MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

SERIOUS MARINE CASUALTY | REPORT NO 11/2024 | SEPTEMBER 2024

Serious injury to a crew member on board the survey and supply vessel *Kommandor Orca* at Portland, England on 16 August 2022

Email: maib@dft.gov.uk
Tel: +44 (0)23 8039 5500

SUMMARY

On 16 August 2022, the second officer of the UK registered survey and research vessel *Kommandor Orca* sustained crush injuries to his lower left leg while operating one of the rail-mounted deck cranes. His leg became caught in the crane's rack and pinion traversing mechanism when he moved the crane aft for a lifting operation. A helicopter transferred the second officer to hospital, where his leg required amputation below the knee.

The investigation found that the crane was not being used in accordance with the manufacturer's operating manual and that the crew had used the local crane controls designed for emergency use only. There were no instructions on board for the use of the crane beyond those stated in the manufacturer's operating manual. The crew's inappropriate use of the crane controls was normalised behaviour and had been adopted for convenience.

The owner of *Kommandor Orca*, Hays Ships Ltd, has introduced measures to prevent a reoccurrence.

Image courtesy of Hays Ships Ltd

Kommandor Orca

FACTUAL INFORMATION

Background information

Kommandor Orca was equipped with two deck cranes, one to port and one to starboard, that could be moved longitudinally along rails fixed on top of their respective bulwarks. Drive power was delivered by crane-mounted pinion wheels that engaged with racks mounted on the inboard rails.

Narrative

At 0800[1] on 16 August 2022, *Kommandor Orca* was alongside at Portland, England preparing for a contract. The vessel's chief officer (C/O) held a toolbox talk with the vessel's second officer (2/O), fitter and a deck rating to plan the day's work. During the toolbox talk the C/O also completed the lifting plan and permit to work for moving several items of deck gear and machinery. The C/O returned to the bridge after the toolbox talk, while the 2/O and the fitter used a pallet truck to move equipment on the vessel's main deck. They decided to move heavier items using the starboard rail-mounted crane **(Figure 1)**.

Image courtesy of Tugspotters.com

Figure 1: *Kommandor Orca*'s deck arrangement

The 2/O climbed up the ladder from the aft main deck and walked forward along the starboard crane rail to access the crane **(Figure 2)**. The 2/O then used the local hydraulic valve controls in the pedestal **(Figure 3)** to manoeuvre the crane to reposition two loads on the main deck. While conducting a third lift, the 2/O stood with his left foot on the inboard bulwark and his right foot on the crane drive motor casing **(Figure 4a)**; this enabled him to see both the fitter and the load positioned 4m below on the main deck.

At 0841, *Kommandor Orca*'s 2/O pulled the travel control lever to move the crane a few metres aft. At the same time, he moved his left foot from the bulwark to the rack **(Figure 4b)**. He then felt his left leg overalls being pulled, which unbalanced him and forced his right leg closer to his body. He held onto the

[1] All times used in this report are universal time coordinated plus 1 hour (UTC+1).

crane travel lever for balance, unintentionally pulling it further backwards, which increased the speed of the crane's traverse. As the 2/O's left foot and leg were dragged further into the rack and pinion drive, he let go of the travel lever, which stopped the crane, and then fell backwards.

The 2/O shouted for help and the fitter climbed up to the crane's rail. The fitter found the 2/O lying on his back with his left leg trapped between the rack and pinion. The 2/O instructed the fitter to move the crane forward; this action freed his leg, which was severely damaged below the knee. The C/O also arrived at the crane within 1 minute, having heard the commotion while returning to the deck, and sent the fitter to raise the alarm and mobilise the vessel's first aid team.

At 0845, a company representative, who was on board to observe the vessel's preparations, called the emergency services on their mobile phone.

Kommandor Orca's first aid team arrived at the accident site, and the C/O applied a tourniquet to the 2/O's leg. The crew then transferred the 2/O to a stretcher, where the C/O applied a brace to protect his crushed leg.

By 0913, an air ambulance helicopter had landed on the quayside. A nearby mobile shore crane was used to lift the 2/O to the quayside, and he was transferred into the helicopter and flown to a hospital. The surgeons could not save his left leg and it was amputated below the knee.

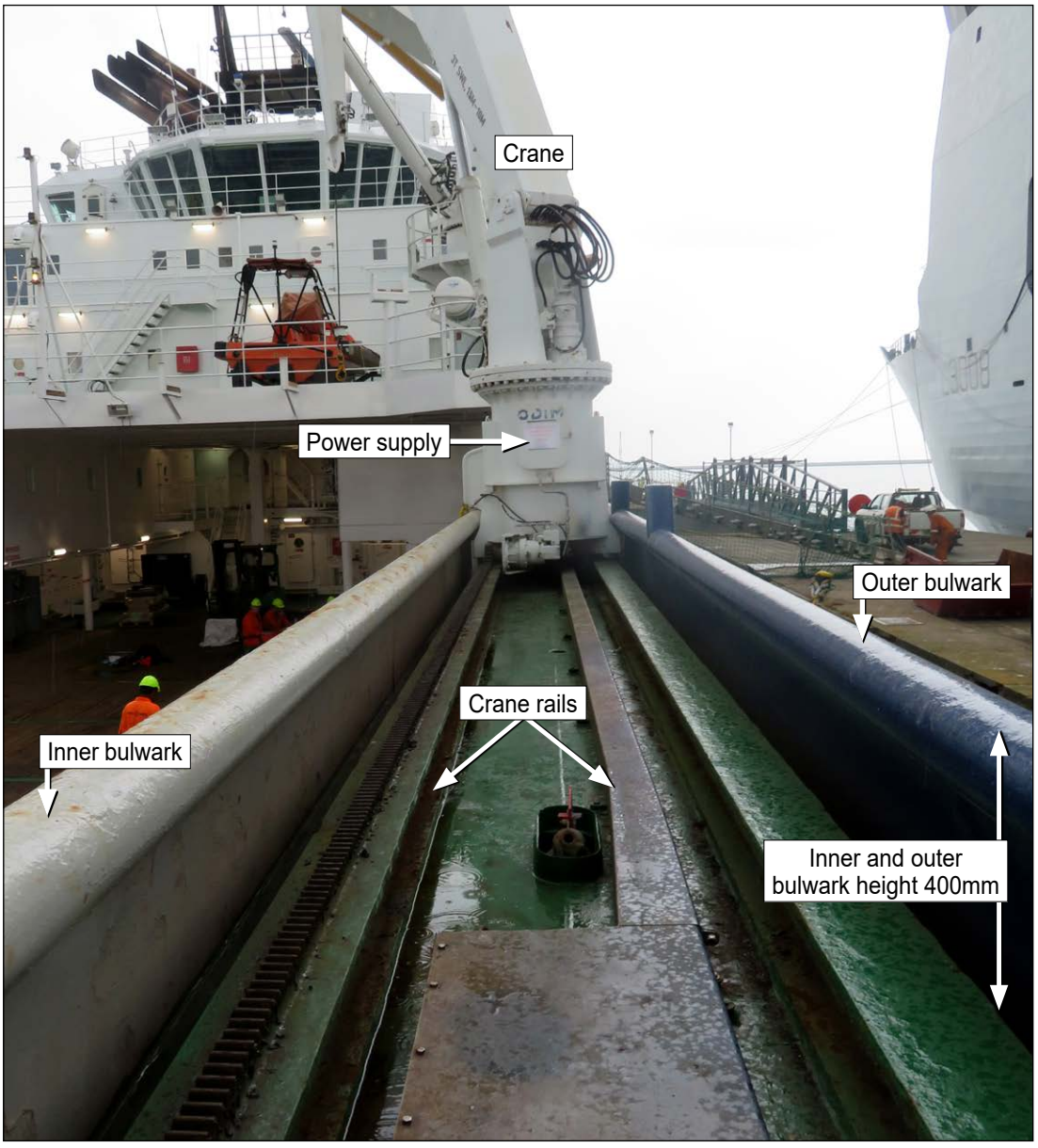

Figure 2: Starboard rail-mounted crane

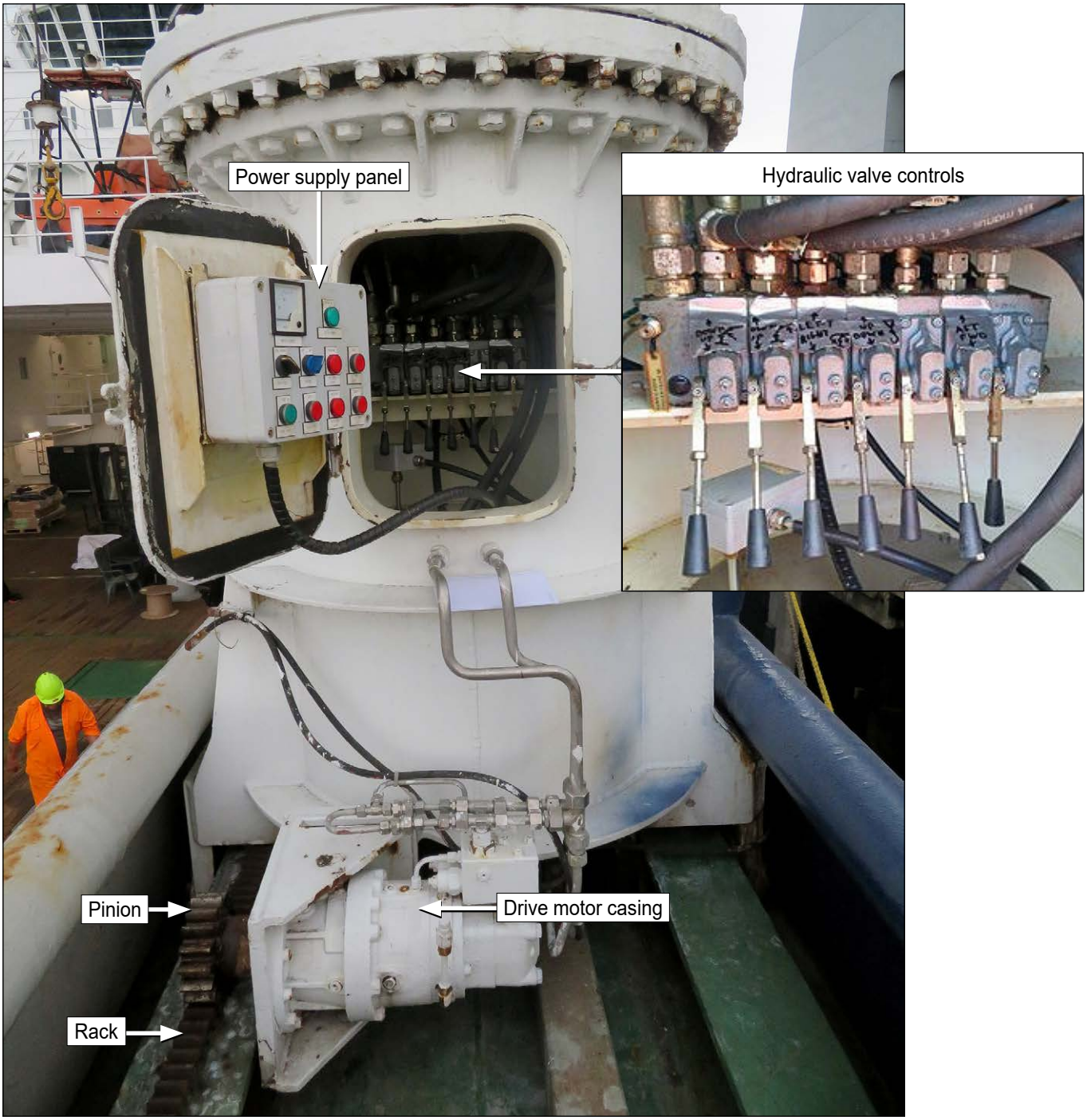

Figure 3: Crane local controls and (inset) the duct-taped instructions on the hydraulic valve controls

For illustrative purposes only: not to scale

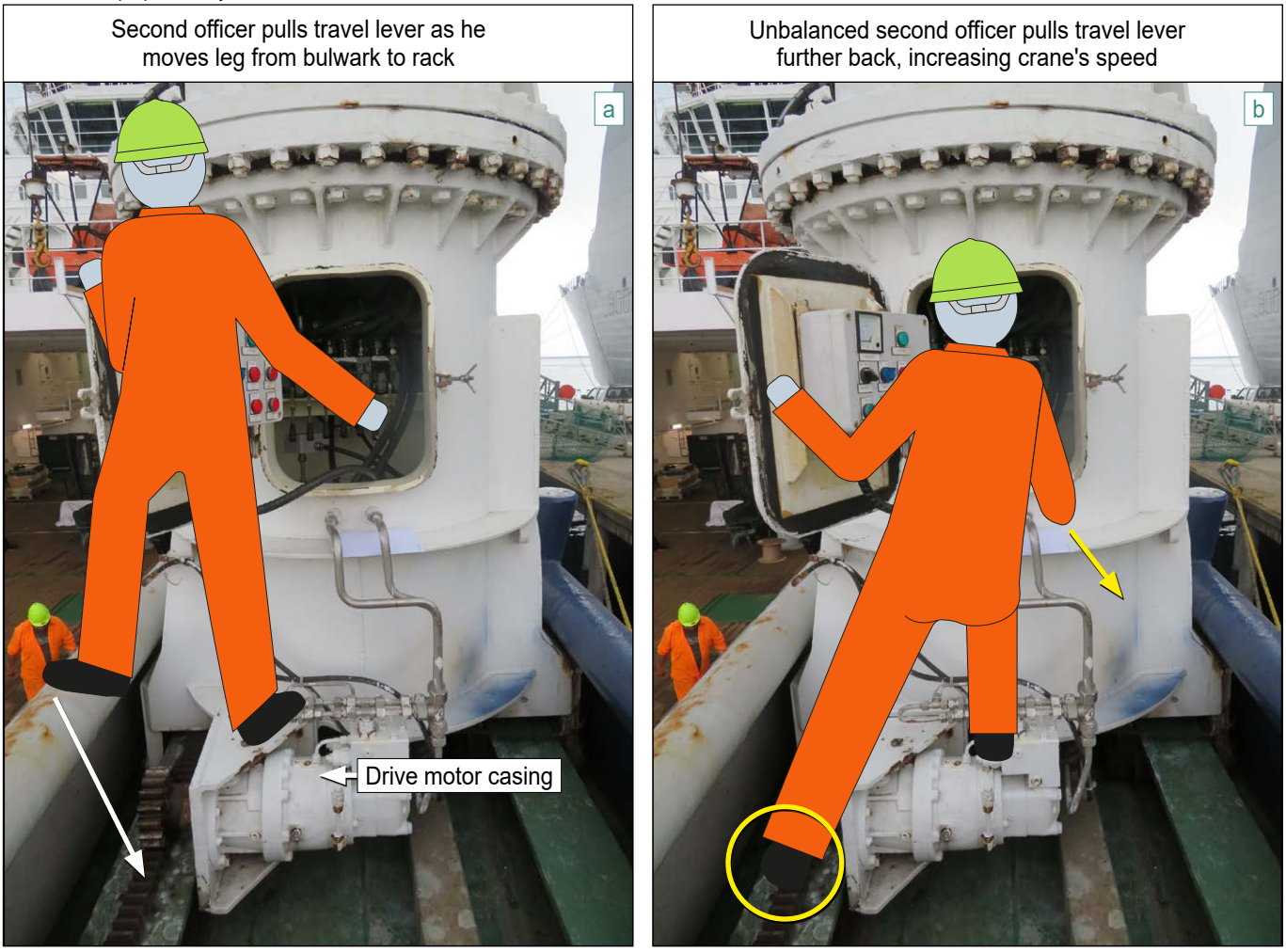

Figure 4: Positions and movements of the second officer

Vessel management

Hays Ships Ltd (the company) was a specialist ship provider that had operated several survey, research and patrol vessels during its 40-year history. At the time of the accident it owned and operated one other vessel, *Kommandor Iona*. The company was the holder of an International Safety Management Code (ISM Code) Document of Compliance (DoC), which was issued on 11 September 2020.

Kommandor Orca

Kommandor Orca was originally built as an anchor handling tug supply vessel and had been in cold lay up[2] for 18 months in Norway with no crew on board before the company purchased it in September 2021. The company's crew did not receive an operational handover from the previous owners or crew, and the vessel required extensive preparation before it sailed to Teesport, England, for surveys and inspection by the Maritime and Coastguard Agency (MCA). The preparations included the implementation of the company's approved Safety Management System (SMS). Following the issue of its required certificates. *Kommandor Orca* sailed to a shipyard in the Netherlands for conversion to a survey and research vessel. The vessel sailed from the shipyard for Portland on completion of this work, arriving on 15 August 2022, where it was mobilised for its first contract.

Crew

All of *Kommandor Orca*'s 14 crew members were appropriately qualified for their roles. The master was Montenegrin, the C/O was British, the injured 2/O was Filipino, and the remaining officers were Eastern Europeans. The ratings were all Filipinos. The ship's working language was English. On the day of the accident the crew were well rested. Post-accident there were no drug and alcohol tests performed; the 2/O was not taking any prescribed medication.

[2] Cold lay up: To take a ship out of service, during which time minimal maintenance work is conducted and few, if any, crew remain on board.

The 2/O had 12 years' experience at sea and had worked on inter-island ferries before joining the company in 2021. He had completed a 9-month contract on board *Kommandor Iona* and had joined *Kommandor Orca* 13 days before the accident. The mandatory familiarisation and training requirements that he had undertaken on the day he joined covered the use of the vessel's deck machinery and cranes and included using the local controls to operate the rail-mounted cranes. He had used the crane 3 or 4 times before the accident. At the time of the accident the 2/O was wearing orange overalls, a hard hat and safety boots.

The master had worked for the company for 6 years and had been in post for 18 months. The master had been part of the team that had joined to take over the ship after its lay up.

The C/O had 26 years' service with the company and was also its offshore marine superintendent. The C/O maintained the validity of their STCW[3] certificate of competency so that they could cover for deck officer roles when necessary.

The crew had a good understanding of the SMS and had not raised any concerns about the operation of the cranes.

The cranes

The vessel had two rail-mounted cranes, each with a safe working load of 3 tonnes, which were fitted 4m above the main deck on platforms running the length of the deck, one on the port side and one on the starboard side. An outer and inner bulwark of 400mm in height was adjacent to each crane rail **(**see **Figure 2)**.

The cranes could be controlled remotely, either from the bridge aft station overlooking the main deck **(Figure 5)** or by using a wireless remote control unit **(Figure 6)**. A wireless remote control fault required that the port side crane could only be operated using the local emergency controls, or the bridge control. The starboard crane was operable with both remote and bridge controls.

The crane pedestals housed the local hydraulic valve controls **(**see **Figure 3)** behind an access hatch. These local controls were proportional, which meant that the selected function sped up as the lever was increasingly pushed or pulled. At some point in time before the accident the crew had annotated the local controls using permanent marker pen on duct tape to indicate the function of each lever. The manufacturer's operations manual, which was available on board, stated that the local controls were for *emergency use only* and that normal operation was to take place using either the bridge station or the remote control unit.

Figure 5: Bridge aft station, showing left-hand crane control joystick

Figure 6: Wireless remote control unit

[3] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

Lifting plan and crane operation

The planned work was to move various items on the main deck to clear space for a container. *Kommandor Orca* was due to sail the following day and there was no undue urgency for the task to be completed. The C/O had followed the company's SMS and prepared a lifting plan, which included a permit to work and a generic risk assessment from the SMS: *Number 13 – Crane operation at sea or in port – Lifting stores, equipment, provisions etc*.

Neither the lifting plan nor the associated risk assessment completed by the C/O during the toolbox talk included the hazards of working at height or working near unguarded machinery.

Safety management system

Kommandor Orca's SMS contained a section for crane lifting operations and referenced applicable regulations and guidance, which are detailed below. The SMS procedure required that personnel were trained in the use of equipment, that a lifting plan was completed, and that crane safety checks were carried out before the operation. The generic instructions applied to all vessels in the fleet and detailed both the steps to be taken before conducting a lifting operation and the crane operator's responsibilities during the crane's use. The SMS made no reference to ship-specific operating instructions.

The crane lifting procedure stated that, *The controls of the crane must be permanently and legibly marked*. It noted in its pre-operational checks section that all machinery was to be adequately guarded.

The SMS detailed the training that was required before crew could work with cranes and undertake lifting operations. It stated that:

> *Training shall consist of theoretical instruction and supervised practical experience in order that the trainee fully appreciates the factors affecting the safe operation of the lifting appliance.*

The 2/O had received training in the use of winches and cranes on the day he joined *Kommandor Orca* and was issued with a certificate of completion in line with the SMS. The instruction on how to operate the cranes only covered the use of the local hydraulic valve controls and the 2/O was consequently unaware that the crane could be operated from either the bridge or the remote control unit.

International Safety Management Code

The ISM Code required owners and operators of ships to operate an SMS to ensure compliance with rules and regulations related to the objectives of the ISM Code. The ISM Code was expressed in broad terms and based on general principles and objectives, providing companies with the scope to develop their own SMS to meet its objectives.

A Safety Management Certificate (SMC), valid for 5 years, was issued to a ship when its SMS had been audited and found to comply with the operational requirements of the ISM Code, and where the operating company held a DoC. An interim certificate valid for a period not exceeding 6 months could be issued to a ship that was new to either a company or the flag state.

SMC audits for the issue of a full certificate were carried out when a ship was in its operational state and not in a shipyard or dry dock. Audits that were completed to extend the validity of an interim SMC while the ship was not operational were only valid for 6 months.

Section 7 of the ISM Code referred to shipboard operations. The UK instructions for the guidance of surveyors concerning the ISM Code contained the interpretation that:

> *The Company should establish the key shipboard operations and ensure that procedures and instructions are available for carrying out these operations. While shipboard operations will vary depending on ship type, it is suggested that plans and instructions for the following operations should be documented:*
>
> - *General shipboard operations.*

Safety Management Certificate audits

Kommandor Orca underwent MCA surveys and inspection in Teesport. These included an audit for an interim SMC, which was issued on 6 December 2021 with an expiry date of 6 June 2022. The audit identified several minor deficiencies that were rectified before the vessel's departure for the shipyard in the Netherlands.

On 31 May 2022, Det Norske Veritas (DNV)[4] started a further interim SMC audit of *Kommandor Orca* in the shipyard, which was undertaken when work to convert the vessel permitted. DNV completed the audit on 1 July, with no deficiencies or observations identified, and issued the vessel with an interim SMC with a 6-month validity.

None of these audits highlighted that there were no vessel-specific procedures for the key shipboard operation of using the deck cranes.

Regulations and guidance

The applicable regulations for access to and operation of the crane at the time of the accident were:

- The Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations 2006 (PUWER), referenced in Marine Guidance Note (MGN) 331 (M+F) Amendment 1;
- Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations 2006 (LOLER), referenced in MGN 332 (M+F) Amendment 1.

Both MGNs identified that the majority of injuries to crew involving lifting equipment occurred when crew were struck by, crushed or caught in, moving machinery. The causes were often attributed to incorrect practices, inadequate training or errors of judgement.

The position of the crane 4m above the working deck and bounded by 400mm bulwarks meant that staff using the crane's local controls were working at height and so *The Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Work at Height) Regulations 2010* and associated *MGN 410 (M+F) Amendment 2* applied for *Kommandor Orca*. The MGN identified several common factors associated with falls from height, which included:

- *Failure to recognise a problem.*
- *Failure to provide safe systems of work.*
- *Failure to ensure that safe systems of work are followed.*
- *Inadequate information, instruction, training or supervision provided.*
- *Failure to use appropriate safety equipment, including PPE e.g. safety harnesses.*
- *Failure to provide safe plant/equipment.*

The MCA's Code of Safe Working Practices for Merchant Seafarers provided guidance for the use of lifting equipment. It repeated the advice given in MGNs 331 and 332 and highlighted in its PUWER and LOLER sections that, among other things:

- *Every dangerous or exposed working part of work equipment is to be provided with appropriate guards or protection devices.*
- *All seafarers and any managers or supervisors who use work equipment should have access to all necessary health and safety information and written instructions, including manufacturers' instructions, relating to the use of that equipment. These should be in an easily understood form and should include information and, where appropriate, written instructions*

[4] DNV was a *recognised organisation* for the purpose of flag state surveys and inspections on behalf of the MCA.

on the conditions in which the work equipment may be used and its method of use. This should include foreseeable abnormal situations and the action to be taken if such a situation occurs; and information on any conclusions drawn from previous experience of using that work equipment.

- *Controls of lifting equipment should be permanently and legibly marked with their function and their operating directions shown by arrows or other simple means, indicating the position or direction of movement for hoisting or lowering, slewing or luffing, etc.*

- *The person operating any lifting equipment should have no other duties that might interfere with their primary task. They should be in a proper and protected position, facing the controls and, so far as is practicable, with a clear view of the whole operation.*

ANALYSIS

Overview

The 2/O's lower left leg was crushed as he operated a rail-mounted crane with unguarded rotating machinery using its local controls. Operating the crane from the local controls in the pedestal was unsafe. The method of crane control used by *Kommandor Orca*'s crew was contrary to the method stated in the manufacturer's manual, and the hazards of working at height and operating unguarded machinery had not been identified in the vessel's risk assessment.

This section of the report will consider why the crane was operated in an unsafe manner with none of the associated risks being recognised.

The crane operation

The manufacturer's manual stated that the crane was to be remotely controlled from either the bridge station or the wireless remote control unit on the deck, and that the local hydraulic controls were for *emergency use only*. The starboard crane could have been operated using the wireless remote or the bridge control position. However, the inability to use the wireless remote control on the port side crane due to a fault, the visibility constraints of the bridge control, and the need to mobilise the remote controls, appeared to have had the senior officers and crew seek the simplest solution and operate both cranes using the local controls. Additionally, in the absence of permanent and legible signs, the crew had labelled the crane's local controls with duct tape and marker pen, which was neither questioned nor alerted anyone to the fact that this was not the usual method of operation.

Kommandor Orca's 2/O was following his training when he operated the crane's local controls from the exposed position at height and without safeguards. His position, with his left foot on the inboard bulwark and his right foot on the crane drive motor casing, was stable until he needed to step down from the bulwark as the crane moved aft. When the crane mechanism dragged his boilersuit into the unguarded rack and pinion gear, he lost his balance backwards and continued to hold on to the travel control lever. The added pressure that this applied to the lever was an automatic reaction, which in turn increased the crane's speed and dragged the 2/O's leg further into the pinion gear.

Safety management

Kommandor Orca had been in cold lay up with no significant maintenance before the company purchased it. Consequently, the senior officers and crew would have had the complex task of commissioning all the ship's equipment and learning its operation without the benefit of a handover of the previous crew's knowledge. It is likely that the senior officers and crew applied their own experience of ship's systems instead of referring to the manufacturer's manuals and instructions.

The crane operation training was conducted by the senior officers and so the crew might have assumed that they were being instructed in the correct methods. However, the requirement to operate the crane while working at height with no guardrails or restraints, and near to the unguarded rack and pinion gearing, was a clear sign that the process was flawed. The crew indicated that they had the

freedom to challenge on board practices, but they did not do this for the operation of the cranes. This demonstrated either their acceptance of senior officers' instructions or no recognition of unsafe acts or unsafe conditions.

Vessel-specific procedures for crane operations were not documented in *Kommandor Orca*'s SMS. This was a significant omission as the cranes were frequently used pieces of deck equipment. The creation of vessel-specific procedures was not deemed to be a requirement by the crew who followed the generic instructions in the SMS, and this was not identified in the internal or external ISM audits.

Management of deck operations and risk assessment

The shipboard risk assessment process had not identified the hazards of working at height or the crane's unguarded rotating machinery, indicating a selective or naive view on safety. *Kommandor Orca*'s day-to-day paperwork was in order, its crew were dressed appropriately and the ship was clean and tidy; however, the methods used to operate the crane showed that the crew were either unable to recognise basic safety violations or chose to ignore them for expedience.

The master, C/O and 2/O were experienced officers. When this experience was coupled with their professional training, it should have provided them with a greater level of safety awareness. Neither the C/O nor 2/O recognised the hazards of operating the crane using the local controls as part of the lifting plan, permit to work, or during their pre-work toolbox talk discussions on the morning of the accident. That the crane was operated in the same way by every crew member indicated a weak approach to safety on board the vessel.

CONCLUSIONS

- *Kommandor Orca*'s 2/O was following his training when he operated the crane's local controls from the exposed position at height and without safeguards. As a result, when he moved his position he became entangled in the unguarded drive mechanism, overbalanced, and his leg was crushed before the crane stopped moving.
- Operating the crane from the local controls in the pedestal was unsafe. The method of crane control used by *Kommandor Orca*'s crew was contrary to the method stated in the manufacturer's manual. The crane was not designed to be operated from the local position other than in an emergency and so no personnel platform, guardrails or machinery guards were fitted.
- None of the shipboard risk assessment process, vessel's lifting plan, or the company's own procedures had identified the hazards of operating the crane using the local controls and the associated risks of working at height or being exposed to the crane's unguarded rotating machinery indicated a selective or naive view on safety.
- The vessel had been in cold lay up before its purchase 11 months before the accident, and there was no handover from the previous company's crew. As a result, the cranes' flawed operating procedures and subsequent on board training were developed without sufficient reference to the manufacturer's operating manual. Consequently, neither the bridge station nor portable wireless remote control units were used. The training provided to the crew in operating the crane's local controls led to it being used in an unsafe manner.
- *Kommandor Orca*'s SMS did not include ship-specific crane operating procedures and principally covered generic crane and lifting operations that referenced applicable regulations and guidance. This omission was not identified during subsequent ISM Code audits.

ACTION TAKEN

Actions taken by other organisations

The **Maritime and Coastguard Agency** has issued *Kommandor Orca* with a full SMC on 23 December 2022, with no defects identified.

Hays Ships Ltd has:

- Mandated the use of the bridge station and wireless remote control units when operating the rail-mounted cranes.
- Provided its crews with instruction in lifting operations by an approved training organisation.
- Undertaken a full review of its SMS and amended the sections on crane operations and cargo handling.
- Fitted *Kommandor Orca* with bulwark guardrails, rack and pinion guards and a crane emergency stop to enable safe access to the local controls for maintenance, or in the event of a remote control unit failure.
- Supported the injured 2/O with the intent to continue his employment in a suitable capacity.

RECOMMENDATIONS

In view of the actions already taken, no recommendations have been made.

VESSEL PARTICULARS	
Vessel's name	*Kommandor Orca*
Flag	UK
Classification society	Det Norske Veritas
IMO number	9352377
Type	Research vessel
Registered owner & manager	Hays Ships Ltd
Year of build	2006
Construction	Steel
Length overall	86.2m
Breadth	18.5m
Gross tonnage	4,615
VOYAGE PARTICULARS	
Port of departure	Portland, England
Port of arrival	Not applicable
Type of voyage	Not applicable
Cargo information	Project
Manning	14
MARINE CASUALTY INFORMATION	
Date and time	16 August 2022 at 0841 (UTC+1)
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Portland, England
Place on board	Aft deck
Injuries	Left leg amputation below the knee
Damage/environmental impact	None
Ship operation	Loading
Voyage segment	Alongside
External & internal environment	Daylight, overcast with light wind and drizzle
Persons on board	15