MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

VERY SERIOUS MARINE CASUALTY | REPORT NO 1/2012 | FEBRUARY 2012

Flooding and foundering of *VELLEE* in the Little Minch 6 August 2011

Email: maib@dft.gsi.gov.uk
Tel: 023 8039 5500
Fax: 023 8023 2459

SUMMARY

Late on 5 August 2011, the 19m trawler *Vellee* **(Figure 1)** suffered catastrophic flooding when on passage from Fraserburgh to Kilkeel. The crew received no warning of the water ingress from the vessel's three high-level bilge alarms, and by the time the flood was discovered, the sea water level was above the main engine's gearbox.

The crew were unable to establish the source of the water ingress and, despite making attempts to pump out the water, in the early hours of 6 August they were forced to abandon to the liferaft.

Approximately 45 minutes later the vessel sank. The crew were rescued by helicopter and delivered safely ashore at Stornoway.

A recommendation has been made to the owners of *Vellee* regarding the need to apply improved maintenance regimes to their remaining vessel.

Image courtesy of Jimmy Thomson

Figure 1

fv *Vellee*

BACKGROUND

During main engine repairs a few days before *Vellee*'s final voyage, it was discovered that two of her eight main engine cylinder liners had suffered extreme electrolytic corrosion, reducing their thickness by 85% in places **(Figure 2)**. The engineering company carrying out the work advised the owners to have an electrician investigate the cause of the electrolytic action. The subsequent investigation found that the main engine earth bonding strap was missing and that there was an earth fault on one of the vessel's radio installations. The electrician's opinion was that these faults could have caused the electrolytic corrosion of the cylinder liners. No further inspections were instructed or carried out to establish if electrolytic action had affected any other areas in the vessel.

FACTUAL INFORMATION

Narrative

Vellee sailed from Fraserburgh at 1530 (UTC+1[1]) on 4 August 2011, bound for her home port of Kilkeel, **(Figure 3)** as fishing in the Irish Sea was believed to be more favourable. The weather and sea conditions were calm and settled throughout the voyage.

[1] All times in this report are UTC+1 hour, unless otherwise stated.

Around 2130 the following evening the skipper carried out a routine inspection of the engine room and the bilges were seen to be dry.

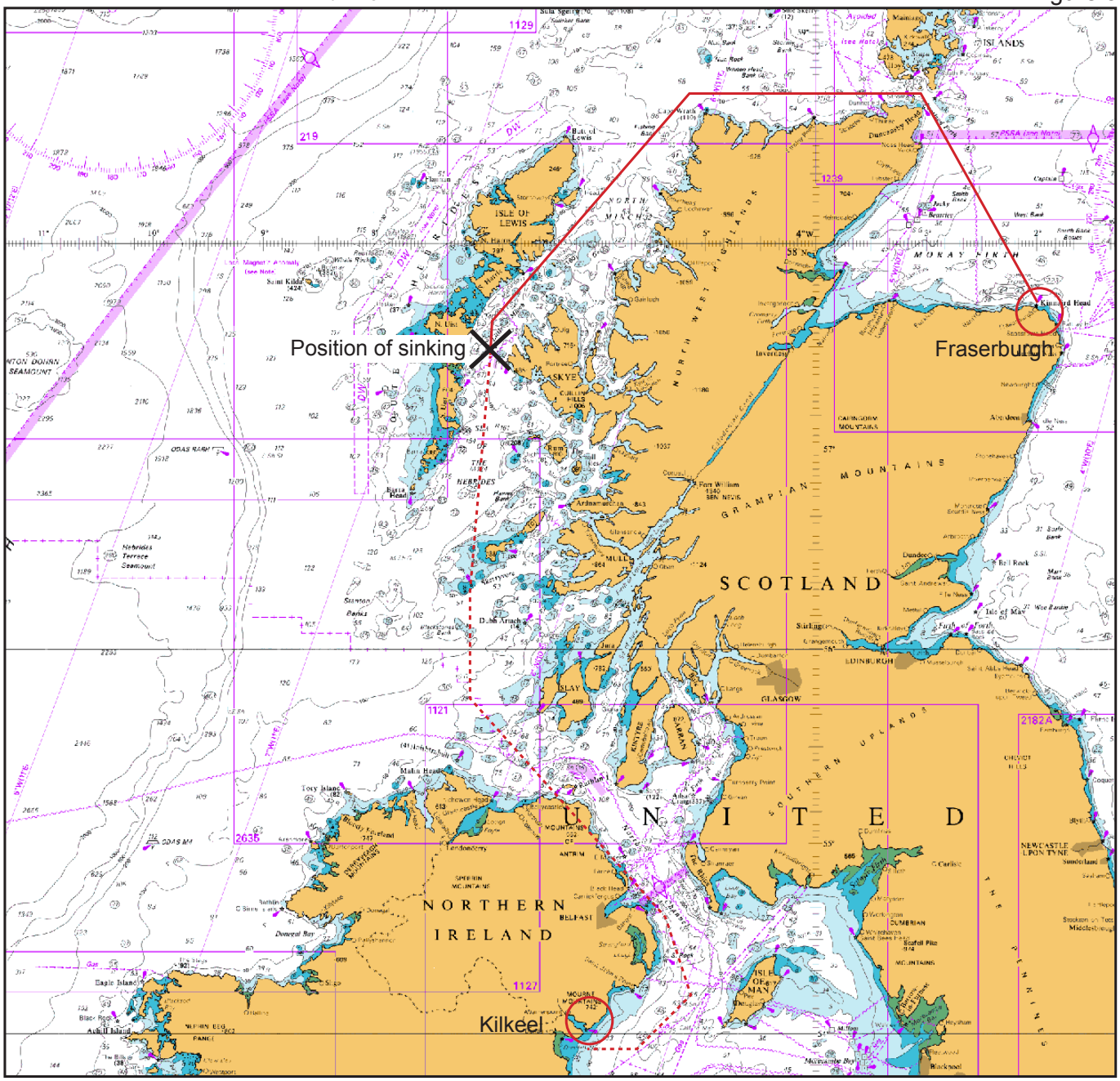
At about 2315 the skipper left the mate in the wheelhouse while he went to the mess deck, where he joined the deckhand for a cup of tea. About 15 minutes later, *Vellee*'s main engine slowed down from full ahead to idle. The skipper hurriedly left the mess deck to be met by the mate in the companionway between the mess deck and the wheelhouse. The mate explained that the autopilot's alarm was sounding continuously, indicating that perhaps the generator belts were slipping and required tightening, as had happened on previous occasions. The skipper opened the engine room hatch to investigate and saw the space awash with sea water to a level which covered the main engine's gearbox. He immediately switched on the electric submersible bilge pump using the switch close to the top of the access hatch, and descended into the engine room.

Due to the depth of water, the skipper was forced to climb across the top of the engine to access the sea water distribution valve chest, from where he changed over the main bilge pump suction from sea to engine room bilge. Up to that point, this pump had been continuously pumping sea water to the deck wash as it was permanently driven by the main engine. The skipper could not identify the source of the flooding and was unable to close the

Figure 2

Electrolytic corrosion on *Vellee*'s cylinder liner

Figure 3



Vellee's passage from Fraserburgh to Kilkeel

ship's side sea suction valves as they, and their remote closure wire-pulls, were below the water level.

The skipper then left the space and instructed the mate and deckhand to fetch their lifejackets from the cabin aft of the engine room. The men then went forward and, upon lifting the fish room hatch, discovered a similar level of water in that space. The skipper then ordered the mate and deckhand to launch a liferaft as a precaution.

Once the liferaft had been launched, the skipper instructed the deckhand to stand by it and also to monitor the bilge pumps' overboard discharges and notify him or the mate if there was any decrease in their discharge rate. The skipper and mate then descended from the top deck to the main deck, where the mate monitored the water level in the engine room from the engine room's escape hatch. However, due to the constant agitation of water as the vessel rolled, it was difficult to gauge whether the water level was changing.

As the mate monitored the water level, the skipper went forward to retrieve the vessel's salvage pump from the fo'c'sle. Lifting the fo'c'sle hatch he discovered that the light was not working, but from the available light it was apparent that the salvage pump was buried below spare netting and was somewhere between deck level and the keelson, some 3m below the hatch. The skipper therefore decided that, under the circumstances, he did not have time to retrieve the salvage pump.

Up to this point, the skipper and mate were confident they could cope with the situation, and had decided not to alert the coastguard. There had been a similar level of water in another of their vessels a few weeks earlier, and on that occasion the vessel's pumps had coped well. However, at about 0045 *Vellee* took a list to port, indicating that the pumps were not coping and the skipper ordered the mate and deckhand into the liferaft while he transmitted a distress call using the radio in the wheelhouse. The call was answered by Stornoway coastguard, who immediately broadcasted a "Mayday" relay and tasked a SAR[2] helicopter and lifeboat to attend the scene. No vessels responded to the coastguard's "Mayday" relay.

The rescue

After transmitting the distress call, the skipper joined the mate and deckhand in the liferaft. As they paddled clear of *Vellee* her engine and lights were still running. The crew had taken a portable radio and distress rockets with them to the liferaft, and remained in constant radio contact with Stornoway coastguard, who were able to assure them that rescue services were on their way.

At about 0130 on 6 August, *Vellee* sank, leaving her crew adrift in the Little Minch, with no vessels in sight. Distress rockets were not used to attract attention or highlight their position to rescuers. However, at about 0150 the Maritime and Coastguard Agency's (MCA) SAR helicopter, R100, picked up a signal from *Vellee*'s EPIRB[3], which had floated free as she sank. At a range of 5nm, R100's FLIR[4] equipment picked up body heat generated by the crew in the liferaft, which guided them to the survivors. The crew of *Vellee* were successfully winched on board R100 and taken to Stornoway.

Vellee's second liferaft self-released as the vessel sank and, along with the first liferaft and the EPIRB, were picked up by the crew of the Barra lifeboat when it arrived on the scene.

Vessel

Vellee was a traditional 20m wooden trawler **(Figure 1)** built in 1981 and acquired by her owners in October 2006. She was designed with four separate under deck spaces. From forward these were: fo'c'sle, fish room, engine room and cabin.

Because *Vellee* had been built before 2002, only the collision bulkhead between the fo'c'sle and fish room was required to be watertight. A deckhouse sited on the main deck directly above the engine room housed the wheelhouse, galley and mess deck, with accesses leading to the engine room, cabin and starboard side deck. The starboard side deck and main deck forward were enclosed by a non-watertight deck shelter, with openings to the aft deck, fish room, fo'c'sle and top deck **(Figure 4)**.

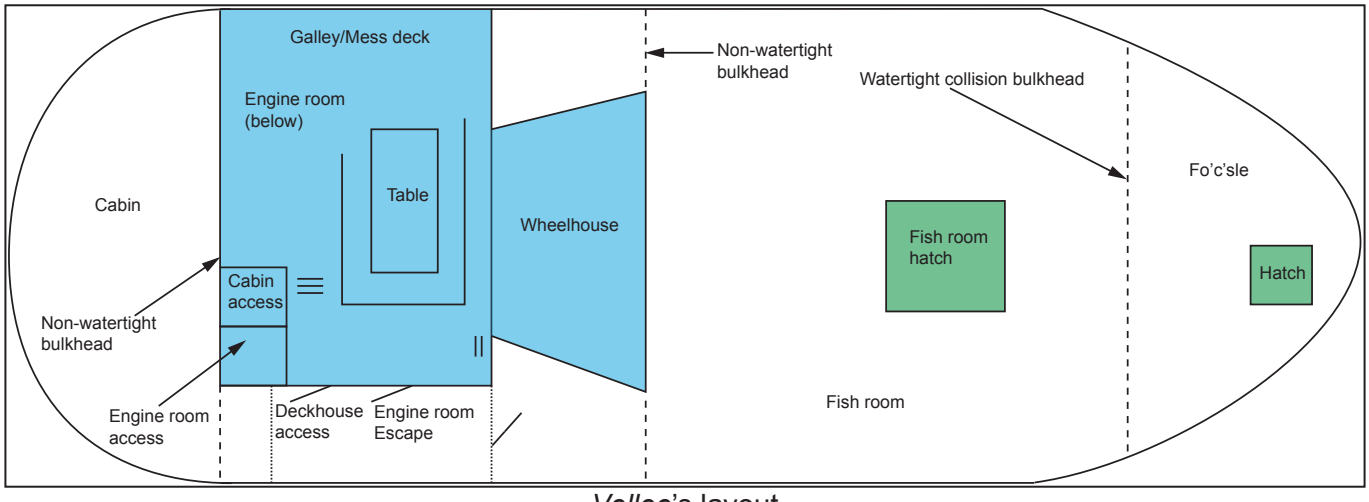
Vellee had last been taken out of the water in Fraserburgh in June 2010. At this time her planking had been inspected by a local ships' carpenter, who found her to be in reasonable condition for a vessel of age. Minor caulking and pitching was completed to some plank seams at that time.

[2] SAR: search and rescue

[3] EPIRB: Emergency Position Indicating Radio Beacon

[4] FLIR: forward looking infrared

Figure 4



Vellee's layout

Bilge pumping systems

Vellee was powered by a Kelvin TASC8 main engine delivering 375kW. As well as providing propulsion, the engine also drove a 24 volt DC generator and the constant drive mechanical sea water/bilge pump. The sea water/bilge pump, could deliver 420 litres of water per minute. Depending on the setup of the distribution valves, it could pump the engine room bilge, the fish room bilge, or deliver sea water to deck for deck washing. Since the pump could not be disengaged, it was necessary to have a continuous flow of water through it to prevent it from overheating and seizing.

Vellee's auxiliary engine powered a generator for charging the 24 volt batteries and a 350 litre/minute bilge pump. However, this engine had been seized for several months prior to the accident. To compensate for this loss of charging and pumping capacity, an enhanced battery charger with a shore power connection facility had been installed, and an automatic submersible electric pump had been piped into the cabin bilge, which was a continuation of the engine room bilge. This pump was activated by a float switch in the cabin bilge, but there was no indicator in the wheel house to show when it was running. The pump could also be manually activated by a switch close to the top of the engine room hatchway.

The vessel had two hand pumps: one for the fish room and one for the engine room. They had not been operated or maintained since November 2006, when they had been tested as part of a UK Fishing Vessel Certificate inspection conducted by the MCA.

Vellee also had a petrol-driven salvage pump stored in the fo'c'sle as an additional source of emergency pumping.

Bilge alarms

Vellee had three high-level bilge alarms, as required by the "Fishing Vessels Code of Safe Working Practice for the Construction and Use of 15 metre length overall (LOA) to less than 24 metre registered length (L) Fishing Vessels" (the Code). These were float switch activated alarms, one in the fish room and two in the engine room.

During fishing operations the vessel was prone to accumulating bilge water as a result of melting fish ice and the natural seepage of sea water common on most wooden vessels. When *Vellee* was rolling in a seaway this water would regularly activate a bilge alarm.

Vellee's bilge alarms had been repaired on several occasions since she was acquired in 2006. The most recent repair and test of the system was in May 2010.

Crew

The skipper for the passage to Kilkeel joined *Vellee* on 1 August. He had been the skipper of this vessel on numerous occasions over the years and was familiar with her layout. He was 56 years old, held all the necessary Seafish[5] training certification and had owned and been the skipper of vessels continually since acquiring his Second Hand (Fishing) Certificate of Competency in 1977.

Vellee's mate was the skipper's 27 year old son, and was part owner of the vessel. He had been employed at sea since the age of 16 and held all the necessary Seafish training certification.

The deckhand was a 54 year old Latvian national who had joined *Vellee* 3 weeks before she sank. He held all the appropriate safety certificates for his role and had sailed on UK fishing vessels for a number of years.

ANALYSIS

The flooding

Vellee sank as a result of catastrophic flooding from an unidentified source low down in the vessel.

Two of the vessel's main engine cylinder liners needed to be replaced as a consequence of severe electrolytic corrosion only days before her final voyage. It is highly probable that electrolytic corrosion had also affected the vessel's sea water piping and associated fittings, weakening their integrity and ultimately causing a failure.

[5] Seafish: the Sea Fish Industry Authority, a non-departmental public body with responsibility for delivering mandatory training courses to the fishing industry.

Investigation by marine electricians had identified the probable sources of the electrolytic action and repairs were made to prevent further electrolysis. However, no further inspections were made and the owners issued no instructions to identify other areas that might have also suffered from electrolytic corrosion. Furthermore, no precautions were taken to combat the increased risk of flooding resulting from electrolytic corrosion of sea water piping and fittings. These precautions could have included:

- Testing of the bilge alarms.
- Ensuring that sea water isolating valves were free moving, and that their remote closure mechanisms were working and were sited at a substantial height above the floor plates.
- Ensuring that all pumps, including the petrol-driven salvage pump were available and functioning.

Bilge alarms

No bilge alarms sounded during the flooding. This lack of early warning resulted in both the source of the water ingress and the ship's side sea water valves being submerged and, hence, inaccessible by the time the flooding was discovered.

Neither the skipper nor the mate had been concerned by the lack of bilge alarm activation during the voyage since *Vellee* had no ice on board and the sea state had been benign since departure, with little water movement within the bilges. Any small amount of water that might have accumulated would have been removed by the automatic submersible pump without the crew necessarily being aware the pump was operating.

It is not known why *Vellee*'s bilge alarm systems failed. The Code requires a minimum of two independent engine room bilge alarm systems so that in the event of malfunction of one system, the other still provides protection in this critical compartment. It has not been possible to establish if *Vellee*'s bilge alarm system circuits were independently wired, but MCA surveyors have occasionally found installations on vessels where multiple sensors were attached to a single alarm circuit. Had this been the case on board *Vellee*, then a single circuit failure could have disabled the entire bilge alarm system. However, since these alarms had not been tested since May 2010, it is equally possible that one of the engine room bilge alarm systems had failed during the 14 months before the accident, and that the vessel had been operating with a single functioning bilge alarm for some time.

Pumping arrangements

Vellee's main sea water/bilge pump ran continuously, pumping either to the deck wash or overboard discharge, with no facility to disconnect it from the main engine; if this pump was allowed to run dry it would seize. To operate with such systems is considered poor practice because:

- Sea water is circulating continuously, increasing the possibility of flooding should any part of the system fail.
- Impellers, casings and pipes are worn needlessly, reducing the pumping efficiency.
- There is an increased risk of back-flooding from the sea to the bilges in the event of valves failing to seat properly when changing over from deck wash to bilge pumping.
- It is an inefficient use of engine power.

It is highly probable that this pump's design capacity of 420 litre/minute had been significantly reduced by wear and tear from its continuous running.

Vellee's auxiliary engine had been out of commission for several months. By design, this was the vessel's secondary means of bilge pumping and, had it been functional, it would have provided significant additional pumping capacity.

Vellee's actual secondary means of bilge pumping was the automatic submersible electrical pump. The lack of a "pump running" indicator in the wheelhouse meant that watchkeepers were unable to monitor and consequently investigate the cause of pump activation, such as an abnormal level of water ingress.

Vellee's two hand pumps were not in a state of readiness. Had they been operational they could have been utilised in the time leading up to the abandonment.

The petrol-driven salvage pump had seldom been used, and over time had become buried under spare netting in the fo'c'sle. The owners had shown the foresight to invest in this pump, recognising the possible need for it at some point in the future. However, no suitable storage had been arranged for it, and thus it was not available when most required.

Emergency actions and abandonment

By the time the flooding in *Vellee*'s engine room was discovered the situation was already serious, and the skipper took the precaution to launch a liferaft and tie it alongside. This was sensible under the circumstances and enhanced the crew's chances of survival. However, the decision to delay contacting the coastguard was flawed. Despite the skipper and mate's belief that their pumps could cope, early communication with the coastguard would have enabled them to deploy SAR assets with salvage pumps, which might have successfully saved the vessel. Early attendance by these SAR assets would also have provided increased protection for the crew when final abandonment proved necessary.

Vellee's crew had the foresight to take a hand-held radio and additional distress rockets with them to the liferaft. They did not take their EPIRB with them, but fortunately it floated free and activated when *Vellee* sank, giving the SAR units an approximate position of the survivors. It should be noted that in these circumstances, the EPIRB indicates the position of the sinking vessel, not the survivors in a liferaft. There have also been instances when EPIRBs have failed to float free from sinking vessels. Had the crew taken the EPIRB with them when they abandoned ship they would have ensured that it did not get carried to the seabed as the vessel sank, while also providing the SAR units with the best chance of locating them.

CONCLUSIONS

- The source of *Vellee*'s water ingress is unknown, but it is probable that it was a result of a catastrophic failure of sea water piping or associated fittings arising from advanced electrolytic corrosion.
- Having identified significant electrolytic corrosion on board, no attempts were made to ensure the integrity of pipework, and no precautions were taken to combat the increased risk of flooding.
- The bilge alarms failed to operate and had not been tested or maintained for 14 months prior to the accident.
- The vessel's main sea water/bilge pump was permanently operating, leading to reduced efficiency and an increased risk of flooding.
- An inoperable auxiliary engine significantly reduced the vessel's potential pumping capacity.
- The lack of a "pump running" indicator on the automatic submersible pump might have masked early signs of flooding.
- *Vellee*'s emergency pumping systems were not maintained, tested or kept in a state of readiness.
- The coastguard was not notified in the early stages of the emergency, so was unable to provide additional pumps to the vessel in time to help prevent it from sinking.
- The crew abandoned safely to a well prepared liferaft but did not take the vessel's EPIRB with them.

RECOMMENDATIONS

2012/101 The **owners of *Vellee*** are recommended to:

- Improve the planned maintenance and inspection regimes on all vessels in which they hold an interest, with particular focus on the integrity of sea water systems, hull fittings and identification and prevention of electrolytic corrosion.

SHIP PARTICULARS

Vessel's name	*Vellee*
Flag	UK
Classification society	Not applicable
IMO number/fishing numbers	N 962
Type	Fishing vessel; trawler
Registered owner	Privately owned
Manager(s)	Not applicable
Construction	Wood; carvel planked
Length overall	19.81m
Registered length	18.66m
Gross tonnage	103.17
Minimum safe manning	Not applicable
Authorised cargo	Not applicable

VOYAGE PARTICULARS

Port of departure	Fraserburgh
Planned port of arrival	Kilkeel
Type of voyage	Sea passage
Cargo information	None
Manning	3

MARINE CASUALTY INFORMATION

Date and time	6 August 2011; 0030 UTC+1
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	6 miles west of Neist Point, Isle of Skye
Place on board	Complete vessel
Injuries/fatalities	None
Damage	Vessel lost
Ship operation	On passage
Voyage segment	Fraserburgh to Kilkeel
External & internal environment	Light airs; calm seas; good visibility; dark. Tidal stream – north east at 0.3kt
Persons on board	3