MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

VERY SERIOUS MARINE CASUALTY | REPORT NO 19/2016 | OCTOBER 2016

Fatal accident while manoeuvring *Svitzer Moira* alongside an unmanned tug Royal Portbury Dock, Bristol 29 December 2015

SUMMARY

On 29 December 2015, Mr Kevin Jackman, the engineer of the 29m harbour tug *Svitzer Moira* **(Figure 1)**, was crushed and fatally injured after he fell from his vessel as it was being manoeuvred alongside an unmanned tug in Royal Portbury Dock, Bristol.

The MAIB investigation concluded that the engineer probably fell while transferring to the unmanned tug before *Svitzer Moira* had come fully alongside.

Although the vessel's crew provided first-aid and emergency medical services arrived promptly following the accident, the engineer died of his injuries at the scene.

There were no dedicated berths for tugs within Royal Portbury Dock, and so, when not in use, these vessels were moored alongside commercial berths. This meant that the tugs were often required to move from a berth to make way for an arriving vessel. The port tugs were not manned on a continuous basis and it had become common practice for a tug to move an unmanned tug.

Figure 1: *Svitzer Moira*

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The investigation found shortcomings in the oversight and control of deck operations and lapses in the use of personal protective equipment indicative of a significant divergence between company instructions and working practices on board that had not been corrected by shore management.

Following an internal investigation of the accident, Svitzer Marine Limited has identified a number of remedial measures which include a review of relevant safe systems of work and their associated risk assessments, and actions aimed at improving the safety culture on board its vessels.

In view of the actions taken following the accident, no recommendations have been made in this report.

FACTUAL INFORMATION

Narrative

At 0930 (UTC[1]) on 29 December 2015, *Svitzer Moira*'s master was requested by the Svitzer duty tug controller to be on board *Svitzer Moira* at 1930 ready to assist a car carrier that was scheduled to depart from Royal Portbury Dock at 2000. A second Svitzer tug, *Porthgarth,* was also scheduled to assist.

During the afternoon, both tug masters were advised that their orders had changed. They were now to be on board for 1900 as the car carrier was no longer sailing, but shifting to another berth within the port that was occupied by four Svitzer tugs. The intention was to use *Svitzer Moira* and *Porthgarth* to move two other tugs, *Svitzer Ellerby* and *Thorngarth*, to a vacant berth, prior to assisting the car carrier.

The master boarded *Svitzer Moira* at 1900 and joined the engineer and the deckhand who were in the mess room. The engines were running, and the tug's mooring lines had been singled up in preparation for moving.

Porthgarth's crew were also on board, socialising with the engineer and deckhand, but shortly after the master's arrival they returned to their vessel. *Svitzer Moira*'s master went to the wheelhouse, leaving the deckhand and the engineer in the mess room. He checked and accepted the handover notes that had been left on the computer by the previous crew, and completed a departure checklist. It was dark and there was a south-westerly breeze.

The master requested bridge control of the engines by calling the engineer on his portable radio. The engineer acknowledged the request and proceeded from the mess room to the control room where he transferred control of the engines to the wheelhouse. Meanwhile, the deckhand raised the gangway.

At 1918, the master requested permission from Vessel Traffic Services (VTS) for *Svitzer Moira* to leave the berth. Permission was granted and, at 1920, the mooring ropes were let go.

Svitzer Moira departed its berth and was manoeuvred approximately 40 metres ahead until it was abeam of *Svitzer Ellerby*, a sister vessel that was moored alongside the same quay **(Figure 2)**. *Svitzer Ellerby* was unmanned and unlit.

As *Svitzer Moira* came alongside *Svitzer Ellerby,* the deckhand, who was positioned forward, lassoed a bitt on *Svitzer Ellerby* with the eye of a mooring rope. Using his portable radio, he requested some minor adjustments to the vessel's relative fore and aft position to *Svitzer Ellerby*. He then made the rope fast and began running a second rope.

[1] Universal Co-ordinated Time

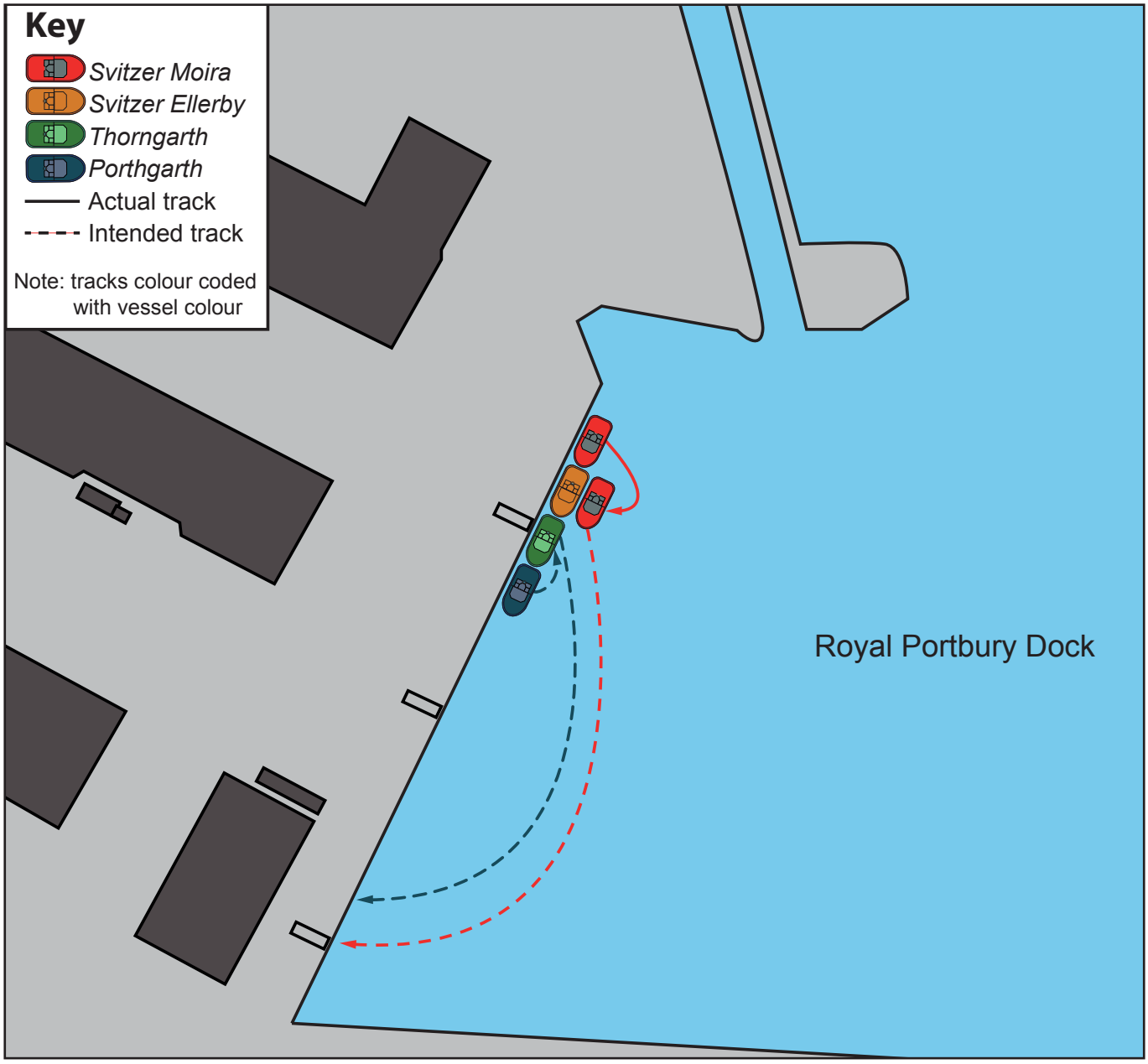

Figure 2: *Svitzer Moira*'s intended manoeuvre

The master then applied athwartships thrust to push *Svitzer Moira* bodily against *Svitzer Ellerby* and maintain its parallel position alongside. He looked aft and noticed that the stern rope that had been prepared on the aft deck was unexpectedly still lying slack.

The master left the wheelhouse to get a better view of the aft deck. He could not see the engineer so went down to the aft deck and called to the deckhand, who was now making his way aft having made the second forward rope fast. The deckhand did not know the whereabouts of the engineer, who normally secured the amidships rope and the stern rope. The deckhand noticed that neither rope had been made fast and that the eye of the amidships rope was lying slack over *Svitzer Ellerby*'s bulwark **(Figure 3)**. The deckhand straddled the bulwark with the intention of boarding *Svitzer Ellerby* to make the amidships rope fast. He then saw the engineer lying on and partly trapped between the longitudinal fendering of the two tugs, in a position forward of *Svitzer Moira*'s bulwark gate, which was open.

Figure 3: Amidships mooring rope as found following accident (reconstruction)

He informed the master, who returned to the wheelhouse and, at 1925, called *Porthgarth* on VHF[2] radio to request assistance. He also advised VTS and requested medical assistance. The master then left the wheelhouse and returned to the main deck to assist the deckhand, who was holding onto the engineer. *Porthgarth*'s crew arrived quickly and also assisted the deckhand. The master then returned to the wheelhouse to declutch the engines, which allowed *Svitzer Moira* to move away from *Svitzer Ellerby* and so enable the engineer to be freed. The engineer was recovered onto the deck of *Svitzer Ellerby* and the crew started to administer first-aid.

At 1940, an ambulance arrived on scene followed, at 1953, by two more.

At 2017, despite the efforts to save him, the engineer was declared deceased by a doctor at the scene.

Vessel

Svitzer Moira was an Azimuth Stern Drive tug, built in Japan in 1998. The tug, which had a forward towing winch and a bollard pull of 50 tonnes, had been based at Bristol since 2012.

The wheelhouse was accessed via a stairwell from the main deck. Access to the accommodation, mess room and engine room was also from the main deck.

On the starboard side of the main deck was a permanently attached gangway with a pivot that enabled it to be raised or lowered as required. A bulwark gate was located aft of the gangway **(Figure 4)**.

[2] Very High Frequency

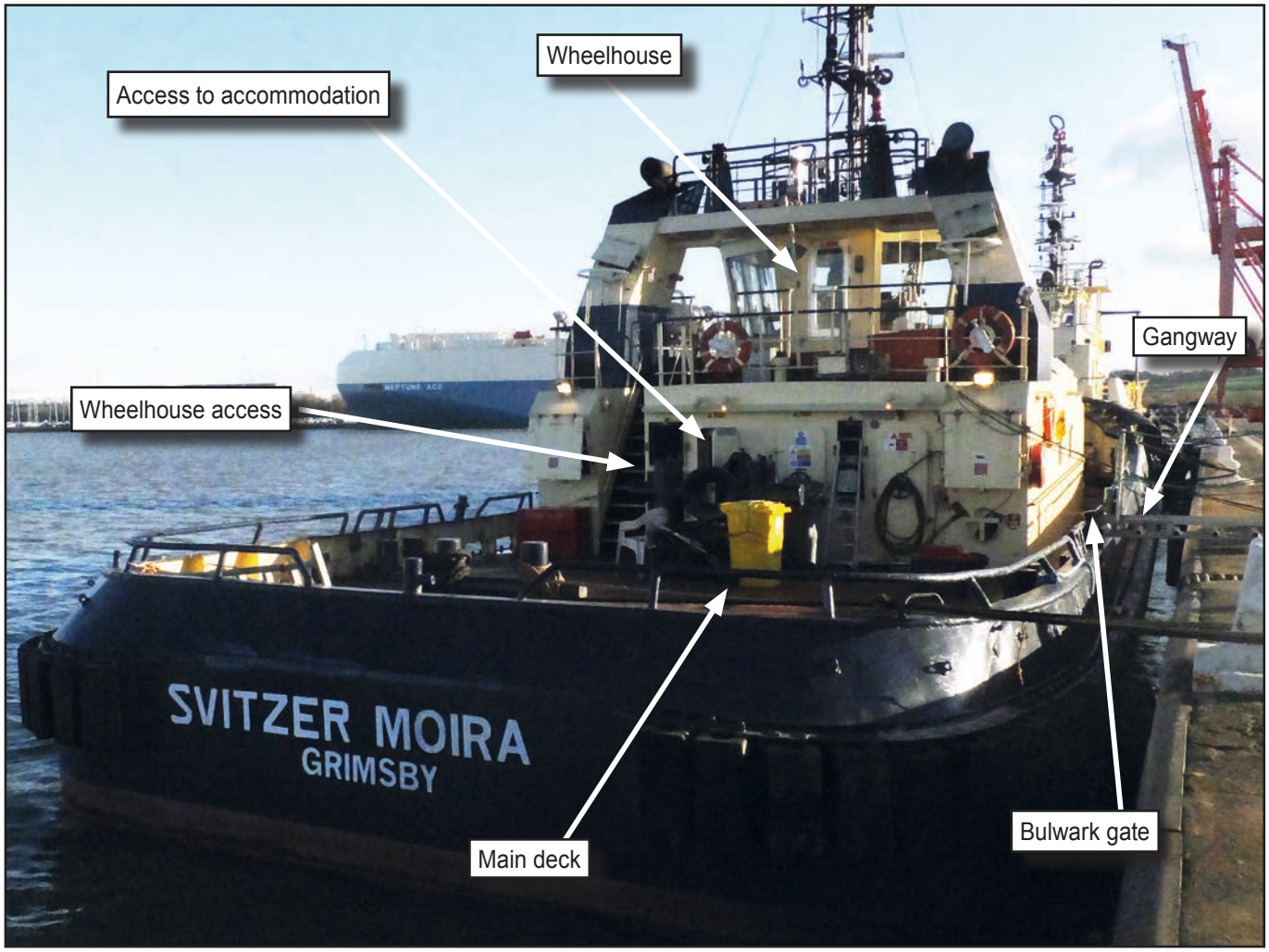

Figure 4: *Svitzer Moira*

Wheelhouse visibility

From within *Svitzer Moira*'s wheelhouse visibility of the starboard side of the aft deck was obstructed by the funnels, and the amidships mooring bitt and the bulwark gate could not be seen.

Mirrors had been fitted, externally to the wheelhouse, allowing the master some visibility of the starboard quarter.

There was good visibility forward, with the forward mooring bitt clearly visible to the master.

Tug operation and manning

Svitzer Marine Limited (Svitzer), part of the Maersk Group, operated around 80 tugs in UK ports.

Svitzer maintained a fleet of five tugs in the port of Bristol, four of which were available for use. The tugs were not permanently manned and the required number of duty tug crews was called in when required. At the time of the accident, the four available tugs were berthed in Royal Portbury Dock.

The tugs' crews operated a 1-week on, 1-week off duty rota, with four crews being available on each duty week. Each tug had a crew of three for harbour operations, comprising a master, an engineer and either a mate or deckhand. The crew had the option of residing on the tug during their duty week. If they chose not to do so, their contract required them to reside within 90 minutes travel of the port.

There were no dedicated berths for the Svitzer tugs within Royal Portbury Dock. Tugs were moored on berths that were vacant and anticipated to remain so. VTS instructed individual tug masters on where to berth their vessels on completion of a job. Tugs were frequently moved when berths were required to be used by ships. It was common practice for a tug to move an unmanned tug.

Each of the four operational tugs had their own crews assigned, although the crews were familiar with the other tugs and could operate them if required. Crew changeover occurred each Monday on the afternoon tide. A physical crew handover was not required as a computerised handover system was in place.

Svitzer Moira's and *Porthgarth*'s crews had begun their duty week on the afternoon of Monday, 28 December. This was their first job of the new duty period.

One of the duty tug masters was appointed the Svitzer duty tug controller and acted as a link between VTS and the remaining duty tug masters. VTS notified the duty tug controller of the times vessel movements were planned to occur, and of the number of tugs required for each movement. The duty tug controller then called or sent a text message to the master of each of the tugs that he required, advising them of the time their tug needed to be available. The tug masters, in turn, either called or sent text messages to their crews advising them of the time they were required to be on board.

It was normal practice for the tug crews to be on board their vessels about 30 minutes before the start of a task.

Crew experience, qualifi ation and training

The master had been assigned to *Svitzer Moira* since it arrived in Bristol in 2012. He had been at sea for 35 years with the past 28 years spent exclusively on tugs, and held an appropriate Certificate of Competency (CoC).

The deckhand had also been assigned to *Svitzer Moira* since 2012, and had worked on tugs in Bristol for 38 years.

Kevin Jackman was 61 years old and had been employed as an engineer on *Svitzer Moira* for 1 year. He held an STCW[3] III/2 CoC that qualified him to serve as an engineer on tugs of less than 6000kW operating within 30 miles of a safe haven. He had been employed in a full-time capacity with Svitzer since 2004, serving as engineer on a wide variety of tugs in several ports.

In addition to engineering and maintenance tasks, the engineers acted as the winch operators during towage operations. They also assisted on deck when required, including during mooring operations. While Svitzer required an engineer new to a vessel to be familiar with mooring operations, assisting on deck did not feature in the engineers' formal job description, and there is no record of Kevin Jackman having received familiarisation training for this task.

Safety management system

All tug crews had access to Svitzer's computer-based safety management system (SMS), which contained safe systems of work and associated risk assessments for the operational tasks that the tugs were expected to undertake. The SMS included two particular safe systems of work that incorporated the hazards that could be associated with moving an unmanned tug:

The 'mooring' safe system of work included the following control measures:

- Prevent a slippery deck.
- Use correct personal protective equipment (PPE), including safety boots, safety helmet, personal flotation device (PFD) and gloves.
- Conduct a toolbox talk to establish the mooring arrangement and method.
- Check communication methods are clear and functioning.
- Ensure safe means of access – do not jump.
- Ensure proper lighting on deck.
- Do not stand in rope bights.

The 'barge handling (alongside)' safe system of work included the following control measures:

- Tug to be suitable for the job.
- Master to be familiar with the manoeuvre.
- Weather to be suitable.
- Provide safe means of access.
- Transfer crew only with permission of the master.
- Ensure proper lighting on deck of tug and barge during darkness.
- Crew to wear PFDs.

Svitzer Moira's crew had not consulted either of the above safe systems of work on the computer-based SMS.

[3] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended

Personal protective equipment

Merchant Shipping Notice (MSN) 1870 (M+F) provides updated safety standards applicable to Personal Protective Equipment covered by The Merchant Shipping and Fishing Vessels (Personal Protective Equipment) Regulations 1999 (S.I. 1999/2205). MSN 1870, paragraph 4, Use of PPE by seafarers and other workers, states:

> *4.1 The shipowner and employer must ensure so far as practicable that PPE is used as instructed – e.g. that it is only used for the purpose for which it is designed, and that it is put on and worn correctly.*
>
> *4.2 Seafarers and other workers should receive adequate and appropriate training so that they are aware of the risks against which the PPE is designed to protect them, how and when to use it, and how to look after it correctly.*
>
> *4.3 Seafarers and other workers are required to wear and use the PPE which has been issued to them when appropriate, and to comply with any instruction provided.*

Svitzer's policy on PPE was contained within its SMS, and the company had provided PPE to all of its tug crews in Bristol. When new PPE was required, crew members ordered it via the company from an approved catalogue. *Svitzer Moira*'s crew members had each been supplied with overalls, safety helmet, high-visibility jacket, PFD and safety boots. Spare PFDs and safety helmets were kept on each tug in the main deck alleyway.

The engineer had been issued with new safety boots 3 months before the accident and his personally issued PFD had recently been returned to him following its annual service. At the time of the accident the engineer was not wearing a PFD and had chosen to wear a pair of walking boots rather than his company supplied safety boots. No safety helmet was found either in the vicinity of the accident or in the water.

Footwear testing

Independent comparative slip resistance tests were conducted on the walking boots the engineer was wearing at the time of the accident and a new pair of safety boots of the type supplied to him by the company **(Figure 5)**. The tests concluded:

> *'The worn boots are clearly not in a condition that would be recommended for wearing in the work place due to the general state of wear of the upper, sole and construction. The integrity of the construction in particular is of concern with the shoe bottom coming away from the upper presenting a safety risk. The outsole itself is also in need of replacing being materially changed from its original design and the wearing face breaking down.*
>
> *Notwithstanding the above, however, there is no indication from the slip resistance testing completed and reported here, that the worn boots would have been expected to have a significantly different level of slip resistance performance in wear on wet and otherwise contaminated surface from the new boots.*
>
> *It is also worth noting that comfort is a factor to be considered in risk assessment related to footwear. Shoes that are comfortable and compliant to the wearer's foot may provide additional sense of foot security and underfoot awareness.'*

Figure 5: Walking boot undergoing slip resistance testing

Previous accident

On 3 August 2015, a shore worker was fatally injured when he became trapped between the hull of the passenger vessel *Oldenburg* and a vertical fender as he attempted to disembark through a main deck shell door and along the ship side belting.

Oldenburg was alongside a berth close to the harbour entrance and, after the shore worker had boarded, the vessel's gangway had been withdrawn due to the vessel's movement in the prevailing swell.

The main deck shell door had been left open and unguarded and, while attempting to return ashore, the shore worker left the vessel via the door and made his way along external belting towards a platform and steps on the quayside. The vessel's crew were unaware that he intended to return ashore at that time or by that route.

Following the accident the crew went to the man's aid but, due to his injuries he died shortly after arriving at a local hospital.

The MAIB safety investigation[4] concluded that the hazards associated with leaving the shell door open and unsupervised had not been recognised. Consequently, no supervision had been provided.

[4] MAIB Report No.3/2016

ANALYSIS

Accident overview

In the absence of witness evidence, it has not been possible to establish with certainty how the accident occurred.

The engineer was found in the prone position, lying predominantly on top of the fendering between the two tugs. His body was angled such that he was facing *Svitzer Moira* with his head and right arm located between the fendering. Evidence indicates that the vessels remained together once athwartships thrust had been applied. Although the possibility that the vessels moved apart briefly once alongside each other cannot be discounted, that the engineer was found on top of and partially between the fendering suggests that he had passed outside *Svitzer Moira*'s bulwark before *Svitzer Moira* had come fully alongside *Svitzer Ellerby*.

The status of the amidships mooring rope indicates that the engineer had made an attempt to pass the eye of the rope over the corresponding bitts on *Svitzer Ellerby* but was unsuccessful. The open bulwark gate suggests that the engineer had opened it, to transfer to the unmanned tug in order to place the rope correctly over the bitt.

There were several trip hazards in the vicinity of the bulwark gate. These included the bulwark structure and the bolts used to secure the fendering in position **(Figure 6)**. *Svitzer Moira* was well illuminated but *Svitzer Ellerby* was in darkness, giving rise to an increased risk of tripping **(Figure 7)**.

It is probable that the engineer fell forward, possibly as a result of slipping or tripping as he exited through the bulwark gateway in an attempt to pass between the two tugs. As he fell he might have extended his right arm for protection, and possibly struck his head against something, rendering him unconscious.

Oversight and control of deck operations

The engineer's task on deck, initially, was to assist with securing *Svitzer Moira* alongside *Svitzer Ellerby*. To do this he needed to cross between the vessels to pass the eyes in the ends of the amidships and stern mooring ropes over the relevant bitts on *Svitzer Ellerby*, and then cross back to his own vessel to take up the slack and secure the lines. The frequency with which unmanned tugs were moved in the port meant that the crew had carried out similar tasks on numerous occasions and each crew member knew their role, although there is no record of the engineer having received familiarisation training for working as part of a mooring party.

From *Svitzer Moira*'s wheelhouse the master had limited visibility of the aft deck where the engineer was working and, in the dark conditions, he was restricted in his ability to see what he was doing or assure himself that the engineer was wearing the correct PPE. However, he also did not anticipate communicating with the engineer, made no attempt to do so, and expected that the engineer would not cross to the other vessel until he considered it safe to do so.

Svitzer's risk assessments for 'mooring' and 'barge handling (alongside)' required, among other items; a tool box talk to be carried out, correct PPE to be worn, communications to be clear and functioning, and crew to transfer only with the permission of the master. While the risk assessment for 'barge handling (alongside)' did not specifically include other unmanned vessels, a toolbox talk should have identified that *Svitzer Ellerby* was unmanned, and so the tug's crew would need to transfer between vessels to secure the ropes. There was, therefore, a need for crews to transfer only when it was safe for them to do so, and this required the master to communicate to them when he was content that his tug was securely in position and it was safe to move between vessels. A similar need for supervision was identified in

Figure 6: Bulwark structure, fendering and securing bolts

Figure 7: *Svitzer Moira* (left) alongside *Svitzer Ellerby* (right) at night

the MAIB report of the fatal accident on board *Oldenburg*. Further, gathering the crew together to brief them on the conduct of the task would have provided the master with the opportunity to check they were appropriately dressed, were carrying radios, and to carry out a communication check.

While not specific to moving unmanned tugs, the company's safe systems of work for 'mooring' and 'barge handling (alongside)' were adequate for the task, and had the control measures contained in them been applied it is likely that this accident would not have occurred.

PPE

Following the accident, *Svitzer Moira*'s engineer was found not to have been wearing a PFD or company approved safety boots, and if he was wearing a safety helmet it subsequently could not be found.

As required by MSN 1870 (M+F), Svitzer had taken appropriate action to provide the engineer with the PPE required to work on deck, and had an effective means by which crew could order replacement PPE when required. Further, the crew members were required to wear safety boots, a safety helmet, a PFD and gloves when carrying out mooring operations.

Had the engineer been wearing the required PPE at the time it is unlikely that it would have changed the outcome of this tragic accident. Nonetheless, he chose to proceed onto deck wearing walking boots instead of safety boots, and without his PFD, perhaps in the knowledge that his lack of PPE would not be challenged. The master had a duty to check that personnel were appropriately dressed for the task they were about to perform, and the logical time to do this would have been during a pre-task toolbox talk.

It has not been ascertained whether the lapses in PPE use on board *Svitzer Moira* were unusual, or had become normalised over time. However, when viewed in the context of the wider shortcomings evident in the oversight and control of deck operations (see above), they indicate a significant divergence between company instructions and working practices adopted at the work place that had not been corrected by shore management.

Frequent re-location of tugs

As there were no dedicated berths for tugs within Royal Portbury Dock, it was common practice for the tugs to be moved when their berths were required by other vessels. While it would be possible for manned tugs to move unmanned tugs, as occurred in this accident, other options were available. These included fully crewing and moving each tug individually, or using a crew to provide deckhands to handle the lines on an 'unmanned' tug so it could be moved by a manned tug. In the event, the crews chose to adopt the method that took them the least time but exposed them to the greatest risk as it required them to make the most transfers between vessels to unsecure and secure the mooring ropes.

Despite re-locating tugs within the port being a frequent activity, it had not been the subject of a formal assessment, and Svitzer had not issued specific instructions on how it should be accomplished. Human nature is often to adopt the quickest easiest method, but if the adopted method is considered not to be sufficiently safe then clear and explicit instructions are required about the method that is to be used.

There was an assumption by the tug's master that the crew would do the right thing. As such, poor practices had been allowed to develop.

CONCLUSIONS

- In the absence of witness evidence, it has not been possible to establish with certainty how the accident occurred.

- It is probable that *Svitzer Moira*'s engineer fell forward, possibly as a result of slipping or tripping, while transferring to *Svitzer Ellerby* before *Svitzer Moira* had come fully alongside.

- From *Svitzer Moira*'s wheelhouse the master had limited visibility of the aft deck where the engineer was working and, in the dark conditions, was restricted in his ability to see what he was doing.

- *Svitzer Moira*'s master did not anticipate communicating with the engineer, made no attempt to do so, and expected that the engineer would only cross to the other vessel when he considered it safe to do so.

- While not specific to moving unmanned tugs, the company's safe systems of work for 'mooring' and 'barge handling (alongside)' were adequate for the task, and had the control measures contained in them been applied it is likely that this accident would not have occurred.

- The engineer was not wearing the appropriate PPE at the time of the accident.

- When viewed in the context of the wider shortcomings evident in the oversight and control of deck operations, the lapse in PPE use on board *Svitzer Moira* indicates a significant divergence between company instructions and working practices adopted at the work place that had not been corrected by shore management.

- Despite re-locating tugs within the port being a frequent activity, it had not been the subject of a formal assessment, and Svitzer had not issued specific instructions on how it should be accomplished.

ACTION TAKEN

Svitzer has issued Safety Flash No. 08/2015 to its fleet, reminding all personnel of the following:

- *'When a tug is underway, crew members must always stay inside the tug's bulwarks until the Master has indicated that the tug is safely alongside the quay or another vessel and that it is safe for the crew member to move outside of the bulwark.*

- *Safe access/egress must always be established and confirmed prior to any crewmember moving between vessels or between a vessel and the quayside.'*

Following its own investigation of the accident, Svitzer has reported to have initiated the following measures:

1. *'To review, and revise if/as necessary, the safe systems of work, risk assessments and training provided for Mooring and Unmooring, Access and Egress, and Movement of Unmanned Units.*

2. *To implement behavioural safety training and a Master's responsibility course; to re-emphasise to crews the consequences of not following safety procedures.*

3. *Exploring a permanent berth solution with Bristol Port and install signage to reinforce Svitzer's PPE policy.'*

The Bristol Port Company conducted a review of Svitzer's SMS and has introduced procedures to increase the control and monitoring of tug movements and practices within the port.

RECOMMENDATION

In view of the actions taken by Svitzer Marine Limited and the Bristol Port Company, no recommendations have been made in this report.

SHIP PARTICULARS	
Vessel's name	*Svitzer Moira*
Flag	UK
Classification societ	Lloyd's Register
IMO number/fishing number	9185229
Type	Azimuth Stern Drive tug
Registered owner	Svitzer Eastlands Limited
Manager(s)	Svitzer Marine Limited
Year of build	1998
Construction	Steel
Length overall	29.0 m
Registered length	27.18 m
Gross tonnage	267
Minimum safe manning	3
Authorised cargo	Not applicable
VOYAGE PARTICULARS	
Port of departure	Not applicable
Port of arrival	Not applicable
Type of voyage	Internal waters
Cargo information	Not applicable
Manning	3
MARINE CASUALTY INFORMATION	
Date and time	29 December 2015, at approximately 1920 (UTC)
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Royal Portbury Dock, Bristol
Place on board	Main deck
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Mooring alongside another tug
Voyage segment	Arrival
External & internal environment	Wind: SW F4. Calm sea. Showers.
Persons on board	3