was likely to have been a major contributing factor to the vessel's structural failure.
- Other relevant contributing factors included a lack of effective safety management and the poor quality of survey and audit.

1.12 REMOVAL AND TESTING OF VALVE A104 PORT

Titan Salvage moved *Sea Breeze* from Fowey to the admiralty moorings at King Harry Reach on the River Fal on 24 April 2014. In late October 2014 the vessel developed a list as a result of water migration between ballast tanks and it was towed into Falmouth for corrective action.

Once *Sea Breeze* was alongside in Falmouth, MAIB appointed contractors to blank the sea chest and the ballast main, and remove valve A104 port. This was completed on 2 December 2014 and technical analysis of the valve was completed on 18 December 2014.

Valve A104 port was a worm and quadrant gear actuated, 15cm diameter, butterfly valve with an extended spindle **(Figure 7)**. The valve was opened and closed by turning a hand wheel attached by an extended spindle to a worm wheel that engaged a gear quadrant attached to the butterfly valve spindle **(Figure 8)**.

Valve A104 was tested by the engineering department at A&P Shipyard, Falmouth **(Annex D)** and additional technical analysis was carried out by Material Technology Ltd, Southampton **(Annex E)**.

The following summarises the findings from the valve testing and analysis:

- The bent extended spindle and the cracked gearbox casing indicated that excessive load had been applied at some point.
- The quadrant gear and worm wheel had suffered excessive wear and were not fit for use.
- An inappropriate weld repair had been attempted on the quadrant gear teeth. The repair had been poorly executed and was inadequate **(Figure 9)**.
- The absence of top hat bearings on the worm wheel allowed it to come into contact with the casing during operation, jamming the actuator gearbox.
- Evidence of corrosion inside the actuator gearbox indicated that it had not been regularly greased.
- The valve was closed and pressure tested, no leakage was detected up to 3.6bar.

It was not possible to establish when or by whom the attempted weld repair to the quadrant gear had been carried out.

The thrust bushes that should have been present on the valve worm spindle were not present. Either these had been removed and not replaced at some stage during maintenance, or they had simply disintegrated over time.

When operating the hand wheel to shut the valve, the worm wheel jammed after approximately six turns, giving the impression that the valve had been shut, when it had not. With further manipulation of the hand wheel, it was possible to free up the actuator gearbox, eventually enabling the valve to be shut fully. The inconsistent nature of the valve actuator mechanism meant it was not possible to determine the position of the valve without reference to the valve position indicator located on the side of the valve actuator gearbox.

Figure 7: Valve A104 port removed from vessel

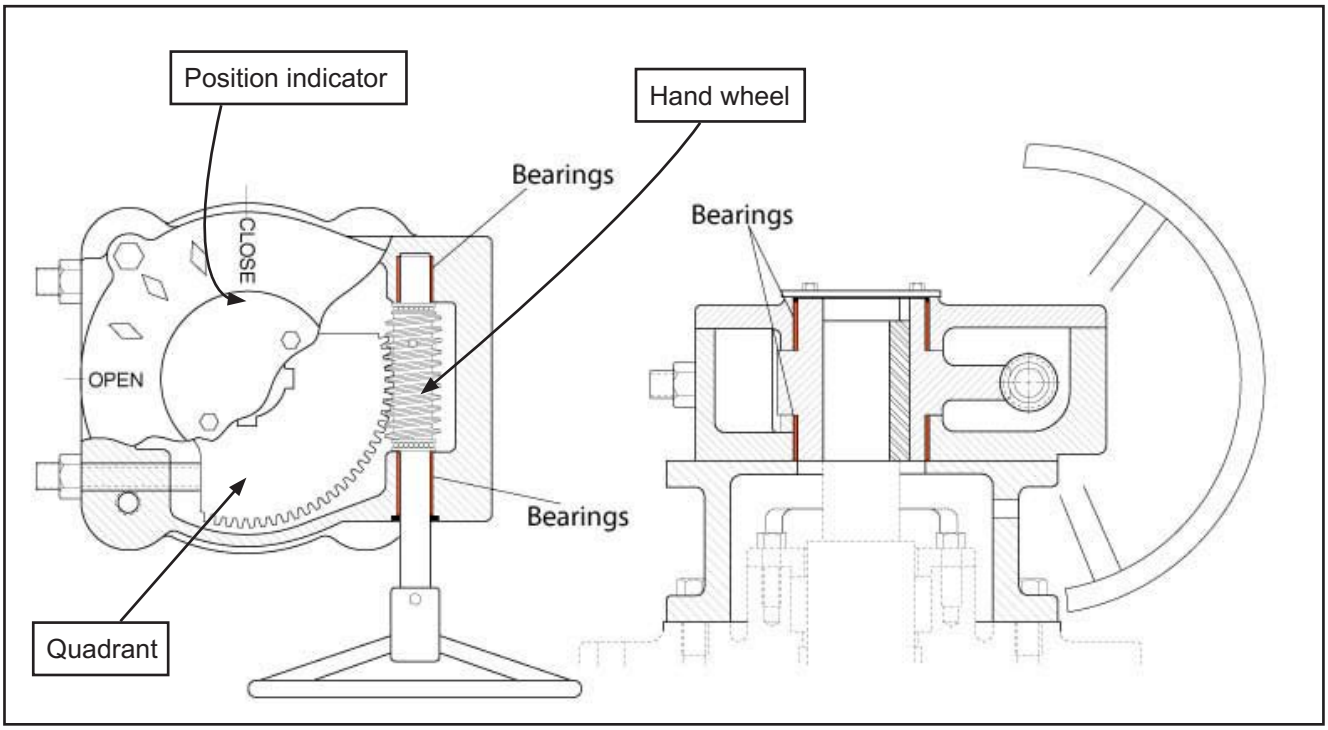

Figure 8: Arrangement of actuator gearbox for valve A104 port

Figure 9: Gearbox quadrant, showing signs of damage and previous repair

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 CAUSE OF THE FLOODING

The engine room on *Sea Breeze* flooded because valve A104 port, the single isolating butterfly valve between the port sea chest and the port ballast pump that was undergoing maintenance, was not fully closed prior to work commencing. The chief engineer had attempted to close the valve and believed that it was closed, although he had not checked the valve position indicator before permitting work on removing the ballast pump to start. When the pump body was lifted clear of the pipe flanges, sea water entered the engine room through the exposed 15cm diameter ballast main.

When salvage engineers entered the engine room on the morning of 10 March 2014 they found valve A104 port to be open. Although the valve wheel was initially tight, they were able to turn it and close the valve. Subsequent testing of the valve, following its removal from the vessel, showed that the nature of the repair was totally inadequate, and the condition of the worm and quadrant gearing was such that it could jam intermittently. Such jamming caused the hand wheel to become tight, thereby giving the impression that the valve was closed when it was not.

2.3 VALVE SUITABILITY AND INSPECTION

2.3.1 Suitability of valve A104 port

The ballast system on board *Sea Breeze* was designed to operate with single valve isolation of the ballast main from the sea. The accident was the result of sea water ingress through one such valve on the port side of *Sea Breeze*'s ballast system, valve A104 port. As required by SOLAS the valve was equipped with a position indicator, showing whether it was open or closed. When valve A104 port was in situ, the position indicator was below the plates but clearly visible from the tank top where the crew were working. Tests following the accident showed that the indicator worked and that the valve, when shut, was watertight at the pressure it would have experienced.

2.3.2 Survey of ship side valves

Ship side valves are required to be examined under the LR's Machinery Surveys, General Requirements. There is also a requirement to examine all sea connections and attached valves during docking surveys under Docking Survey, Hull and machinery requirements. LR's Marine Survey Procedures Manual specifically states;

> *The inability to fully close sea connections has resulted in serious flooding of engine spaces. Surveyors must therefore ensure that these valves are fully reconditioned at this time and correctly assembled.*

Records indicate that *Sea Breeze*'s ship side valves were last inspected in 2009, but no mention is made of defects or repairs to the worm and quadrant gearing of the actuator. While the valve itself should have been inspected and tested for leakage, any survey of the actuator mechanism would have been left to the surveyor's discretion. Without records, it cannot be determined whether or not the actuator was checked at that inspection, but had the surveyor examined the actuator it would almost certainly have been failed. It cannot be determined when the weld repair to the quadrant occurred, though from inspection it appears the repair was not recent. It would, therefore, be prudent for classification society surveyors to carry out a full function test of ship side valve actuator systems during survey, and if this gives any cause for concern the system(s) should be stripped and inspected.

2.4 PLANNED MAINTENANCE

Ballasting operations were taking too long and the chief engineer rightly prioritised this work as soon as he joined *Sea Breeze*, ordering the required parts and completing work to stop the leakage on the starboard ballast pump only a few days after joining the vessel.

The vessel's ballast system was identified in the SMM as equipment whose sudden operational failure could result in hazardous situations, as required by the ISM code. However, despite being required by the SMM, there were no testing or maintenance routines or systems in place to ensure the correct operation of the ballast system or any other equipment on board.

2.5 PLANNING THE WORK

There were no written procedures on board *Sea Breeze* that covered the removal of a ballast pump. However, with appropriate prior planning, the job was straightforward and should not have caused the crew any difficulties. The ballast system drawing **(Figure 10)** was accurate and identified all the valves that needed to be shut in order to isolate the pump. Furthermore, the same three crew had successfully completed maintenance on the vessel's starboard ballast pump 5 days earlier, when all the necessary valves had been properly closed.

The SMM stated that any work that involved '*putting out of operation and opening ships structures and technical facilities*' must only be undertaken with permission of the officer of the watch (OOW) or master. This should have been achieved through the use of a permit to work. However, no permit to work had been issued and the master, who was also the OOW, was not aware of the work having been carried out.

The crew had all signed the familiarisation section of the vessel's SMM to confirm they understood its requirements which, along with the instruction regarding the use of permits to work, included instructions regarding the use of risk assessments when carrying out maintenance work on board. However, no risk assessment had been completed and basic engineering good practice had not been applied.

The application of good engineering practice when assessing the risks posed by the intended work would have provided all the appropriate control measures needed to mitigate for any foreseeable risks. It would also have ensured that in the event of an

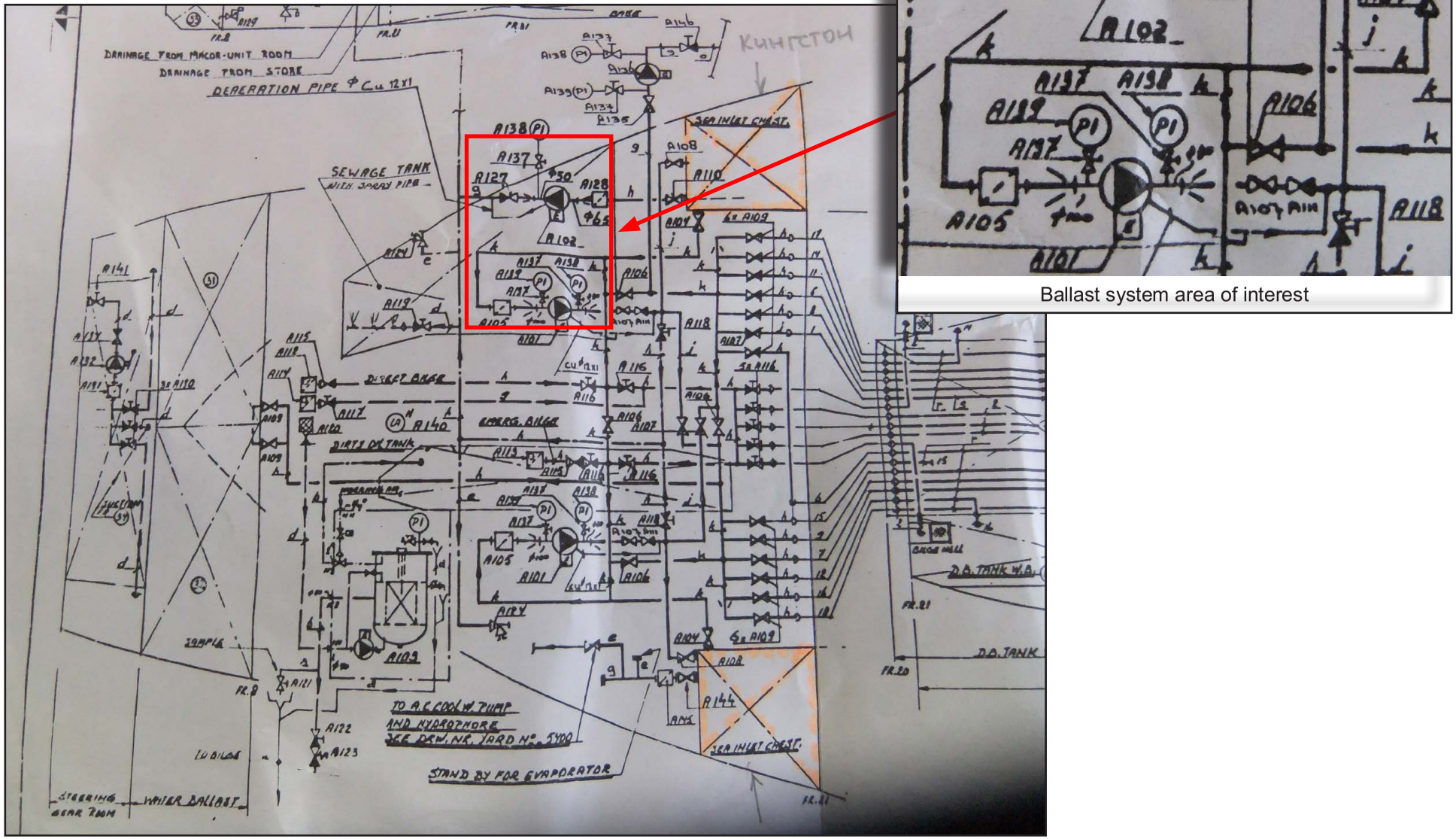

Figure 10: Ballast system drawing - with inset

unforeseen problem, corrective actions could have been taken quickly to prevent the situation deteriorating. Standard precautions that should have been considered included:

- Preparing the engine room bilge pump and emergency bilge pump to take suction from the forward bilge.
- Ensuring that all isolation valves were indicating closed and locked shut.
- The preparation and use of blanking pieces to seal exposed pipework for the duration of the work.
- Ensuring that all pressure was safely released from the suction side of the pump by using the bleed nut on the suction strainer prior to slackening the flange bolts.
- Ensuring that both inlet and outlet flanges were initially split in a controlled manner with a number of loosened bolts still in situ to enable them to be re-tightened in the event of the isolating valves not holding.

It is surprising that an experienced and qualified engineer could allow such basic errors to take place when working on potentially dangerous systems. Risk assessment of the work to be completed, as required by the SMM, would have facilitated appropriate planning to ensure that the basic principles of good engineering practice and emergency preparedness were applied by all involved.

2.6 RESPONSE TO THE FLOODING

Contrary to the requirements of the SMM and SOLAS, *Sea Breeze*'s chief engineer, chief officer and motorman had not completed any emergency drills or training since joining the vessel 9 days before the accident. Furthermore, the records of drills had been falsified and it is likely that none of the crew had completed any emergency preparedness training on board *Sea Breeze*. Consequently, when faced with a serious flooding incident in the engine room, the crew were not able to provide an effective response.

When the engine room was evacuated, the watertight door between the engine room and the accommodation was left open. Not only did this allow the flooding to spread to the accommodation, causing significant additional damage, but in other circumstances it could also have resulted in the loss of the vessel. Leaving this door open not only demonstrated a lack of appreciation of the need to maintain watertight integrity, but was also further evidence of poor emergency preparedness.

The master's initial decision to abandon the vessel into the rescue boat was premature. Had he been familiar with the vessel's damaged stability, he should have recognised that to abandon to the small rescue boat, even in benign conditions, would have been more dangerous than remaining on board *Sea Breeze*.

2.7 CONDITION OF THE VESSEL

Sea Breeze was found to be in poor material condition. The vessel was still within class at the time of the accident although the reports from the master to the DPA, along with surveys of the vessel following the accident, identified several issues that could have resulted in *Sea Breeze* being taken out of class had it been surveyed.

These included:

- The starboard anchor windlass brake was damaged and inoperable.
- The forward mezzanine deck contained several cracks.
- Both anchor hawse pipes were seriously corroded and showed indication of water ingress.
- Temporary repairs, including cement skimming and the use of supporting props below decks, indicated steel damage on the vessel's forward mooring deck.
- Temporary repair patches were noted on the main deck.
- Several hatch cover cleats were found to be defective.

Sea Breeze's annual class survey was due on 31 December 2013, and the 3-month window for this inspection was due to end on 31 March 2014. The accident occurred on 8 March, less than 3 weeks before this deadline, and yet no contact had been made with LR to arrange the attendance of a surveyor.

It was clear that maintenance was not a priority for the vessel's crew or the company as there were no planned maintenance systems in use on board, nor evidence of routine greasing, painting or any other preventative maintenance.

Sea Breeze's condition had deteriorated rapidly since it had been purchased by Camrose and it was this decline that led to *Sea Breeze* being removed from the BMSR following the accident. Had BMSR completed its annual survey of the vessel when it was due, the deterioration of the vessel's condition might have been recognised and corrective action could have been required.

The master was aware of the condition of the vessel and had sent two emails to the DPA, each listing a number of serious defects that required attention. There was no evidence that the owners or managers had any intention of addressing any of these defects, nor had any of the defects been reported to Class.

Had these defects been reported as required by LR Rules, Chapter 2 Section 1.1.5, their seriousness could have been assessed and, if required, conditions of Class imposed until approved repairs had taken place.

A number of factors suggest that the vessel was being intentionally run down:

- The absence of investment in the maintenance of *Sea Breeze* along with the lack of planned surveys.
- That there was no hull and machinery insurance
- The loss of contact between the owners and managers and the MCA following the accident.

It is of concern that the loss of *Swanland*, with six of its crew was, at least in part, a consequence of a strikingly similar lack of maintenance, oversight and effective safety management. Had the deterioration of *Sea Breeze* not been brought to an abrupt end by this accident, it is considered quite possible that it could have suffered the same fate as *Swanland*, possibly with similarly fatal consequences.

2.8 SAFETY MANAGEMENT

The investigation found that *Sea Breeze*'s crew saw no value in safety management and that this was symptomatic of an absence of any safety culture on board or within Shipmar.

2.8.1 SMM

The Shipmar supplied SMM was approved by RS as the basis of the vessel's ISM compliant safety management system. However, despite all crew having signed and dated the familiarisation section of the SMM to indicate that they had read and understood the manual, there was no evidence on board to indicate that it had ever been referred to. Only the master was aware of the identity and role of the DPA, and the emergency checklists (although available on the bridge) were not considered or used during the flooding and all had been pre-ticked prior to being filed.

The following evidence indicates that there had been a complete breakdown in safety management on board *Sea Breeze*:

- Falsification of records of drills
- Absence of any planned maintenance records
- Absence of a ship's safety committee
- Lack of emergency preparedness
- No permits to work or risk assessments had ever been completed on board
- Lack of any procedure to deal with non-conformities.

All of the above were contrary to the requirements of the SMM, and the master had made Shipmar aware of most of these deficiencies in an email to the DPA following the ISM audit by RS on 12 January 2014. That the company had taken no action following this email indicates that the absence of any safety culture on board *Sea Breeze* extended to Shipmar.

2.8.2 Vessel Manager's response to Audits

During the SMC audit completed by RS on 12 January, 10 non-conformities had been identified. The vessel had 1 month in which to rectify these non-conformities, and the master had written to the DPA outlining the actions he felt were required. However, he had received no response to his correspondence.

In common with the SMC audit, company internal audits and recent PSC inspections (paragraph 1.10.7) had all identified that *Sea Breeze*'s crew had a poor knowledge of the company's safety management policies, yet no actions were taken by Shipmar following these audits to address this issue.

The lack of response by the vessel's managers, Shipmar, to the SMC audit, the findings of the PSCIs, and the master's proposals for remedial action are cause for serious concern about their commitment to effective safety management.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. There were no testing or maintenance routines, or systems in place, to ensure the correct operation of the ballast system or any other equipment on board *Sea Breeze*. [2.4]

2. The master, who was also the officer on watch, was not aware of the work being carried out on the ballast system and no permit to work on the system had been issued. [2.5]

3. A risk assessment had not been completed prior to commencing work on the ballast system with the result that basic contingency preparations were not taken, and once the work started basic engineering good practice was not applied. [2.5]

4. Records of drills had been falsified and it is likely that none of *Sea Breeze*'s crew had completed any emergency preparedness training on board. [2.6]

5. The crew's response to the serious flooding incident in the engine room was ineffective. [2.6]

6. When the engine room was evacuated, the watertight door between the engine room and the accommodation was left open, allowing the flooding to extend into the accommodation. [2.6]

7. *Sea Breeze*'s crew saw no value in safety management and this was symptomatic of an absence of any safety culture on board or within Shipmar [2.8], specifically:

8. There was no evidence on board to indicate that the SMM had ever been referred to. [2.8.1]

9. There had been a complete breakdown in safety management on board *Sea Breeze*. [2.8.1]

10. Shipmar's lack of response to the findings of recent audits. [2.8.2]

3.2 OTHER SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. The engine room on *Sea Breeze* flooded because the single isolating butterfly valve between the port sea chest and the port ballast pump that was undergoing maintenance, was not fully closed prior to work commencing. [2.2]

2. The condition of the worm and quadrant gearing in the actuator of valve A104 port was such that it could jam intermittently, giving the impression that the valve was closed when it was not. [2.2]

3.3 SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. It would be prudent for classification society surveyors to carry out a full function test of ship side valve actuator systems during survey, and if this gives any cause for concern the system(s) should be stripped and inspected. [2.3.2]

2. Had BMSR completed its annual survey of the vessel when it was due, the deterioration of the vessel's condition might have been recognised and corrective action could have been required. [2.7]

3.4 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. Reports from the master to the DPA, along with surveys of the vessel following the accident, identified several issues that could have resulted in *Sea Breeze* being out of class prior to the accident had it been surveyed. [2.7]

2. Had the deterioration of *Sea Breeze* not been brought to an abrupt end by this accident, it is considered quite possible that the vessel could have suffered the same fate as *Swanland*. [2.7]

3. Serious defects that could have affected the vessel's classification had not been reported to the Classification Society. [2.7]

SECTION 4 - ACTION TAKEN

4.1 BARBADOS MARITIME SHIP REGISTRY

Following the accident, BMSR introduced new procedures to ensure that the due dates for BMSR inspections were monitored more closely. Under these new procedures, owners are reminded of the requirement for an inspection of a particular vessel at the beginning of the month in which the inspection is due.

4.2 SHIPMAR CO. LTD

On 4 April 2014, Shipmar issued an internal report on its investigation of the flooding on board *Sea Breeze*.

Shipmar's investigation did not extend to visiting the vessel and relied upon statements made by the master and the verbal summary of a contractor who had completed an initial assessment of the causes of the accident.

The company's report concluded that the accident was caused by the erroneous actions of the captain, chief engineer and the ship's crew, who did not accurately or completely comply with the requirements of the SMM.

As a result of the recommendations made by its report, on 7 April 2014, Shipmar took the following actions:

- *Sea Breeze*'s master and chief engineer were dismissed for gross infringement of the SMM and unsuitability for the positions held.
- The owners were instructed not to use the recruitment agency that had supplied the crew.
- The procedures for recruitment of senior officers were altered to include additional interviews by marine safety managers and technical superintendents.
- Masters of company vessels were
    - notified of the results of the investigation.
    - instructed to study their vessel's bilge and ballast pumping arrangements.
    - instructed to conduct engine room flooding exercises.

4.3 KDM SHIPPING LTD

KDM Shipping Ltd. has issued a safety bulletin to its fleet and issued the following instructions:

- The vessel owner must refuse to work with the recruitment agency that supplied unskilled crew.
- The vessel owner must conduct more thorough selection of the senior officers for company vessels.

- The technical department is to carry out additional interviews with masters and chief engineers to test theoretical and practical skills prior to employment.
- Captains must carry out training into bilge and ballast systems on board their vessels.
- Masters of all company vessels are to conduct exercises on board for the flooding of engine rooms.

SECTION 5 - RECOMMENDATIONS

Shipmar Co. Ltd. is recommended to:

2015/136 Conduct a full review of its fleet's safety management systems and take action to ensure that any issues identified are fully addressed. This review should include, inter alia:

- The maintenance of accurate records relating to ISM and SOLAS compliance
- The use of planned maintenance systems
- Crew training and emergency preparedness
- The use of permits to work and risk assessments.

Lloyd's Register is recommended to:

2015/137 Amend its Marine Survey Procedures Manual to include a need for the actuator mechanisms for ships' side valves to be fully function tested during surveys and, should this give cause for concern, require the system to be stripped and internally inspected.

2015/138 Propose to the International Association of Classification Societies that its requirements should be amended to require the actuator mechanism of ship's side valves to be fully function tested during special survey once all the work associated with the valve has been completed. Should the function test give cause for concern, the actuator should be stripped and inspected.

Safety recommendations shall in no case create a presumption of blame or liability

Marine Accident Report

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