



Australian Government
Australian Transport Safety Bureau

Fall from height and serious injuries to crewmembers on board *Shanghai Spirit*

15 NM north-east of Port Alma, Queensland | 29 January 2017



Investigation

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Addendum

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Safety summary

What happened

During the afternoon of 29 January 2017, the deck crewmembers of *Shanghai Spirit* were conducting painting and routine touch-up work in the cargo holds. They used a mobile scaffold tower to access areas of bulkhead about 6 to 9 m above the hold bottom. Two crewmembers conducted the work from the upper tiers of the scaffold tower and remained unsecured on it when it was moved.

To access the full length of the hold bulkhead, the work required repositioning the scaffold tower on multiple occasions. After the work on the aft bulkhead was completed, it was decided to paint the hopper tank edge. As the scaffold tower was moved with the unsecured crewmembers, it became unbalanced and toppled forward onto the deck.

The two crewmembers on the scaffold tower were seriously injured in the fall and were evacuated to a hospital ashore for treatment.

What the ATSB found

The ATSB found that, contrary to established procedures, two crewmembers remained on the unsecured scaffold tower in preparation for repositioning, rendering it top-heavy and unstable. Consequently, when moved it toppled and fell. Additionally, neither crewmember on the scaffold tower utilised the required safety harness and associated safety lines which would have prevented them falling when climbing or working on the tower.

Finally, the afternoon work in hold number four was not supervised by an officer as required by company procedure and in contrast to the morning activity. The absence of formal supervision, in combination with a desire to expedite the task in difficult working conditions, probably led to the crewmembers remaining unsecured on the scaffolding as it was repositioned.

What's been done as a result

The scaffolding equipment operating instructions and maintenance manuals/guidelines have been included in the company's safety management system. Further, there is now a requirement for monthly and quarterly inspection of the equipment.

The use of scaffolding is now specifically classed as 'working at heights' and is therefore subject to all planning and precautionary measures such as risk assessment, working aloft permits and precautions.

Personnel Protective Equipment training and awareness has been reviewed and enhanced. Additionally, new crewmembers will be subject to pre-joining training that now includes the use of scaffolding.

Safety message

This accident highlights the importance of adhering to procedures that assure safety as well as the value of effective supervision. Owners, operators and crewmembers are reminded to plan and undertake risk assessments for assigned tasks in order to identify any shortcomings in procedures and required risk-mitigation measures.

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The occurrence

At 0824 Eastern Standard Time¹ on 27 January 2017, the 140 m geared bulk carrier² *Shanghai Spirit* (Figure 1), anchored in Keppel Bay, about 15 nautical miles³ north-east of Port Alma, Queensland. The ship had just completed a voyage from Subic Bay, Philippines with a cargo of containers, and was expected to berth at Port Alma during the morning of 30 January 2017.

Figure 1: *Shanghai Spirit* alongside at Port Alma



Source: ATSB

While at anchor, the ship's crewmembers went about routine duties including berthing preparations, repairs and maintenance. The following day, Saturday, was Chinese New Year and the ship's crewmembers maintained only essential duties, opting to work on the Sunday.

On Sunday 29 January, during the chief mate's morning watch, he discussed the day's work with the master. This included painting and routine touch-up work in cargo holds (hold) number one and number four. Shortly after 0800, the chief mate briefed the bosun about the day's work. He instructed the bosun to prepare mooring lines for the next day's berthing, and then complete routine paint work in the holds. This required crewmembers to work from the ship's portable, modular scaffold tower.

At about 0830, a work group consisting of the chief mate, the bosun, two able seamen (AB2 and AB3), the ordinary seaman (OS), and the deck cadet (cadet), commenced work in number one hold. They gathered the necessary equipment on the tank top in the hold. This included the ship's scaffold tower, spray painting apparatus, harnesses and safety and securing lines. Their task was to touch up and paint sections of the hold's aft bulkhead and topside tank, about 6 to 9 m above the tank top.

The crewmembers assembled five sections of scaffolding to allow access to an area of the bulkhead up to about 9 m above the tank top. The scaffold tower was secured by two guy ropes that had been run up out of the hold, and secured on deck. The chief mate, as the supervisor,

¹ Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

² A 'geared' bulk carrier means that the ship is equipped with equipment for loading and off loading at a port, and is not dependent on land-based equipment.

³ A nautical mile is 1,852 m.

oversaw the work from the tank top, and the bosun and AB3 painted from the scaffold tower. Both crewmembers wore safety harnesses with the safety lines leading up on to, and secured on the ship's deck. The remaining crewmembers (AB2, OS and cadet) assisted with the paint preparations, moving equipment, and handling of the security and safety lines.

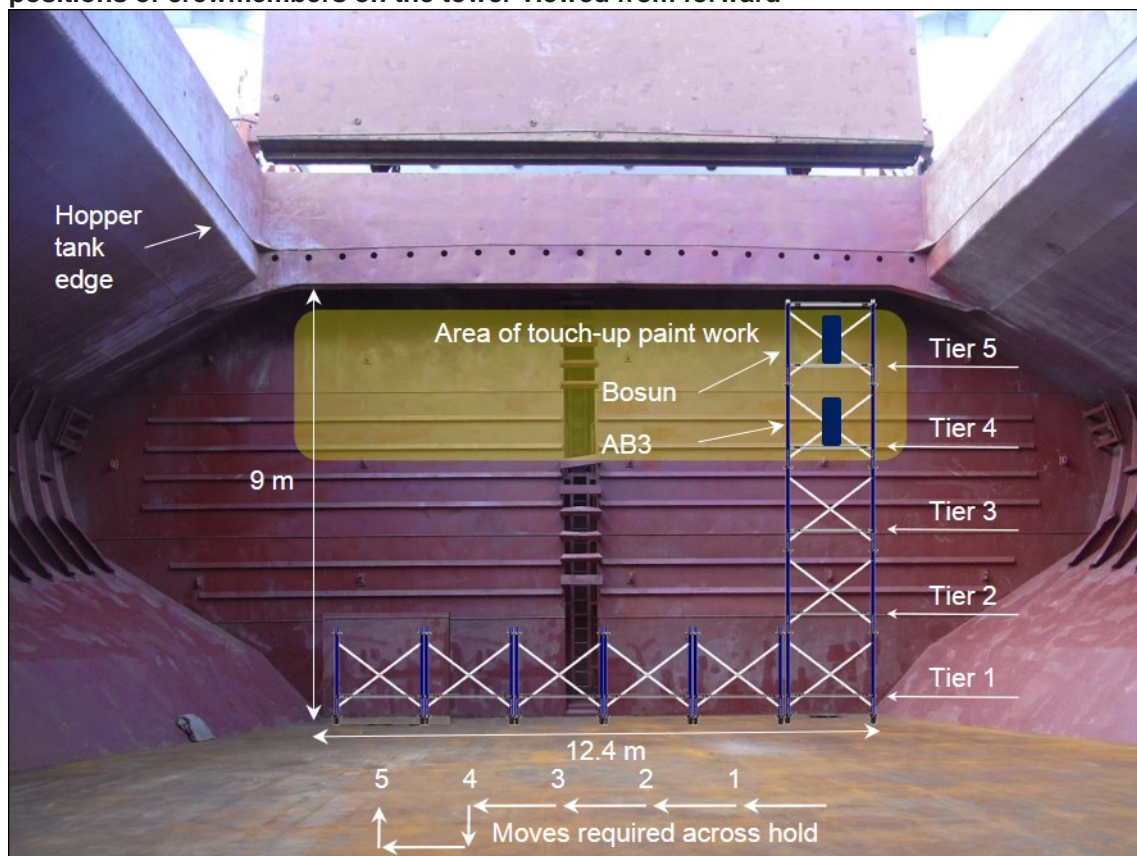
As each area of work was completed, the scaffold tower needed to be repositioned to access the next area. To do this, the bosun and AB3's safety lines were released and they climbed down from the scaffold tower. Then the scaffold tower securing lines were released and the scaffold tower was repositioned and resecured. The bosun and AB3 then climbed up the scaffold tower, and with their safety lines resecured, recommenced work.

This process was followed throughout the morning. By 1130, the touch-up work in hold number one had been completed. The scaffold tower was disassembled and, along with the other equipment, moved to hold number four ready for work there after lunch.

At midday, the bridge watch duty changed over and the 1200-1600 bridge team consisting of the second mate assisted by AB2 commenced duty on the bridge. AB1 replaced AB2 in the deck work crew. The chief mate did not return to the deck in the afternoon as he rested in preparation for taking the bridge watch at 1600.

At about 1300, the team now consisting of the bosun, AB1, AB3, the cadet and the OS, went to hold number four. The scaffold tower was assembled (Figure 2) and the associated equipment prepared. As before, the bosun and AB3 painted from the scaffold tower and the remaining crewmembers (AB1, OS and cadet) assisted. The task commenced in the port aft corner of the hold.

Figure 2: Hold number four showing scaffold tower moves from port to starboard and positions of crewmembers on the tower viewed from forward



Source: ATSB

A similar work sequence of operation to that in hold number one was followed. However, when the scaffold tower was moved, the bosun decided that he and AB3 would not climb down. Instead, they remained on the scaffold tower as the OS and cadet repositioned it. Additionally, and in

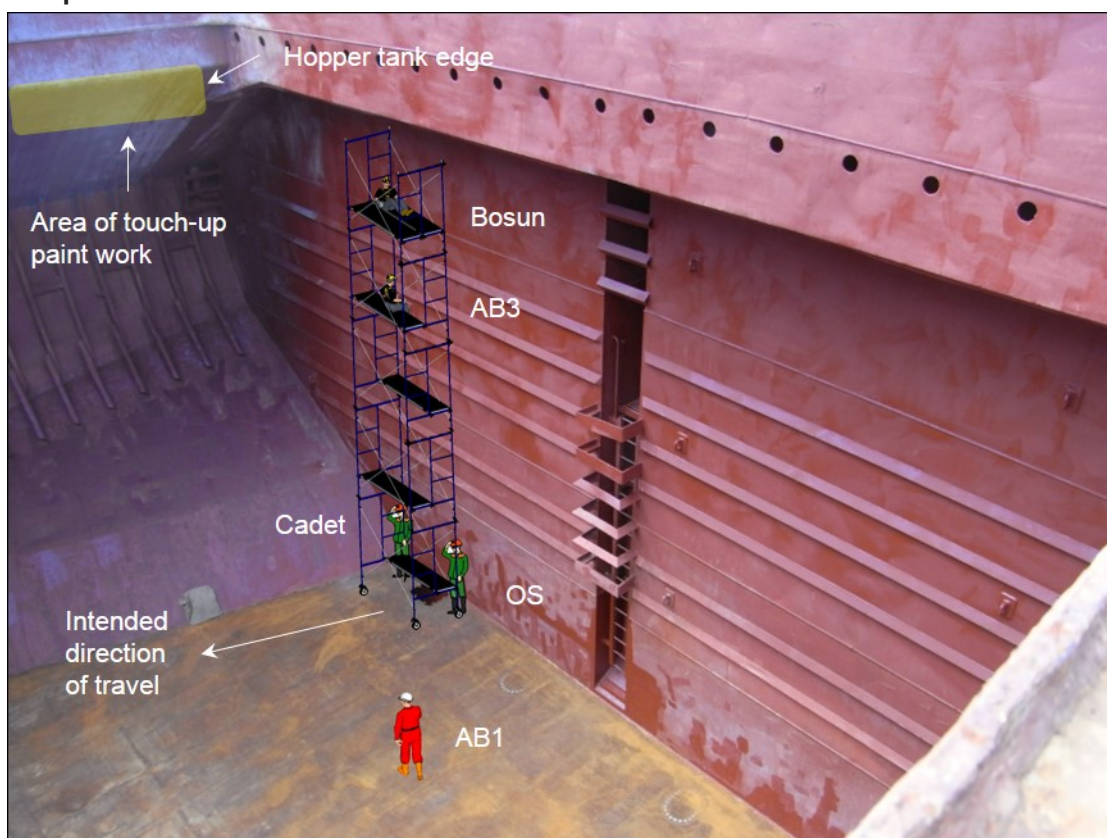
contrast with the morning's activity, neither the bosun or AB3 wore safety harnesses and safety lines were not used.

The work progressed from port to starboard across the aft of the hold. The tower was moved in that direction, in line with the major axis of the scaffold tower footprint, about five times.

At the completion of the fifth move, the crewmembers were in position to finish the touch up of the aft bulkhead. The bosun was on tier five of the scaffold tower, about 8 m above the deck and AB3 was one tier below, facing aft, about 6 m above the deck.

After they had completed the work on the aft bulkhead, the bosun then decided to touch up the hopper tank edge (Figure 3). He instructed the OS and cadet to move the scaffold tower forward adjacent to the hopper tank edge, so they could reach the topside tank surface above.

Figure 3: Hold number four showing position of scaffold tower, crewmembers at completion of work and direction of next movement



Source: ATSB

The AB3 was aware the tower would be moved, and busied himself with clearing the equipment around him and lowering it to the tank top. Toward the middle of the hold, on the tank top, AB1 readied the equipment for the move. The cadet and OS released the tower securing lines and climbed down into the hold to move the scaffold tower.

At about 1410, the cadet and OS were in position either side of the base of the scaffold tower. They grasped the scaffold tower legs, released the wheel brakes and started to push the structure forward. The scaffold tower moved about 0.5 m when, without warning, it toppled forward to the deck, taking with it the bosun and AB3.

On hitting the tank top, the scaffold tower came apart and the bosun and AB3 were entangled in the components. AB1, the OS, and the cadet, hurried to assist the injured men.

The master was in his cabin at the time and heard loud noises coming from hold number four. He was unsure of the sound and went outside to investigate. On deck, he saw the scaffold structure and crewmembers on the tank top and he realised that an accident had occurred. He radioed the

second officer on the bridge and directed that a public address announcement be made for all available crewmembers to go to the hold. He then went down into the hold to determine the details of the incident and the extent of any injuries.

The bosun and AB3 lay where they had landed on the tank top deck and were given assistance and first aid. The master then went to the bridge and commenced notifying his company's Designated Person Ashore and the shipping agent.

At 1448, the agent and then, at 1449, the master, contacted Gladstone vessel traffic service (VTS) and notified them of the accident and requested assistance. The duty VTS officer then notified the Queensland Ambulance Service, the Gladstone Regional Harbour Master, and the Australian Joint Rescue Co-ordination Centre of the incident and the master's request for assistance.

At 1504, emergency services were notified of the incident and tasked a rescue helicopter to retrieve the injured crewmembers. At the time of the tasking, the rescue helicopter was deployed on another mission, but was re-tasked to this job. The helicopter returned to base in Rockhampton where it was refuelled and reconfigured for winch and stretcher retrieval. The duty paramedic was briefed and, at 1558 the helicopter departed the base.

On board *Shanghai Spirit*, the injured men were moved to the main deck in preparation for their helicopter evacuation. At about 1700, the bosun, who had received more serious injuries, was winched to the helicopter and taken to Rockhampton Hospital. After refuelling, the helicopter returned to the ship at about 1830, retrieved AB3, and flew him to the hospital.

The bosun received multiple injuries to his pelvis, chest and arm. He remained in the hospital for 19 days before being repatriated. The AB3 sustained a fractured sternum and back injury. He remained in the hospital for 8 days before being repatriated.

Context

Shanghai Spirit

At the time of the incident, *Shanghai Spirit* was registered in Hong Kong, classed with Nippon Kaiji Kyokai (NKK), and managed by Asia Maritime Pacific (AMP), Shanghai. It was on a regular service between ports in China, Japan and Australia, and frequently called at Port Alma.

The ship had a Chinese crew of 21. The master had 17 years of seagoing experience and held a Chinese master's certificate of competency. He had sailed as master for 5 years and had been with AMP for the last 5 years. This was his second time on *Shanghai Spirit*, which he had joined about 2 months before the incident.

The chief mate had 19 years of seagoing experience and held a Chinese master's certificate of competency. He had sailed on bulk carriers prior to joining AMP. This was his first time on *Shanghai Spirit*, which he had joined about 8 months before the incident.

The bosun and able seaman (AB) each had 12 years of seagoing experience on bulk carriers and general cargo ships. This was their first time with AMP and on *Shanghai Spirit*, which they had joined about 8 months before the accident.

AB1 had 11 years of seagoing experience on bulk carriers and general cargo ships. This was his first time with AMP and on *Shanghai Spirit*, which he had joined about 8 months before the incident.

The ordinary seaman (OS) had 18 months of seagoing experience. This was his second time with AMP and on *Shanghai Spirit*, and he had joined about 2 months before the incident.

The deck cadet had 8 months of seagoing experience and this was his first assignment on a ship.

Shipboard procedures

Safety management system

In compliance with requirements of International Safety Management (ISM) Code,⁴ AMP had developed and implemented a Safety Management System (SMS) on board its ships. The stated intent of this system, amongst others, was 'to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and property...'.⁴

The shipboard management and operation procedures provided general guidance for safe work on board. To ensure effective implementation of the SMS, all personnel, ashore and on board the ship, were directed to strictly obey the rules and regulations defined in the SMS documentation.

However, on 29 January the requirements of the SMS were not met. Crewmembers completing the task did not follow, nor complete required procedures, forms, or other documents.

During interview, crewmembers stated that a risk assessment and working aloft checklist had been completed for this work. Copies of these documents were provided to ATSB investigators on request. However, evidence collected from other sources suggested that the documentation may have been completed after the accident.

For example:

- a Port State Control inspection conducted on 31 January 2017 could find no risk assessment or 'working aloft' checklist for this task

⁴ The International Management Code for the Safe Operation of Ships and for Pollution Prevention ISM Code adopted by the International Maritime Organization's Resolution A.741 (18) as amended.

- the ship's crew could not supply copies of previous risk assessments and checklists for use of the scaffolding
- the ship's risk assessment file contained no risk assessments for scaffold use during the previous 18 months, despite the equipment having been used at least three times in the 6 months before this incident.

In addition to this, the master's incident report to AMP identified that the risk assessment and working aloft procedures were not followed. That assessment was supported by AMP shore management. Additionally, the company issued a fleet circular in which failures to implement company procedures for risk assessment, for identification and planning of shipboard operations and for working aloft were identified as contributory factors in the accident.

Working aloft

Shanghai Spirit's SMS contained procedures for key operations such as working aloft. The SMS classified working aloft as a special operation (when a dangerous situation exists) and required that 'all mandatory international and national regulations' be complied with. Notably, that the crewmembers be qualified for the task and that a risk assessment and maintenance plan be undertaken for that task using a defined process.

According to the ship's SMS, such tasks as working aloft needed an 'on the spot' work assessment to determine the active risk and any preventative measures necessary to reduce that risk. Further, the work should be planned, crewmembers briefed, the checklist completed, and the operation be continuously supervised by an officer in charge of the work. Company requirements for working aloft required that special attention be paid to supervision and inspection of the work. The working aloft special instruction required the chief mate to be in charge and inspect the site for safe working. Further, the duty officer was required to be in attendance at the work site and supervise while the work was being completed.

Task sequencing

The task of painting and touching up hold surfaces was conducted during the morning and afternoon of 29 January. When interviewed, the master, chief mate and involved crewmembers confirmed the agreed task sequence was as follows:

- scaffold tower assembled in position at the port aft corner of the hold
- ladder frame pinned together, platforms in place on each tier, with wheel brakes engaged
- OS and cadet go up onto the deck, run the scaffold guy ropes over the hatch coaming and secure them to strong points on deck
- bosun and AB3 ascend the scaffold tower
- safety harness lines run up to deck and secured by OS and cadet
- work commenced.

As each area of work was completed, the scaffold tower required repositioning to access the next area.

The repositioning process to be followed was:

- equipment secured on, or lowered from, the scaffold tower
- OS and cadet release the safety harness securing lines
- bosun and AB3 descend from the scaffold tower
- OS and cadet release the scaffold tower securing lines
- OS and cadet return to the hold bottom to assist with the movement of the scaffold tower as required
- wheel brakes released and the structure repositioned
- once repositioned, the process was reversed before work recommenced.

Code of safe working practice

According to the UK Code of *Safe Working Practices for Merchant Seafarers*, 2015 (COSWP),⁵ the equipment should be of approved design and be rigged by competent persons in a recognised and/or recommended configuration to provide a safe working platform. The use of scaffolding is classed as ‘working at heights’ and therefore should be subject to planning and precautionary measures such as risk assessment and working aloft permits and precautions.

The ship carried a copy of COSWP that provided guidance for working at heights, with scaffolding, and provided reference to further information in the UK marine guidance notice (MGN 410M+F),⁶ including but not limited to:

Personnel working aloft should wear a safety harness with a lifeline or other arresting device at all times.

If it is a mobile structure, it should be securely fixed to ensure that it cannot inadvertently move while in use.

The scaffolding shall be assembled and positioned to ensure its stability.

Wheeled scaffolding shall be prevented by appropriate devices from moving accidentally during work at height.

No seafarer is to be carried on any mobile work equipment unless it is designed for that purpose.

Subsequent to the incident, the ship’s managers provided an operating manual which detailed the steps for constructing a similar scaffold tower. Of note, the document detailed the correct assembly of the (similar) scaffold, personal safety information (safety belt, non-slip shoes, and safety helmet), and the requirement that all personnel are to disembark the scaffold during relocation.

Scaffolding

General information

The term ‘scaffold’ means any temporary structure, fixed, suspended or mobile, and its supporting components, which is used for supporting workers and materials, and which is not a lifting appliance. Mobile scaffolding is regularly used by ships’ crew to conduct maintenance of normally inaccessible (high) areas on board. Such equipment is particularly useful for hold maintenance such as chipping and painting of upper surfaces.

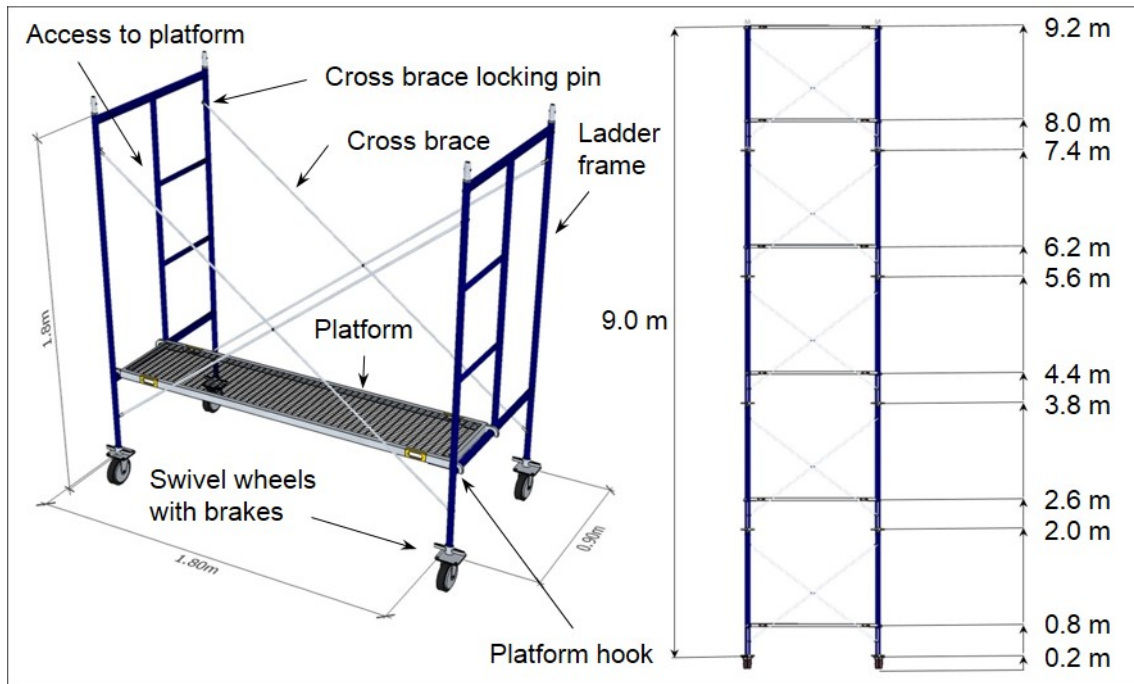
On board equipment

The mobile scaffolding equipment in use on board *Shanghai Spirit* was made of steel and was similar to other common types of mobile scaffold towers designed for use on stable, level surfaces. It was constructed of modular tiers placed one atop the next via inserts in each vertical leg. Each tier was 0.9 m wide, 1.8 m long and 1.8 m high. With five tiers fitted, the scaffolding had a height of 9.2 m. A single, half-width (400 mm wide) work platform was positioned on the lower cross bar of each tier with two in place on the uppermost (fifth tier) level (Figure 4).

⁵ The Code is published by the UK Maritime and Coastguard Agency (MCA) as the best practice guidance for improving health and safety on board ship.

⁶ MGN 410 Health and safety: work at height regulations.

Figure 4: Scaffold construction components and dimensions



Source: ATSB

At the base of the scaffold, rubber-tracked swivel wheels were fitted at each corner and allowed the structure to be moved (rolled) easily from position to position. These wheels could be locked to prevent unintended movement.

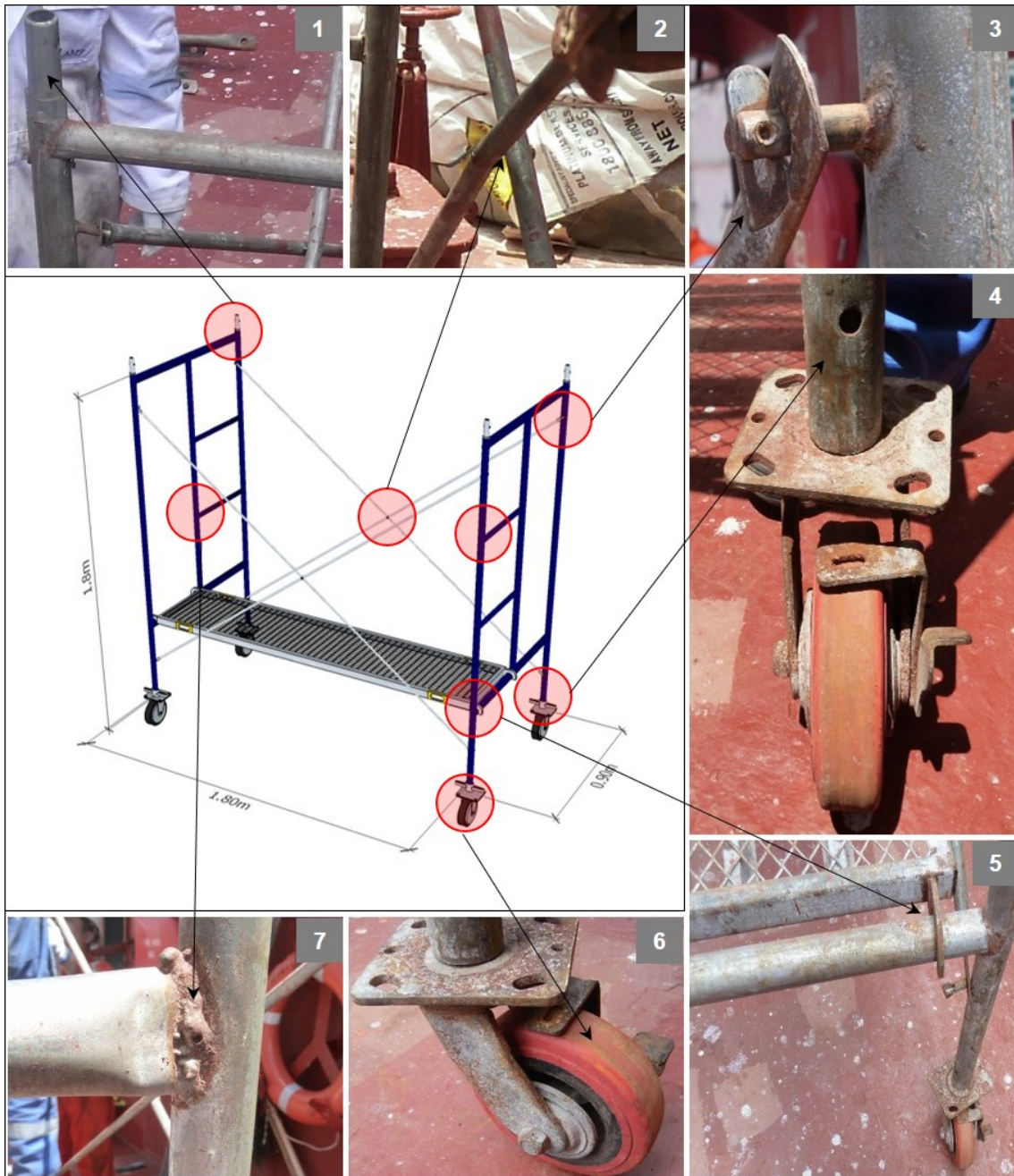
On board inspection of scaffolding equipment

Inspection of *Shanghai Spirit's* scaffolding equipment (Figure 5) identified that it had no manufacturer's identification plate, and all components showed signs of regular use, wear, damage, and some repairs.

The following defects were found during an on board inspection:

1. ladder frame stub piece connections without securing pins
2. loose and bent cross bracing
3. cross brace locking pins loose allowing travel up to with 40 mm
4. swivel wheels stub piece connections without securing pins
5. corroded platform hooks
6. inoperative swivel wheel brakes on three of the four wheels
7. deficient frame ladder welds.

Figure 5: Condition of the scaffold tower



Source: ATSB

Scaffolding documentation

The scaffolding equipment used on board should be supported by suitable documentation such as operating and maintenance manuals, guidelines and training materials. The equipment should, only be used by competent, trained personnel and should be regularly inspected and maintained. Documents specific to the scaffold tower onboard were not identified during the investigation. Some additional documents, including test certificates, were subsequently provided by the company. However, these documents were found to be for mobile scaffolding equipment of a different design and not for that in use on the ship at the time of the accident. The scaffolding certificate showed the equipment was last tested in 2013, and had been on board for about 4 years.

Related occurrences

The ATSB has investigated similar occurrences on board ships at anchor in 2003 and 2009.

[Crew member injury and fatality on board *Pacific Wisdom* \(197\)](#)

Pacific Wisdom was a 1992-built geared bulk carrier with five cargo holds. The ship's holds were serviced by four cranes. On 5 September 2003, the ship arrived at Albany and anchored in the outer harbour. As it was due to load wheat, the ship's crew started preparing the holds for cargo loading. This involved washing each hold and scraping and touching up the interior paintwork ready for the grain cargo.

The ship's crew used a mobile scaffold tower to access the areas around top of the hold and under the main deck. The work progressed over the next few days, working from forward to aft in the holds.

On 7 September 2003, after moving the scaffold tower to the aft end of a hold, two crew members climbed the scaffold tower to resume their work. However, as soon as they had climbed onto the platform at the top of the scaffold tower, the entire tower fell towards the aft bulkhead. The two men fell about 12 m to the tank top resulting in the death of one crew member and serious injuries to the other.

The following findings from that accident are particularly relevant to this occurrence:

- The base of the scaffolding was too narrow for the assembled height, making the scaffolding inherently unstable.
- Guy ropes were not secured, and the castors were not locked prior to the men going back up the tower.
- The two men had not secured their safety harnesses to the ship's structure.
- It is probable that some combination of ship movement in the seaway and the distribution of weights at the working platform level were factors in the fall of the scaffolding.
- In an attempt to hasten the work in hand, both company procedures and normal seaman-like practices were not followed.

[Serious injury on board *United Treasure* off Port Kembla, New South Wales on 7 July 2009 \(266-MO-2009-005\)](#)

United Treasure was a 2006-built gearless bulk carrier with 7 cargo holds. On 23 June 2009, the ship anchored off Port Kembla, Australia, waiting for a berth to load coal. Expecting many days at anchor waiting for a berth, the master thought it would be a good opportunity to paint the empty cargo holds.

On 24 June, work started in number four hold. Scaffolding was used to access higher areas in number four hold. The scaffold tower was moved in the hold and its height adjusted as required.

By 4 July, work had been completed in holds number four, three and two and had progressed to number one hold. However, the weather conditions deteriorated and work was suspended for several days due to the moderate to heavy rolling and pitching.

On 7 July, the weather had abated slightly and the ship's master instructed the crewmembers to progress number one hold. After the crew members had assembled the scaffold tower, they started to heave up the painting equipment. However, the ship rolled and the scaffold tower swayed. Shortly after, the scaffold tower toppled to port and crewmembers fell with it to the tank top, 8 m below. Both men sustained compound fractures and were evacuated from the ship by helicopter and taken to hospital.

The following findings from that accident are also relevant to this accident:

- The mobile scaffold tower was not secured to the ship's structure and it toppled over when *United Treasure* rolled and the seamen began lifting equipment up from the tank top.

- The seamen were secured to the tower instead of a strong point on the ship's structure using a safety harness with a fall arrestor.
- Locking the tower's wheels and using safety belts indicates that some risks were identified but not effectively securing the tower suggests an assumption that it would not topple over. The inadequate and/or ineffective precautions taken indicate that an appropriate risk assessment was not carried out.
- *United Treasure's* permit to work aloft system had not been effectively implemented on board the ship.
- The tower was not assembled as designed. The outriggers and intermediate planks, both key components, were missing and the work platform guard rails were not used. The manufacturer's instructions were also missing, and no attempt was made to obtain them, a parts list or the missing parts.

Safety analysis

Development of the accident

Introduction

Throughout 29 January 2017, deck crewmembers on *Shanghai Spirit* were conducting painting and routine touch-up work in the cargo holds, utilising a mobile scaffold tower. The contrast between how this activity was conducted in the morning compared to the afternoon highlights the key element of this accident. That is, contrary to company procedures, accepted practice and industry guidance, the two crewmembers remained unsecured on the scaffolding while it was repositioned within the hold.

It was reported that the occurrence day was hot (32° C) and the worksite was uncomfortable, in an open hold with poor natural ventilation. As a result, the decision to remain on the scaffold tower was probably motivated by a desire to expedite completion of a task being conducted in difficult working conditions.

That decision to remain on the scaffolding however, led to it being top-heavy and unstable when the supporting lines were not secured. Scaffold repositioning for the majority of the previous work was port to starboard in the direction of the scaffold's longest base dimension. That direction of movement provided sufficient stability to protect against overbalance and toppling, compared to when it was moved in the fore-aft direction along the narrowest base dimension, in order to reach the hopper tank edge.

Consequently, when the unsecured scaffolding and occupants were moved towards the hopper tank edge it toppled and fell.

Use of safety equipment

During the morning in hold number one, the crewmembers operating from the scaffold tower donned safety harnesses however safety lines were not attached before the crewmembers climbed or descended the structure. Instead, the lines were passed down and connected to the harnesses once the crewmembers were at their working positions. Therefore, if the crewmembers had fallen from the scaffold during ascent or descent, their fall could not have been arrested.

During the afternoon task neither crewmember utilised the available safety harnesses or lines so they were not protected in the event of a fall while climbing the scaffold or when they were at their working positions. If the harnesses and the associated safety lines had been in use when the scaffolding fell the two crewmembers may have still have been seriously injured as their safety lines may have become fouled in the collapsing scaffold.

Task supervision

During the afternoon's work there was no appointed supervising ship's officers so, by default, the most senior crewmember was deemed to be responsible for the conduct of the task. However, that individual was one of the two crewmembers working from the scaffold tower who did not come down during its repositioning, despite being required to do so. As these same crewmembers had also worked from the tower in the morning and climbed down during each repositioning, the ATSB concluded that they were both familiar with the requirement to climb down from the scaffolding before it was moved. In that context, the decision to remain on the scaffolding during the afternoon repositioning was probably influenced by the lack of formal supervision, as well as the desire to expedite the task detailed above.

Working from a scaffold tower is 'work at height', and research conducted by the UK Health and Safety Executive shows that falls from height usually occur as a result of poor management control rather than because of equipment failure. The success of shipboard tasks such as hold maintenance relies heavily on the actions, behaviours and relationships of the people involved in

the task. This accident highlights the importance of adhering to procedures that assure safety as well as the value of effective supervision.

Scaffolding condition

Examination of the scaffold tower following the accident identified a number of defects relating to damaged, loose, corroded and unserviceable components.

While these defects would undoubtedly have reduced the tower's rigidity and stability, it was successfully repositioned during the morning activities, and the majority of the afternoon task with the crewmembers on it, without toppling. That indicated that, despite these flaws, it was sufficiently stable during those moves. Therefore, while the identified defects may have contributed to the accident when it was moved towards the hopper tank edge, the lack of stability associated with movement of the tower in the fore-aft direction along the narrowest base dimension with crewmembers on it, may alone have resulted in it falling.

While it could not be determined whether the condition of the scaffold tower contributed to this accident, for equipment to be suitable for use on board a ship, it must not only be in good condition and fit for purpose, but should comply with relevant standards and be suitable for the work which is to be carried out.⁷

Shipboard procedures and documentation

The on board guidance for scaffold use consisted of an 'operation manual' page. While this document proved to be for equipment of different design to that being used on *Shanghai Spirit*, it did contain the following relevant safety precautions:

- workers on the scaffolding should wear protective equipment including a safety helmet and safety harness (belt)
- the scaffolding should not be moved with persons on it.

These precautions, if adhered to, would probably have prevented the accident from occurring. In that regard, the fact that the operations manual page referred to a different equipment design did not in itself contribute to the accident.

Shanghai Spirit's scaffolding equipment was not supported by suitable documentation, and therefore did not ensure guidance for the correct methods and level of maintenance, tracking of maintenance and repair history, or provide training and familiarisation guidance. Had this supporting information been available, it would most likely have provided an opportunity for guidance relating to rectification of the identified damage and wear, and sound methods for its safe operational use.

The ship carried the UK Code of *Safe Working Practices for Merchant Seafarers, 2015 (COSWP)*. This document contains best practice guidance for improving health and safety on board ship. Chapter 17 referred to Work at Height including a specific section and annex on scaffolding. This chapter outlined guidance for such things as scaffold plans, ensuring tower stability, preventing accidental movement, fall prevention and appropriate and specific scaffold/rigging training.

Furthermore, the COSWP section on carrying seafarers on mobile work equipment stated that 'No seafarer is to be carried on any mobile work equipment unless it is designed for that purpose'. If the guidance contained in the scaffold operation manual page, and/or COSWP had been heeded, the accident and resulting crewmember injuries would not have occurred.

The appropriate methods of attaching safety lines should have been considered, and the lines attached to the crewmembers before they climbed the tower and this practice followed in the afternoon.

⁷ UK Code of *Safe Working Practices for Merchant Seafarers, 2015 (COSWP)* Chapter 18.1, Provision, Care and Use of Work Equipment – Suitability of Work Equipment.

Findings

From the evidence available, the following findings are made with respect to the fall from height and serious injury of two crewmembers aboard *Shanghai Spirit* during a maintenance task, while at anchor 15 nautical miles north-east of Port Alma, Queensland on 29 January 2017. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance.

A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- Contrary to established procedures, two crewmembers remained on the unsecured scaffold tower in preparation for repositioning, rendering it top-heavy and unstable. Consequently, when moved it toppled and fell.
- The afternoon work in hold number four was not supervised by an officer as required by company procedure and in contrast to the morning activity. The absence of formal supervision, in combination with a desire to expedite the task in difficult working conditions, probably led to the crewmembers remaining unsecured on the scaffolding as it was repositioned.

Other factors that increased risk

- The assembly and condition of the scaffold tower had several defects, which exacerbated the unstable state of the structure.
- **Guidelines for the provision, care and use of the scaffold tower, was not supported by suitable on-board documentation. The only documentation was for mobile scaffolding equipment of a different design, and not for that in use on the ship. [Safety issue]**
- Neither crewmember on the scaffold tower utilised the required safety harness and associated safety lines which would have prevented them falling when climbing or working on the tower.

Safety issues and actions

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to initiate safety action proactively, rather than to issue formal safety recommendations or safety advisory notices.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions are repeated separately on the ATSB website to facilitate monitoring by interested parties. Where relevant the safety issues and actions will be updated on the ATSB website as information comes to hand.

Inadequate on-board documentation

Safety issue number:	MO-2017-001-SI-01
Safety issue owner:	Asia Maritime Pacific
Operation affected:	Shipboard operations
Who it affects:	All owners and operators and crewmembers involved in working aloft

Safety issue description

Guidelines for the provision, care and use of shipboard equipment were not supported by suitable documentation. The only documentation was for mobile scaffolding equipment of different design and not for that in use on the ship.

Status of the safety issue

Issue status:	Adequately addressed
Justification:	The action taken by Asia Maritime Pacific by adding the applicable operating instructions and maintenance manuals guidelines to the safety management system and implementing monthly and quarterly inspections addresses the issues.

Proactive safety action

Action taken by:	Proactive safety action taken by Asia Maritime Pacific
Action number:	MO-2017-001-NSA-003
Action date:	27 December 2018
Action type:	Proactive safety action
Action status:	Closed

Safety action taken: Documents specific to the scaffold equipment such as operating instruction and maintenance manuals/guidelines were identified and added to the safety management system. Monthly/quarterly inspections and maintenance have been implemented, made and kept on board.

Additional safety action

Following this accident, the ATSB was advised the following addition safety action has been taken:

The use of scaffolding is now specifically classed as ‘working at heights’ and is therefore subject to all planning and precautionary measures such as risk assessment, working aloft permits and precautions.

Personnel Protective Equipment training and awareness has been reviewed and enhanced. Additionally, new crewmembers will be subject to pre-joining training that now includes the use of scaffolding.

General details

Occurrence details

Date and time:	29 January 2017 – 1410 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Serious injury	
Injuries:	Two crewmembers requiring hospitalisation before repatriation	
Damage:	Nil	
Location:	Port Alma anchorage, Queensland	
	Latitude: 23° 23.01' S	Longitude: 151° 02.2' E

Ship details

Name:	<i>Shanghai Spirit</i>
IMO number:	9326328
Call sign:	VRD04
Flag:	Hong Kong, the People's Republic of China
Classification society:	ClassNK
Ship type:	Geared bulk carrier
Builder:	Yamanishi Co, Ishinomaki, Japan
Year built:	2005
Owner(s):	Shanghai Spirit Shipping Ltd
Manager:	Asia Maritime Pacific (Shanghai)
Gross tonnage:	11,751
Deadweight (summer):	18,829 t
Summer draught:	8.44 m
Length overall:	139.92 m
Moulded breadth:	25.00 m
Moulded depth:	11.50 m
Main engine(s):	Makita – Mitsui MAN B&W 7S35MC (Mk 7)
Total power:	5,180 kW, 173 rpm
Speed:	13.0 knots

Sources and submissions

Sources of information

The sources of information during the investigation included:

- the master and involved crewmembers of *Shanghai Spirit*, including the injured persons
- Asia Maritime Pacific (Shanghai)
- the Australian Maritime Safety Authority
- the Capricorn Helicopter Rescue Service
- Maritime Safety Queensland
- the Marine Department, Hong Kong, the People's Republic of China.

References

International Association of Classification Societies (IACS) 2014 [Recommendation 136: Guidelines for Working at Height](#).

Maritime and Coastguard Agency (MCA) 2010, [MGN 410: The Merchant Shipping and Fishing Vessels \(Health and Safety at Work\) \(Work at Height\) Regulations 2010](#), UK.

Maritime and Coastguard Agency (MCA), [Code of Safe Working Practices for Merchant Seafarers, 2015](#).

Rolfe ST, Barsom JM 1977, Fracture and fatigue control in structures, applications of fracture mechanics, Prentice-Hall New Jersey, pp. 414-440.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to Asia Maritime Pacific (Shanghai), the Australian Maritime Safety Authority, Maritime Safety Queensland, the Marine Department of Hong Kong and the master, chief mate, bosun and AB3 on board *Shanghai Spirit*.

Submissions were received from Asia Maritime Pacific (Shanghai), the Australian Maritime Safety Authority and Maritime Safety Queensland. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Terminology used in this report

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing factor: a factor that, had it not occurred or existed at the time of an occurrence, then either:

- (a) the occurrence would probably not have occurred; or
- (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or
- (c) another contributing factor would probably not have occurred or existed.

Other factors that increased risk: a safety factor identified during an occurrence investigation, which did not meet the definition of contributing factor but was still considered to be important to communicate in an investigation report in the interest of improved transport safety.

Other findings: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.

Australian Transport Safety Bureau

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Research

ATSB Transport Safety Report Marine Occurrence Investigation

Fall from height and serious injuries to crewmembers on board Shanghai Spirit, 15 NIM north-east of Port Alma, Queensland, on 29 January 2017

328-MO-2017-001

Final – 21 February 2019