

**Fall of a suspended load, resulting in injuries
to two crewmen on board the general cargo vessel
ZEA Servant
in Campbeltown, Scotland
on 2 March 2019**

SUMMARY

At about 2300 on 2 March 2019, two crewmen on board the Hong Kong registered, general cargo vessel *ZEA Servant* were injured when a suspended load fell and struck them. The suspended load was the lifting gear used to move the vessel's cargo hold hatch covers, and it fell because it became snagged, resulting in the tension overload failure of a fibre sling that was being used as part of the hoist.

The injuries occurred because both crewmen were standing inside the hazardous area around the suspended load when it fell. They were standing ready to manually guide the load clear of snagging hazards during the lift. The lifting gear had been stowed in the cargo hold ventilation duct space, where it was known to have snagged before. The lifting operation had not been formally risk assessed, and a lifting plan for the work had not been produced.

Since the accident, *ZEA Servant's* manager, Tianjin Xinhai International Ship Management Co Ltd, has identified an alternative stowage location and developed a lifting plan for the cargo hold hatch cover lifting gear. It has also taken action to improve general levels of safety awareness and the standards of lifting operations carried out on board *ZEA Servant* and across its fleet of vessels. In view of the managing company's actions taken, no recommendations have been made in this report.



ZEA Servant

FACTUAL INFORMATION

Narrative

ZEA Servant arrived in Campbeltown, Scotland on 1 March 2019 to load a cargo of wind turbine tower sections (**Figure 1**). On 2 March 2019 the deck crew, supervised by the chief officer, began preparing the vessel for cargo loading. This work was halted in the afternoon due to adverse wind conditions, but was scheduled to recommence later in the evening when the weather was expected to improve. At 2100, the chief officer held a safety briefing and took up position as supervisor, accompanied by the bosun. By this time, the wind was light, and it was dark and dry; the vessel's deck working lights were on, illuminating the area where the crew were working.

Following the safety briefing, one of *ZEA Servant*'s able-bodied seamen (AB) used the vessel's forward crane to remove the cargo hold ventilation duct space hatch cover so that the cargo hold hatch cover lifting gear could be retrieved (**Figure 2**). Two other ABs then entered the ventilation duct space and attached the first of two cargo hold hatch cover lifting gear sets to the crane's hook using a fibre sling (**Figure 3**). Both ABs then climbed out of the space and stood close to the hatch edge ready to guide the load and free any snags as it was lifted.

Using a very high frequency (VHF) radio for communications, the chief officer instructed the AB controlling the crane to commence lifting. After the load had been lifted about 2-3 metres (m), the gear snagged. The chief officer ordered the crane driver to stop hauling and the two ABs on deck freed the snag by hand. The two ABs remained close to the edge of the hatch and the chief officer ordered the crane driver to start heaving again.

Shortly after the lifting operation recommenced, a shackle at the lower end of the load became snagged on a ventilation trunk coaming (**Figure 2**). The chief officer immediately instructed the crane driver to stop, but at the same time the fibre sling parted and the lifting gear fell to the deck, striking both ABs.

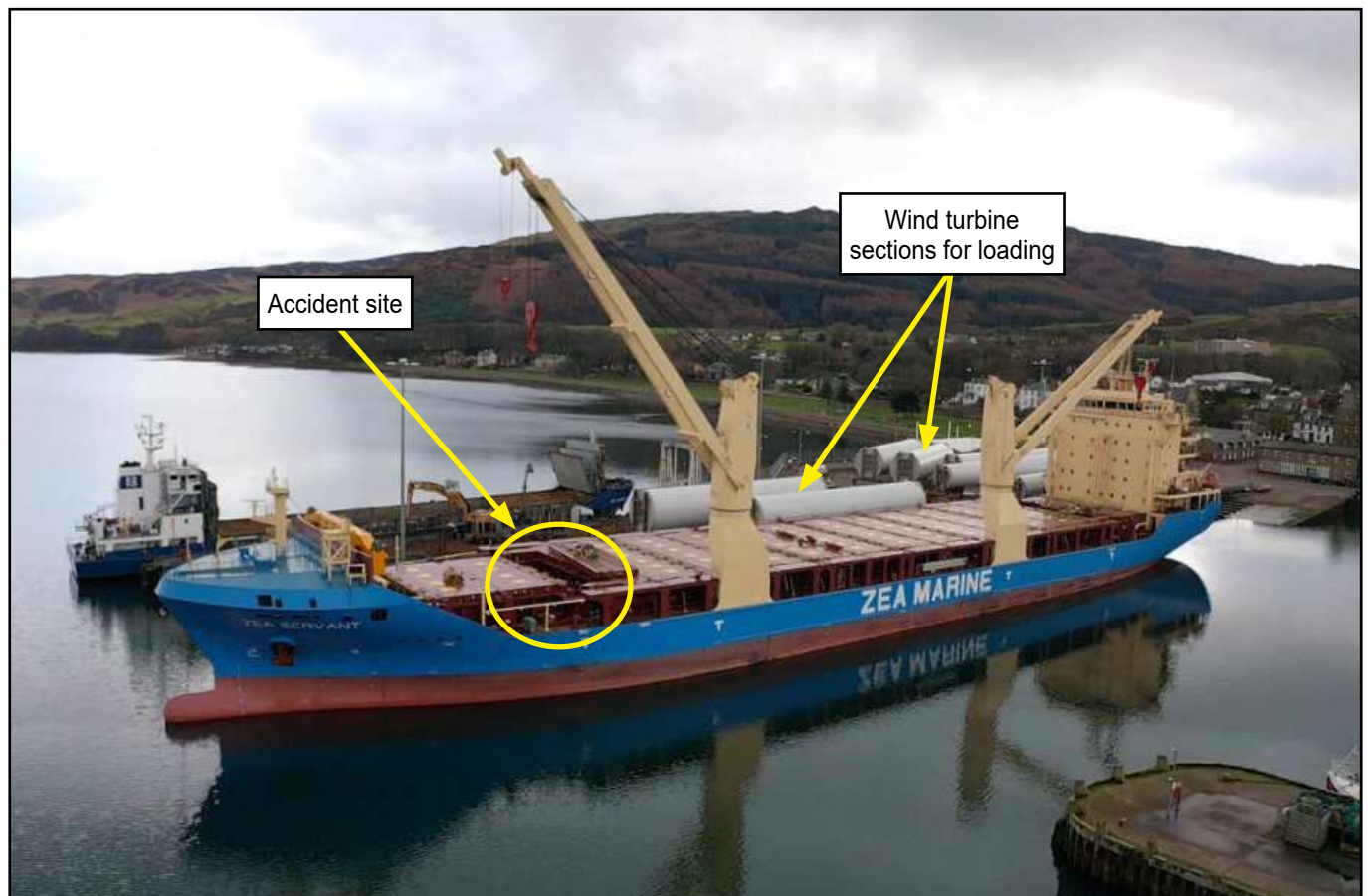


Figure 1: *ZEA Servant* berthed in Campbeltown showing accident site and wind turbine sections for loading

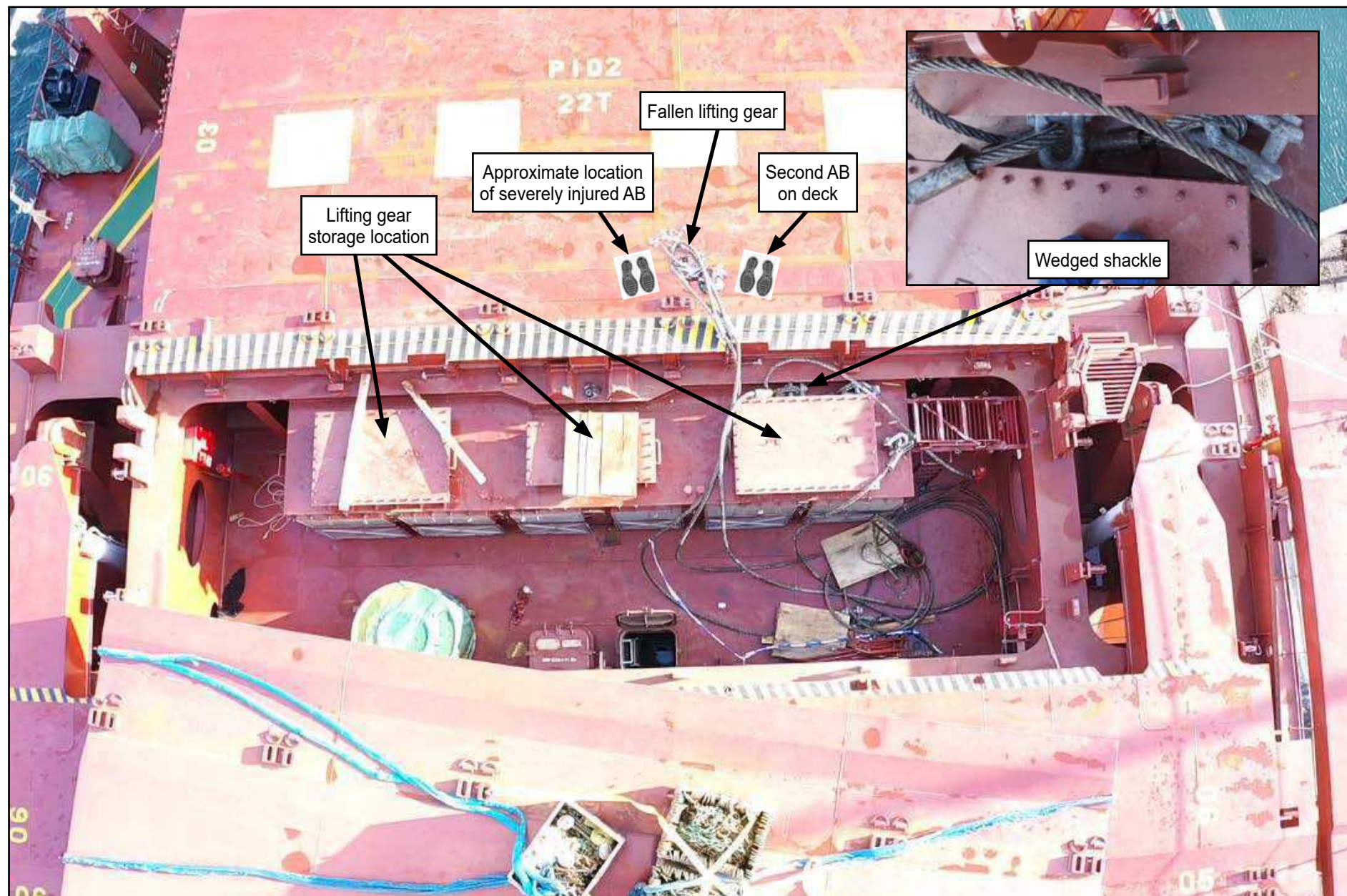


Figure 2: Plan view of the ventilation duct space and accident site (**inset:** close up of wedged shackle)

One of the ABs suffered a severe head injury and the other had a minor hand injury. Other crew members administered first-aid to both injured crewmen and raised the alarm. Ambulance paramedics were soon on the scene and treated both ABs before transferring them to a local hospital. The AB with the serious head injury was then transferred to a dedicated neurological injuries unit in Glasgow where he received extensive specialist treatment, before eventually being repatriated to recover at home in China.

Vessel and company

ZEA Servant was a 11619gt general cargo vessel that was built in 2018 by Huanghai Shipbuilding Company, China. It was owned by Huanghai Rong An Shipping Company Limited and managed by Tianjin Xinhai International Ship Management Company Limited (Tianjin Xinhai). As a newly built vessel, *ZEA Servant* had been issued with a 6-month interim Safety Management Certificate by Lloyd's Register (LR) on 12 December 2018. Tianjin Xinhai held a Document of Compliance issued by Bureau Veritas certifying the company's International Safety Management compliance until 5 July 2022.

Since leaving the shipyard in December 2018, *ZEA Servant* had called at ports in several countries including Malaysia, Qatar, Greece and Spain. This was the vessel's first visit to Campbeltown.

Crew

ZEA Servant's crew of 23 were all Chinese nationals. The chief officer, bosun and the three ABs who were on deck were all experienced seafarers and held the appropriate qualifications for their roles. They were all wearing personal protective equipment including high visibility jackets, hard hats and safety footwear. The AB controlling the crane had completed a training course that qualified him to operate *ZEA Servant*'s cranes.

Lifting arrangements

ZEA Servant's forward crane had a safe working load (SWL) of 250 tonnes (t), and its ramshorn hook had a SWL of 45t. The crane was in date for survey and had no known defects. The cargo hold hatch cover lifting gear was made up of two slinging sets; each set weighed 0.6t and consisted of two 17m long, 52-millimetre (mm) diameter, wire rope legs joined together with a master link (**Figure 3**). Each wire leg had a shackle attached to an eye at the lower end.

The hatch cover lifting gear had been stowed on wooden pallets positioned on top of the ventilation duct coamings in the ventilation duct space ever since delivery by the shipbuilder. There was no designated storage space for the lifting gear on board.

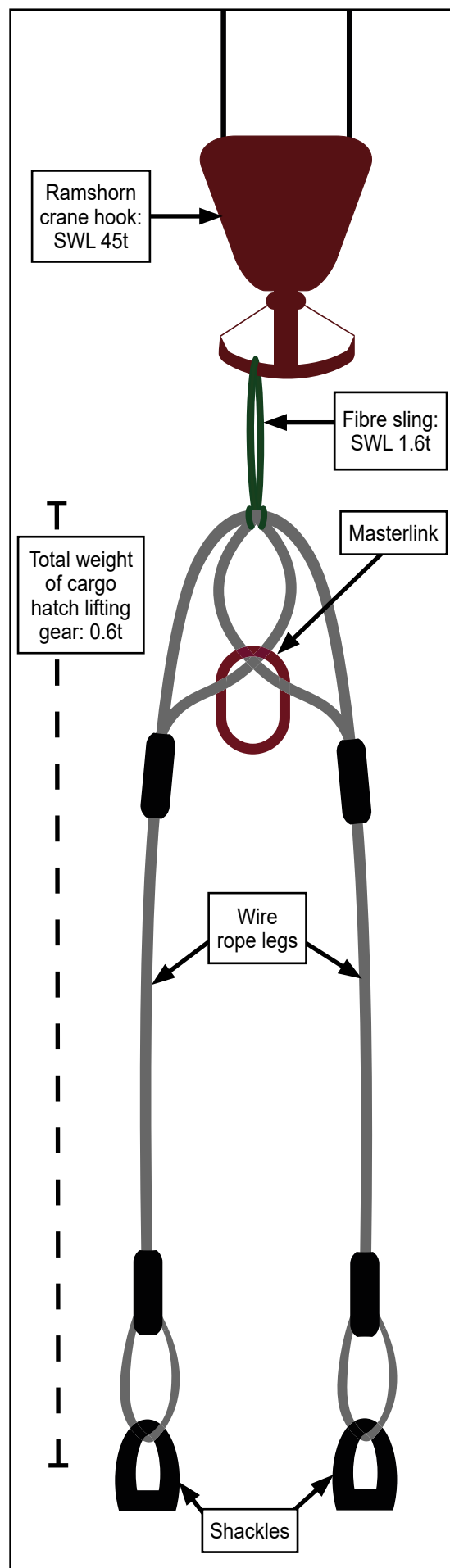


Figure 3: Cargo hold hatch cover lifting gear - attachment to crane hook with fibre sling

The crew used fibre slings to connect the hatch cover lifting gear to the crane's ramshorn hook because of the weight of the gear and the restricted amount of space around the ventilation coamings. The crew had used the same method to remove the lifting gear from the ventilation duct space on at least five previous occasions and had experienced similar snagging events. When these had occurred, the deck crew had manually freed the gear after the crane had stopped hauling.

The fibre sling that parted (**Figure 4**) had been rigged using a choke hitch; it was one of several similar slings on board and had an SWL of 2t with a factor of safety of 6:1. This equated to a minimum breaking load (MBL) of 12t in a straight pull. These values reduced to 1.6t SWL and 9.6t MBL in a choke hitch configuration.

After the accident the parted sling (**Figure 4**) and five other similar slings from *ZEA Servant* were examined at an expert testing centre. The report of these tests stated that all six slings would have failed a visual inspection as they were soiled and had illegible identification markings. The parted sling was also noted to have some localised damage. During destructive testing, one of the other fibre slings failed at a load of 6.4t when rigged in the choke hitch configuration. The test laboratory report estimated that the actual breaking load of the parted sling at the time of the accident would have been 6.25t.



Figure 4: Broken fibre sling (after the accident)

Onboard safety management

ZEA Servant's safety management system included a procedure for cargo hold hatch operations. This procedure set out the requirements for personnel to maintain a safe distance from the hatch covers when they were being moved, and for lifting equipment to be inspected prior to use. This procedure also detailed the need for a lifting plan and a designated person to be in charge of safety during hatch operations. This procedure did not include direction on the cargo hold hatch cover lifting gear, specifically, there was no reference to stowage, retrieval or freeing snags.

Lifting operations on board *ZEA Servant* were preceded by a safety briefing given by the chief officer who communicated instructions to the crane driver via hand-held VHF radio in the hours of darkness; in daylight hand signals were also used. On the day of the accident the deck crew were instructed not to stand under the crane hook and were told that anyone involved in the lifting operations could stop the process if unsafe practices were observed.

Certification and registration of lifting appliances and gear

The cargo hold hatch cover lifting gear had been inspected and certified by LR, and copies of the relevant certificates were held on board. The certificates stated that each component part of the lifting gear, including the wire ropes, master link and shackles, had been satisfactorily inspected and tested in November 2015. No test certificates were held on board for the fibre slings.

ZEA Servant carried a Register of Lifting Appliances and Cargo Handling Gear as recommended by the International Labour Organisation's (ILO) Convention No. 152¹. This Register was certified by LR and catalogued details of the vessel's lifting equipment, which included: cargo cranes, provision crane, engine room crane and their associated hook and block assemblies. There were no entries in the Register for the cargo hold hatch cover lifting gear or the fibre slings.

Regulation and guidance

Relevant extracts from the ILO's Code of Practice for Accident Prevention on Board Ship at Sea and in Port include:

20.2.6. The officer with primary responsibility for cargo operations should check that all safety features are in place and that any possible hazards are clearly marked and otherwise dealt with to prevent injury to any persons who may be working on board the vessel.

20.2.9. All seafarers must take particular care to not exceed the safe working load of any equipment.

20.3.1. All lifting equipment used on board ship should be of good design, sound construction and material, adequate strength for the purpose for which it is used, free from defect, properly installed or assembled and properly maintained.

20.3.4. A register of a ship's lifting appliances and items of loose gear should be kept on the ship. All lifting gear and loose gear should be included in the register.

20.3.5. All equipment should be thoroughly examined by a responsible officer before use and regularly examined during use.

20.3.7. Loads being lowered or hoisted should not pass or remain over any person engaged in loading or unloading or performing any other work in the vicinity.

¹ C152 – Occupational Safety and Health (Dock Work) Convention, 1979

The Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations, 2006 applied to non-UK registered vessels when in UK waters. Guidance and interpretation of these regulations was provided in the Maritime and Coastguard Agency's Marine Guidance Notice 332(M+F). Regulation 10 set out the requirement for the organisation of lifting operations and stated that every lifting operation should be:

...properly planned; appropriately supervised; and carried out in a safe manner.

It further stated that:

All reasonable measures should be taken to ensure that any load cannot strike and injure someone - the simplest way to achieve this is by ensuring no-one is close enough for this to happen and is prevented by barriers or some other method, from moving into a position where this could happen.

This guidance also required that:

Personnel are not positioned beneath suspended loads, or moved above them or that persons are likely to move into the path of a suspended load - the simplest way to achieve this is by ensuring no-one is in the danger area and is prevented by barriers or some other method, from moving into it whilst lifting is in progress.

ANALYSIS

Overview

The injuries to the crewmen were a direct result of standing in the hazardous fall zone around a suspended load. The suspended load fell when the fibre sling being used to lift it failed under tension overload. This happened because a shackle at the lower end of the load became snagged. This section of the report will examine the causes and circumstances of the accident including the onboard procedures for safe lifting operations.

The accident

One of the most compelling requirements of safety on deck is to avoid working around or under a suspended load. Guidance on lifting operations required that all reasonable measures be taken to ensure that personnel are not endangered by the risk of a suspended load falling.

Although the chief officer was supervising the lifting operation and had briefed the safety arrangements, the operation to lift the cargo hold hatch cover lifting gear was not called to a halt when the ABs positioned themselves underneath or close to the suspended load. Any of the crew on deck, including the crane driver, could have stopped the operation, but particularly the chief officer or the bosun, who were in supervisory roles. However, the crew had a collective desire to get the task done; a 'can do' attitude. Furthermore, the deck preparations had been delayed by adverse winds and there was pressure to prepare the vessel for the cargo loading.

Although qualified seafarers, the crew had limited experience with this particular vessel, and as there was no procedure to follow they had adopted their own method of carrying out the lifting operation. That the crew had previously experienced similar snags when attempting to lift the cargo hold hatch cover lifting gear should have acted as a warning. Conversely, that they were able to resolve the snags without difficulty might, instead, have inadvertently acted to reinforce their belief that their actions were not unduly hazardous. Previous exposure to risk without consequence in this way can result in a misplaced sense of a situation being safe when this is not the case.

Risk assessment and lifting plan

All lifting operations should be properly risk assessed and planned, and safe systems of work put in place. Lifting plans and safe systems of work should address the foreseeable risks involved in the work and identify all the appropriate resources necessary for safe completion of the task. Factors to consider when developing a lifting plan include: appropriate equipment, suitably qualified personnel, rigging arrangements, lift route, other proximate hazards, visibility, weather and an assessment of the fall zone (**Figure 5**).

The fall zone is not limited to the immediate area directly beneath the load; instead it is the reasonably foreseeable area that partially or completely suspended loads could fall into in the event of an accident. Solid loads can bounce, roll, topple over or fragment in any direction on impact with the ground. Flexible loads, such as steel wire ropes, will collapse into an area dependent on their stiffness of the wire ropes (**Figure 6**). Having assessed the hazards and resources, the plan should then set out clearly the actions involved at each step of the operation and identify the responsibilities of those involved.

ZEA Servant's safety management system did not contain a risk assessment or a procedure for the stowage and handling of the cargo hold hatch cover lifting gear, nor any guidance for the conduct of a lifting plan and the identification of fall zones. Had a fall zone assessment been undertaken, it would have been evident that it was unsafe for the crew to position themselves so close to the suspended load.

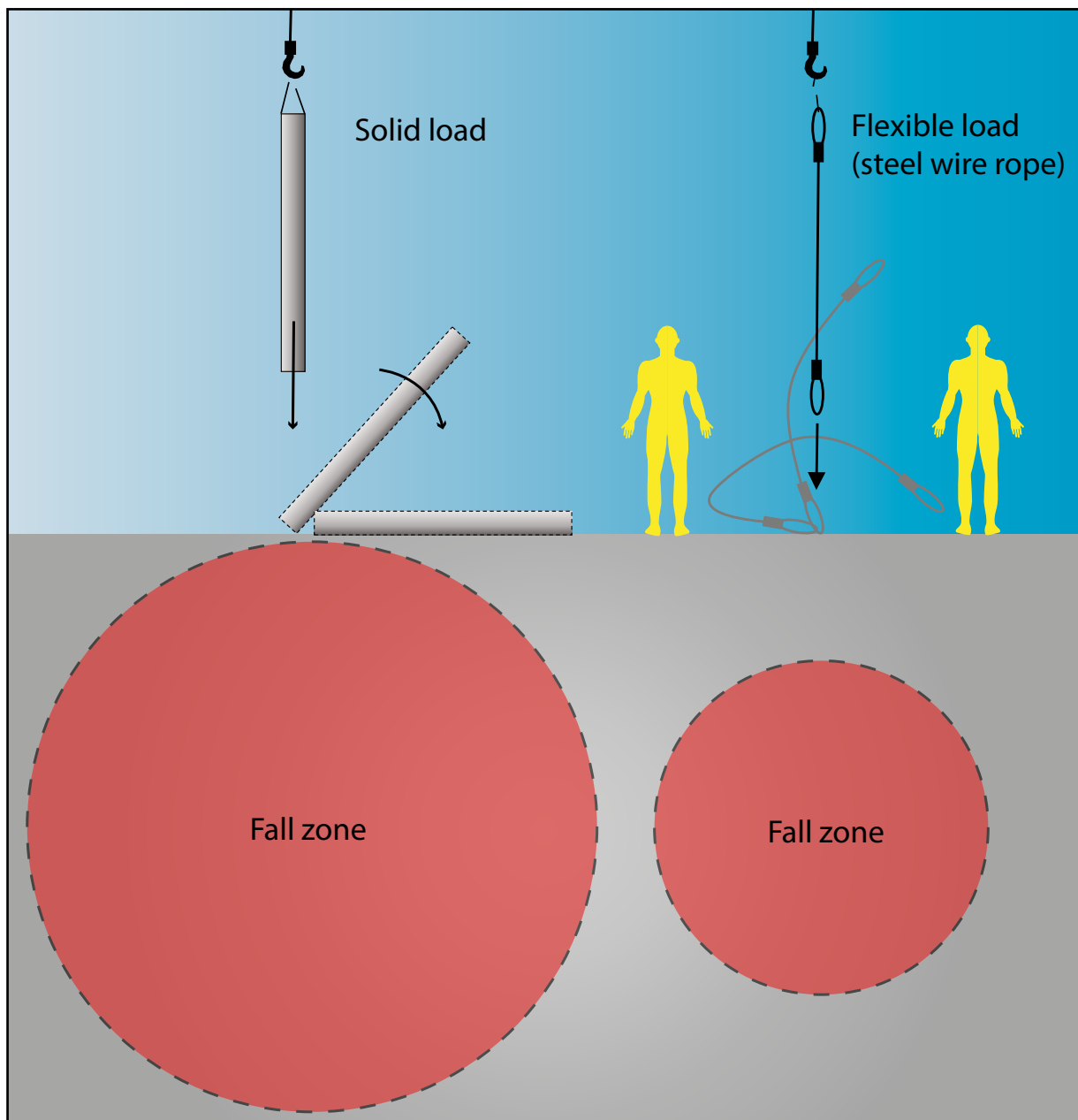


Figure 5: Illustration of the fall zone around a suspended load

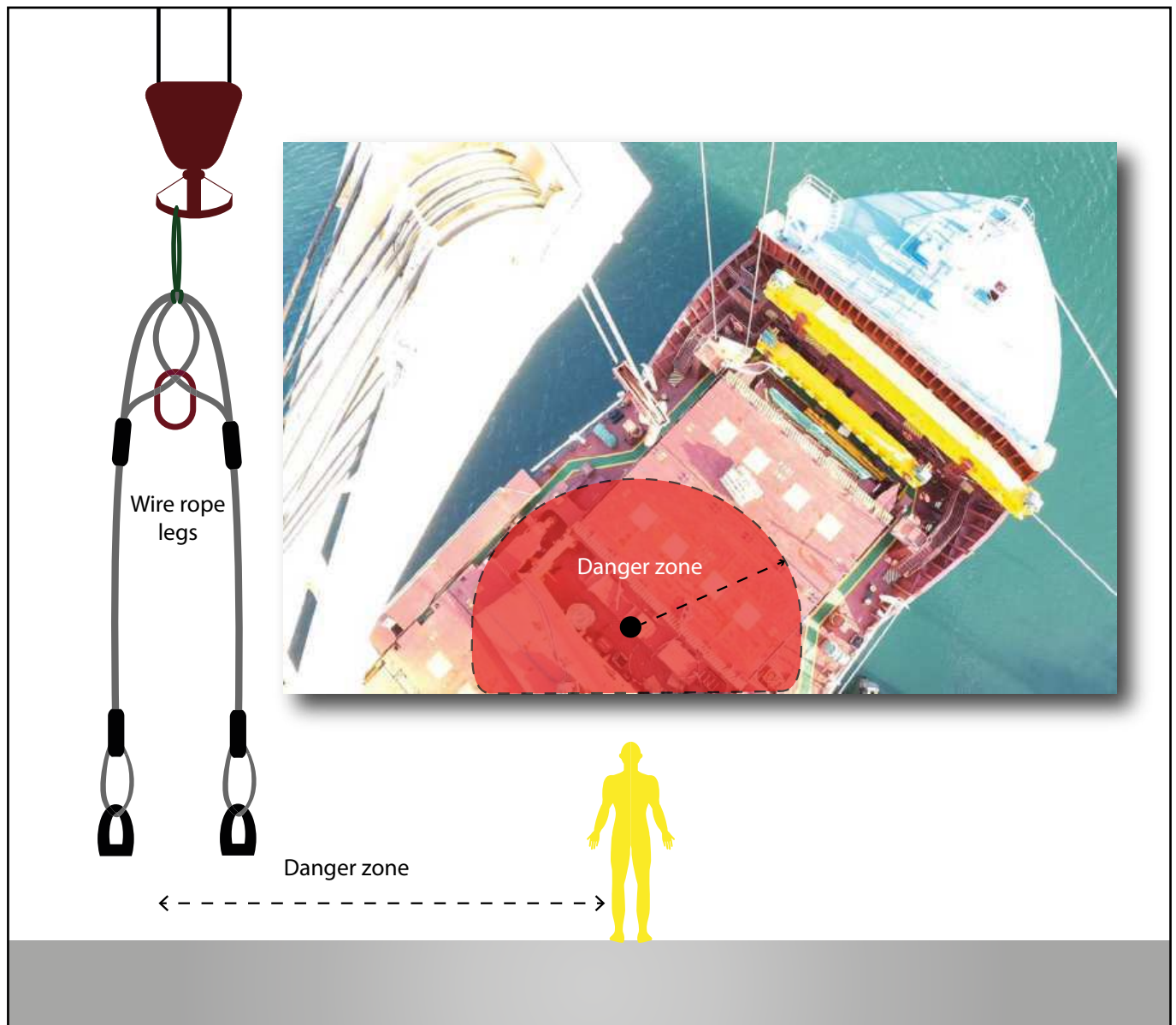


Figure 6: Illustration of the estimate of the danger zone that the lift would have created on board *ZEA Servant*

The absence of a task-specific risk assessment and lifting plan for the handling of the hatch cover lifting gear was probably because *ZEA Servant* was still a new vessel and was being operated under an interim safety management certificate. *ZEA Servant* had arrived in Campbeltown for the first time the day before the accident and this was the initial load of the wind turbine components. Although cargo hold hatch cover operations had been undertaken previously, in this early stage the crew and company were still learning about the vessel's equipment and developing experience with its operational procedures and safety management system.

Storage of the lifting gear

ZEA Servant had not been built with a dedicated storage area for the heavy cargo hold hatch cover lifting gear. As a result, the crew had devised a local arrangement to store the lifting gear on top of wooden pallets in the cargo hold ventilation duct space (**Figure 2**). This might have appeared appropriate as a suitable storage space because it was accessible; however, it was an area where there was a significant number of potential snagging hazards, especially for lifting slings with shackles at their ends.

It is likely that a formal risk assessment process would have identified the cargo hold ventilation duct space as an unsuitable location for the stowage of the lifting gear, and prompted the crew and/or vessel operator to consider alternative options. It is evident that the storage arrangement was not appropriate, and that a more suitable alternative was required.

Maintenance and logging of lifting gear

The load fell because the synthetic fibre sling used to lift it parted under tension. It was reasonable to use such a fibre sling as its SWL was more than twice the weight of the load being lifted when rigged using a choke hitch. However, the fibre sling in use was in a poor condition, with local damage, soiling (**Figure 4**) and illegible identification markings. It therefore should have been discarded. Destructive load tests and laboratory analysis showed that its residual strength was almost half its design MBL.

ZEA Servant's Register of Lifting Appliances and Cargo Handling Gear had no record of the cargo hold hatch cover lifting gear, or the fibre sling used at the time of the accident.

An accurate register recording the survey, testing and maintenance of all lifting equipment held on board is a vital component of a safety management system. Such a record, combined with a suitable system of tagging or marking, can help ensure that uncertificated or inadequately maintained lifting equipment is easily identified and isolated to prevent its inadvertent use.

CONCLUSIONS

- The suspended load fell because the fibre sling being used to lift it failed under tension. This happened when the load became snagged and the crane was not stopped in time to prevent overloading of the sling.
- The two crewmen were struck by the falling lifting gear and were injured because they were standing in the hazardous fall zone beneath the suspended load.
- The injured crewmen were standing in the hazardous area because they wanted to be on hand to guide the load and free any snags. They probably underestimated the risks they were taking because they had done the job before and the load had previously snagged without incident.
- *ZEA Servant* was not fitted with a dedicated storage arrangement for the cargo hatch lifting gear, and the practice of placing it on pallets in the ventilation duct space was not appropriate, due to the snagging hazards.
- A formal task-specific risk assessment and lifting plan had not been carried out for the handling of the cargo hold hatch cover lifting gear.
- The SWL of the fibre sling that parted was sufficient for the lift, but it should not have been used and should have been discarded because its material condition was poor and its identification markings were illegible. The vessel did not have a comprehensive lifting equipment register; the onboard records did not include all of the loose lifting gear.

ACTIONS TAKEN

ZEA Servant's manager, **Tianjin Xinhai**, has:

- Identified an alternative and more suitable location to stow the cargo hold hatch cover lifting gear and developed a lifting plan for its removal and re-stowing.
- Notified its fleet of the importance of crew safety awareness, including the need for self-protection measures and safe positioning during lifting operations.
- Notified its fleet of the importance of the safety brief and the responsibilities of those supervising lifting operations.
- Undertaken a review of the vessel's safety management system.
- Provided additional safety training to *ZEA Servant's* crew on the procedure to open hatches and the inspection of lifting equipment.
- Issued a fleet circular requiring checks to lifting equipment, including SWL of each component, certification and the condition of fibre slings.
- Required shore managers to inspect operational safety of crew.

RECOMMENDATION

In view of the actions taken by *ZEA Servant's* manager, no recommendations have been made in this report.

SHIP PARTICULARS

Vessel's name	<i>ZEA Servant</i>
Flag	Hong Kong
Classification society	Lloyds Register
IMO number	9741126
Type	General cargo vessel
Registered owner	Huanghai (HK) Rong An Shipping Co. Ltd
Manager(s)	Tianjin Xinhai International Ship Management Co. Ltd
Year of build	2018
Construction	Steel
Length overall	147m
Registered length	140.44m
Gross tonnage	11619t
Minimum safe manning	17
Authorised cargo	General cargo

VOYAGE PARTICULARS

Port of departure	Bilbao, Spain
Port of arrival	Campbeltown, Scotland
Type of voyage	Commercial
Cargo information	Wind turbine bases
Manning	23

MARINE CASUALTY INFORMATION

Date and time	2300 UTC on 2 March 2019
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Main deck
Place on board	Forward cargo hatch
Injuries/fatalities	One serious head injury, one minor hand injury
Damage/environmental impact	None
Ship operation	Loading
Voyage segment	In port
External & internal environment	Wind: gentle breeze Darkness
Persons on board	23