



Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Marine Occurrence Investigation No. 225
Final

Independent investigation into the crew member fatality
on board the Bahamas registered passenger ship

Pacific Sun

while berthed in Sydney, Australia

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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6590
Accident and serious incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6274 6474; from overseas + 61 2 6274 6474
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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Independent investigation into the crew member fatality on board the Bahamas registered passenger ship *Pacific Sun* while berthed in Sydney, Australia on 5 February 2006

Prepared by

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

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The photographs of *Pacific Sun* were provided by P&O Cruises.

Abstract

On 5 February 2006, *Pacific Sun* berthed at number eight wharf Darling Harbour, Sydney. The weather was fine with little wind. The twelve to four quartermaster was assigned to clean rust streaks from the outside of the port bridge wing windows. At 1205 the senior second officer checked the safety harness and completed a work permit, as required by the working aloft procedure, but no workplace risk assessment was used in planning the job.

The quartermaster, wearing the safety harness, then started work on a catwalk outside the port bridge wing. At about 1249 he fell approximately 24 metres onto the wharf below. He died as a result of the injuries sustained from the fall. He was an experienced seaman who had been inducted in the ship's safety management system and had done this task many times.

The ATSB's investigation report concludes that the quartermaster's harness was not properly attached to the grab rail when he probably lost his footing and fell. The contributing factors to the incident include an inadequate safety harness, the design of the catwalk, an inadequate workplace risk assessment and procedures, the ineffective use of personal protective equipment and that the quartermaster may have been distracted from the task at the time by non-work related issues. There was no evidence to support a suggestion that he may have committed suicide.

The ATSB has made several safety recommendations with the aim of preventing further incidents of this type.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

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 fare-paying passenger operations. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. 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.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau is pleased to report positive safety action in its final reports rather than make formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

1 EXECUTIVE SUMMARY

On 5 February 2006, *Pacific Sun* was berthed port side to at number eight wharf Darling Harbour, Sydney, after a cruise to New Caledonia. The weather was fine and dry with little wind.

The quartermaster assigned to the twelve to four watch was given the task of cleaning rust streaks from the outside of the port bridge wing and then to clean the outside of the windows. He was an experienced seaman who had been inducted in the ship's safety management system and had performed the task on many occasions.

The quartermaster would be working on a catwalk mounted on the outside of the bridge wings and wearing a safety harness.

At about 1205 local time (UTC¹ + 11 hours), the senior second officer checked the safety equipment and completed a work permit, as required by the company's working aloft procedure. The quartermaster, wearing the safety harness, then started work on a catwalk outside the port bridge wing. At about 1249 he fell approximately 24 metres onto the wharf below. He died as a result of the injuries sustained from the fall. He was an experienced seaman who had been inducted in the ship's safety management system and had done this task many times.

The ATSB's investigation report concludes that the quartermaster's harness was not properly attached to the grab rail when he probably lost his footing and fell. The contributing factors to the incident include an inadequate safety harness, the design of the catwalk, an inadequate workplace risk assessment and procedures, the ineffective use of personal protective equipment and that the quartermaster may have been distracted from the task at the time by non-work related issues. There was no evidence to support a suggestion that he may have committed suicide.

The report recommends that ship operators should ensure that the procedures, permits and risk assessments for personnel working aloft adequately identify the hazards and stipulate measures to mitigate the risks. Ship operators should also ensure that the safety harness and lanyard used by personnel when working aloft is appropriate for the purpose considering all aspects of the tasks to be performed.

1 Co-ordinated universal time.

2 FACTUAL INFORMATION

2.1 *Pacific Sun*

Pacific Sun is a passenger ship (Figure 1) registered in Nassau, Bahamas. The ship is owned by Carnival PLC and operated by P&O Cruises Australia. It is classed with Lloyds Register of Shipping (LR).

The ship was built in 1986 by Kockums AB Shipyard in Malmo, Sweden. It was originally named *Jubilee* and was renamed *Pacific Sun* in 2004. The ship has an overall length of 224.82 m, a beam of 28.20 m and a depth of 21.06 m. *Pacific Sun* has a gross tonnage of 47 262 and a loaded draught of 7.63 m.

Propulsive power is provided by two Sulzer 7RLB66 single acting, direct reversing two-stroke diesel engines each developing 11 353 kW at 140 RPM. Each engine drives a fixed pitch propeller giving the ship a service speed of 19 knots. The ship is also fitted with bow and stern thrusters to assist with manoeuvring.

Pacific Sun, like most passenger ships, has fully enclosed bridge wings. The bridge wings extend over the side of the ship and the windows and glass floor panels allow full visibility of the wharf and ship's side while berthing.

Figure 1: *Pacific Sun*



At the time of the incident, *Pacific Sun* had a complement of 665 officers and crew. The officers were British, Italian, Croatian and Bulgarian nationals. The deck crew were mainly Indonesians, the engine room and technical crew were mainly from the Philippines and the remaining crew were of mixed nationalities – coming from Europe, South Africa, Indonesia and the Philippines.

The deck officers maintained a bridge watch keeping routine of four hours on, eight hours off. Each bridge watch normally consisted of a single deck officer and a quartermaster/helmsman, who was an able-bodied seaman. This watch keeping routine was maintained on the bridge in port as well as at sea.

The master on board *Pacific Sun* at the time of the incident held a British master class one certificate of competency and had 27 years seagoing experience. He had been master of *Pacific Sun* for about one month. This was both his first command and the first time he had served on board the ship.

The senior second officer on board *Pacific Sun* had held an Italian master class one certificate of competency since 1993. He first went to sea as a deckhand in 1986. He rejoined *Pacific Sun* on the day of the incident after travelling to Australia from Italy. He had previously served on board the ship for about five months as senior second officer. The senior second officer was the bridge officer for the twelve to four watch.

The twelve to four quartermaster was a 56 year old Indonesian national. He held an efficient deck hand certificate issued in Indonesia in July 2000. He had served on board *Pacific Sun* as quartermaster since July 2005 and had a total of fifteen months experience on the ship. He had over thirteen years of service with P&O Cruises Australia. In addition to his watch keeping duties, he normally undertook two hours of overtime work each day after he came off watch at 1600.

The ship's senior doctor had completed his medical training in 1997, surgical training in 2001, intensive care training in 2003 and clinical skills training in 2004. He was employed by P&O Cruises as a ship's doctor in June 2004. He had also served on several other passenger ships as senior doctor.

2.2 Bridge window cleaning

Cleaning of the bridge windows is carried out to remove salt spray and dirt which might impede vision from the bridge. This task was completed every time the ship was in Sydney and at other times if required. It was a routine task that was normally undertaken by the eight to twelve watch quartermaster, the twelve to four watch quartermaster, or both, depending on other work requirements.

Rust spots around bridge window frames on *Pacific Sun* leave rust streaks on the white paintwork below them. Removing these rust streaks was regularly done to maintain the appearance of the ship. For this, a proprietary rust removing chemical was painted onto the streaks before being rinsed off with fresh water.

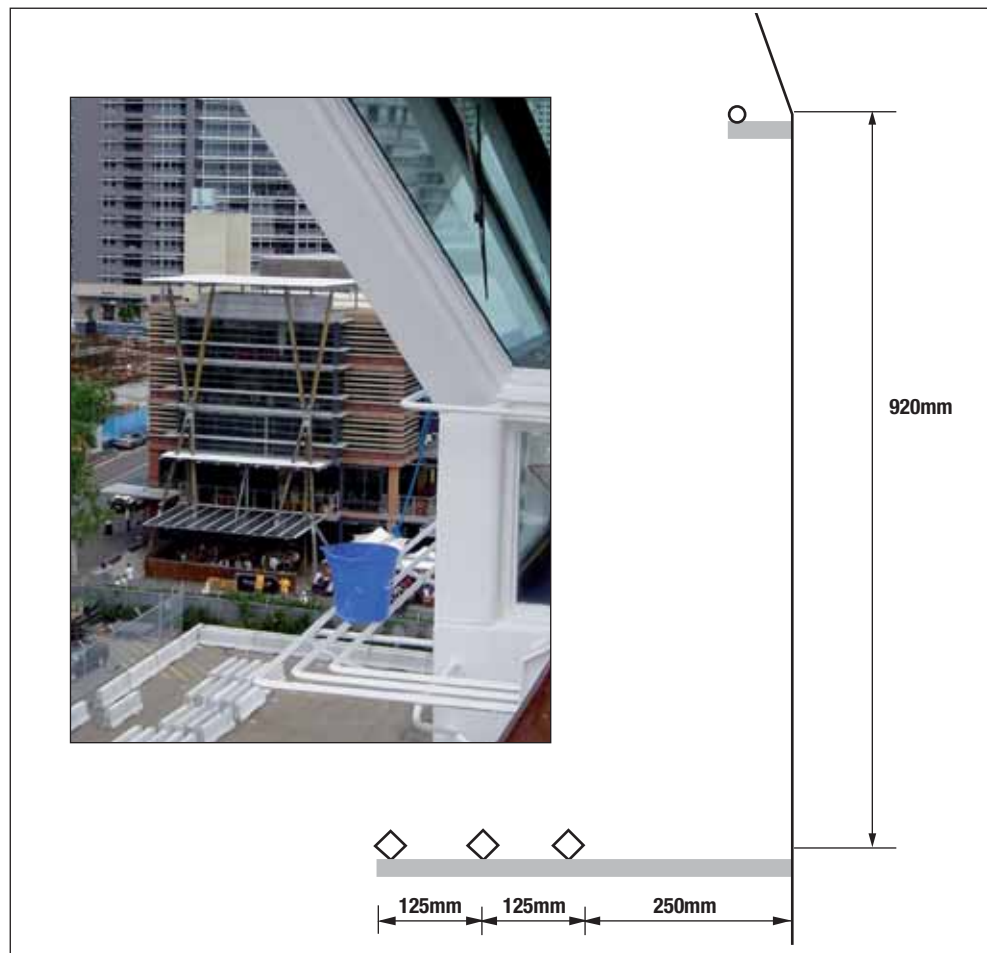
The outside of the windows, and the window frames, are cleaned from a catwalk mounted outside the bridge. Forward of the bridge is a walkway that is enclosed with handrails. The bridge wings, however, overhang the side of the ship and access to the outside of the bridge wings is by a catwalk which is designed so that it does not reduce the visibility from the bridge windows and is not enclosed by a handrail.

The catwalk for cleaning the bridge wing windows consists of three lengths of 25 mm square section steel bar welded on an angle to brackets that are permanently attached around the outside of the ship's bridge. These bars provide a working

platform 250 mm wide, set between 250 mm and 500 mm out from the sides of the bridge wing (Figure 2).

Inboard, a 25 mm round section grab rail is welded onto brackets approximately 100 mm from the bridge wing side below the windows (Figure 2). This rail serves as an anchoring point to secure a safety harness lanyard while working around the outside of the bridge.

Figure 2: Catwalk arrangement with inset showing actual bridge wing catwalk



No international standard exists for the design and construction of catwalks for working outside enclosed bridge wings but the design and construction of these catwalks must meet classification society approval.

2.3 The incident

At 0710 local time (UTC + 11 hours), on 5 February 2006, *Pacific Sun* arrived at number eight wharf Darling Harbour, Sydney, after a voyage from Emerald Bay, New Caledonia with 1949 passengers and 665 crew on board. The weather was fine and warm with little wind and no rain during the previous 24 hours. The passengers started to disembark from the ship at 0808 and by 1020 all of the passengers had disembarked.

After arrival, the ship carried on with its normal port operations for Sydney. With the ship berthed with its port side to the wharf, fuel oil bunkers were loaded between 0830 and 1130 from a barge on the starboard side. Freshwater tanks were filled from a shore connection on the port side. A partial crew change took place where the crew who were due to go on leave were relieved by their replacements. Passengers for the next cruise started embarking at 1215. All of these activities were monitored and logged by the officer of the watch (OOW) on the bridge.

During the morning, the quartermaster on the eight to twelve watch raised the bunker flag, tidied the bridge, cleaned the inside of the bridge windows and cleaned the outside of the starboard bridge wing windows. While working outside the bridge wing, he used the approved procedure, a working aloft permit and a safety harness that was kept on the bridge for that purpose.

The twelve to four quartermaster went to the bridge at 1200 to start his watch. He had come off watch at 0400 that morning and had gone to bed. He had not been required for berthing operations or overtime work that morning. Before going on watch at 1200, he had gone ashore to telephone home from the passenger terminal. After he came on watch he was asked to make coffee for the senior second officer, which he did in the pantry adjacent to the bridge. While there, he also had a brief conversation with the master's steward.

At 1200, the senior second officer took over the watch on the bridge. After a brief discussion about the work required for the watch, both he and the quartermaster agreed that the main task during the watch was to clean the rust streaks from the outside of the bridge window frames on the port side using a proprietary product, Metalbrite HD, and then to wash the outside of the windows. The MSDS² for Metalbrite HD required the quartermaster to wear plastic or rubber gloves, suitable work clothing and mask. He was wearing normal work clothes and lace-up safety shoes. He was also wearing thin nitrile gloves, sunglasses and a cap.

At 1205 the senior second officer completed a work permit allowing the quartermaster to work aloft. Before starting work, the quartermaster donned the bridge safety harness and it was checked by the senior second officer. His bucket of Metalbrite HD was lashed to the railing with a short length of rope (Figure 2 inset). The quartermaster was familiar with the task, having completed it on many previous occasions, most recently on 28 January 2006. The quartermaster started cleaning at the after end of the port bridge wing and was moving forward. Several witnesses ashore in the passenger terminal saw, and took photographs of, the quartermaster while he was cleaning the windows.

At the start of his watch, the senior second officer re-familiarised himself with the bridge equipment and procedures. He read his handover notes, monitored the ship's activities and was given a handover by the departing senior second officer. During this period, he monitored the progress of the quartermaster and noted that the quartermaster's harness was correctly attached every time he checked. The last time the senior second officer checked on the quartermaster was at about 1235. The senior second officer who was going on leave left the bridge at approximately 1240

2 MSDS refers to the Material Safety Data Sheet that outlines the hazards associated with a chemical and the safety precautions required when using it.

with the intention of returning at 1345 to relieve the new senior second officer while he underwent induction training.

At about 1249, the twelve to four quartermaster fell approximately 24 metres from the port bridge wing catwalk onto the wharf below.

The ship's security officer had started making his rounds of the ship's hull openings and gangways after 1200. At about 1249, while in the vicinity of the number three deck forward gangway he heard a woman scream. It seemed to him to have come from one of a group of women behind the fence in the visitors' area next to the terminal building. These women gestured to him that there was something wrong towards the bow. He stepped onto the wharf and looked towards the bow where he saw the quartermaster lying on the wharf.

A crew member standing near the gangway told the security officer that the quartermaster had fallen. The security officer moved up the wharf to where the quartermaster was lying, checked him for vital signs, and then contacted the bridge on his UHF radio³ and informed the senior second officer of the situation. The senior second officer announced a 'Code Alpha'⁴ on the wharf using the ship's public address system. A boarding passenger, who was a paramedic, had seen the incident and also made his way to where the quartermaster lay and administered first aid.

The master, who was having lunch with a company superintendent, immediately went to the bridge when he heard the Code Alpha announcement. He noticed that the senior second officer appeared shaken. The senior second officer explained that the quartermaster had fallen onto the wharf from the port bridge wing. The master briefly inspected the railing and catwalk for any signs of damage or breakage but everything appeared normal. He then went down to the wharf where he saw the quartermaster on the ground, still wearing his harness. He instructed the ship's agent to call emergency services and was informed that they had already been called and were on their way.

Pacific Sun's senior doctor, who had joined the ship that morning and was receiving a handover in the medical centre, also responded to the Code Alpha call. He went to the wharf with a ship's nurse and the ship's medical emergency bag. They worked with the paramedic to provide life support until an ambulance arrived.

At approximately 1300, with emergency services in attendance, the quartermaster was declared deceased by the ship's doctor. Passenger boarding was halted at this time and the area was screened off.

At 1615, after the quartermaster had been identified by the boatswain and removed from the scene, passenger boarding resumed. The ship sailed from Sydney on its next cruise at 1900, approximately two hours behind schedule.

3 An Ultra High Frequency handheld radio used for internal shipboard radio communications.

4 Code Alpha was the ship's internal announcement indicating that a medical emergency has occurred and that the ship's doctor is urgently required at the location specified in the announcement. This is normally used for passenger illness or injury.

3 ANALYSIS

3.1 Evidence

On 18 and 28 February 2006, two investigators from the Australian Transport Safety Bureau (ATSB) attended *Pacific Sun* while it was berthed in Sydney. The master and directly involved crew members were interviewed, and they provided accounts of the incident. Later, interviews were conducted with other witnesses to the incident. Copies of relevant documents were obtained including log book entries, procedures, permits and statutory certificates. The harness used by the quartermaster was examined by the ATSB investigators at the New South Wales Water Police base.

Several witnesses to the incident had taken photographs of the ship and of the quartermaster before he fell. Some of these photographs had time stamps inserted on them by the camera. Copies of these photographs were given to the ATSB investigators which allowed the investigators to put the images into a sequence.

Information relating to the incident was also obtained from the New South Wales Coroner's Office, New South Wales Police, Carnival Australia and the Australian Maritime Safety Authority (AMSA).

Investigations by the ship's master and security officer, after the ship's departure from Sydney on 5 February 2006, revealed that the quartermaster may have had some personal problems. A crew member who knew him well also reported that his behaviour was a little different from usual on the day of the incident. Several crew members suggested that he may have had some financial or personal problems. No suicide note was found amongst his possessions. These issues were examined by the ATSB investigators in the course of their investigation and it was determined that the quartermaster may have been preoccupied with family considerations on the day of the incident but there is no evidence to support the suggestion that he intentionally jumped from the bridge wing.

3.2 Bridge wing catwalks

The catwalk for working outside the bridge wings was designed and constructed to minimise the effect on the visibility from the bridge windows, particularly the view of the ship's side and the wharf when berthing the ship. The catwalk does not provide an enclosed platform with sure footing on which to stand while working.

The three steel bars, spaced 125 mm apart, form the working platform and provide only a small contact area between the steel and the shoes of personnel standing on them. A photograph taken of the quartermaster working on the catwalk before the incident clearly shows his foot partly hanging over the edge (Figure 3).

Normally, a person standing on such a catwalk would have their weight slightly forward when cleaning windows but because of the outward slope of the bridge wing windows, it is not always possible. There are times when the person must lean out and thereby have their centre of mass suspended over clear air and so the security of the harness is critical under these circumstances.

Figure 3: The quartermaster's foot extending beyond the edge of the catwalk



From the time stamps on the witness photographs it was possible to construct a sequence of events which showed that the quartermaster had progressed all the way along the port side to the limit of the harness lanyard before returning to the grab rail bracket in the middle. The last photograph in the sequence shows the quartermaster standing on the catwalk adjacent to the middle bracket with both of his hands at the grab rail near the bracket (Figure 4). Considering his movement pattern, it is probable that he was moving the lanyard past this grab rail bracket when he lost his footing and fell.

Figure 4: The quartermaster near the middle bracket immediately before the incident



3.3 Safety equipment

3.3.1 Safety harness

A safety harness is required when working on the bridge wing catwalks. This harness must be secured to the grab rail by a lanyard at all times to ensure the security of the wearer. After the incident, the harness and lanyard were inspected by the ATSB and were found to be unbroken and still functional. The grab rail and brackets outside the bridge wing were also unbroken and undamaged. The evidence indicates that the lanyard was not properly connected at the time of the fall.

The safety harness was manufactured in October 2003 by Ridgegear to comply with BS EN 361⁵, the standard for harnesses. The harness had a single 'Protecta' fall arrester lanyard attached at the back which was manufactured to comply with the ANSI Z359.1⁶ standard.

The harness was ordered in June 2004 and received on board in October 2004. The harness and lanyard were inspected quarterly as required by Fleet Instruction SAF.1.13. The last formal inspection was in November 2005. The harness and lanyard were also inspected before every use, including on the day of the incident.

The clip on the single lanyard was too small to attach directly onto the grab rail. Instead, the lanyard had to be passed around the rail and then clipped back onto itself (Figure 5). The clip was of a suitable design for the purpose but the width of the strap made it difficult, when movement was restricted, to close the clip around the strap. If the strap was not curled into the clip, it would not latch closed, possibly allowing the strap to slip back out of the clip. Whilst it is possible to secure the clip around the rail using one hand, the investigators found during testing, and a demonstration by another quartermaster, that it was far easier to attach the lanyard using two hands.

Figure 5: Method of clip attachment

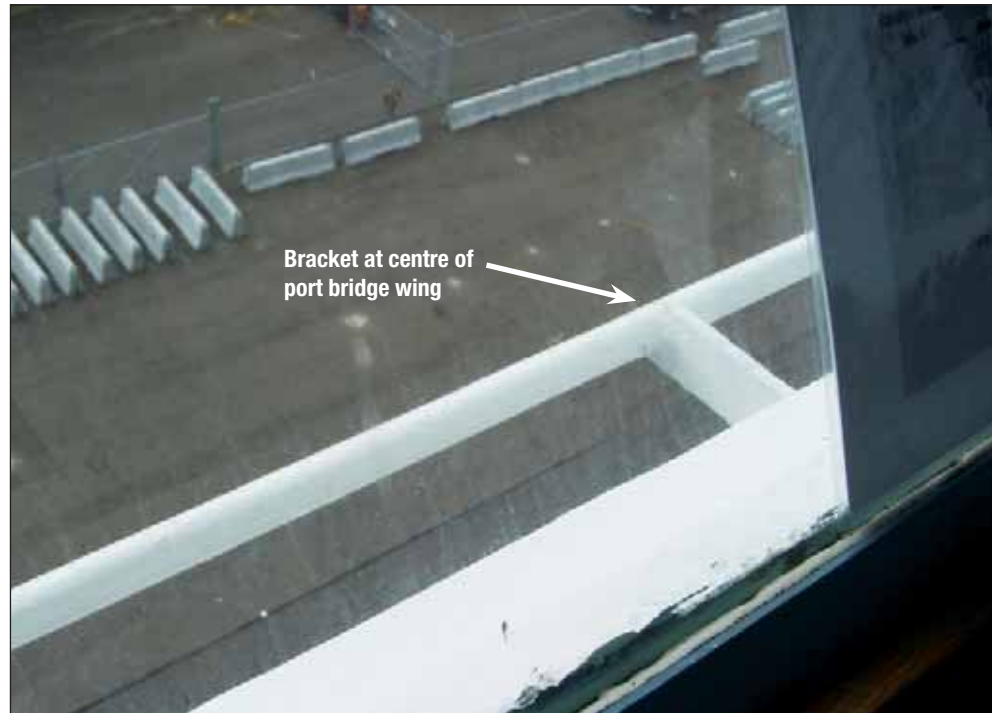


5 BS EN 361:1993. Personal protective equipment against falls from a height - Full body harness.

6 ANSI Z359.1:1992. Safety requirements for personal fall arrest systems, sub systems and components.

Once secured, the lanyard cannot be moved past the brackets on the grab rail (Figure 6). To move along the catwalk, the wearer must disconnect the lanyard and reconnect the clip past each bracket. The fact that it is difficult to fasten the clip with one hand possibly encouraged the use of two hands to unclip, move and re-secure the lanyard. For this critical period of time it is likely that the wearer will have neither the lanyard secured nor a hand free to hold onto the grab rail.

Figure 6: Grab rail bracket



The design of the harness with only a single lanyard did not allow the harness to be attached to the ship in any way while the lanyard was being moved past a bracket.

As a result of this incident, a fleet regulation instruction letter, 'SAF/09/06 Working Aloft', was issued by the company which states:

With immediate effect any person working aloft, who is required to move from one point to another, such as on a catwalk, is to use a Safety Harness with 2 lanyards. All persons performing such tasks are to be instructed that they are to work in such a way that at least one lanyard is securely attached at all times.

3.3.2 Personal protective equipment

The quartermaster was wearing work trousers, a work shirt, sunglasses and a cap to work outside. He was wearing thin nitrile gloves to protect his hands from the effects of the phosphoric acid based rust removing chemical, Metalbrite HD. This personal protective equipment, and its use, was not completely adequate for the task of removing rust stains from outside the bridge wings.

The MSDS for Metalbrite HD specifies the required personal protective equipment for using this chemical. The gloves and work clothes fall within these requirements but the glasses do not. The MSDS requires that a face mask giving complete facial

protection should be worn. There is a possibility that drips of the chemical may have fallen onto the quartermaster's face or into his eyes and distracted him thereby contributing to his fall, considering that he had brushed the chemical onto the outward sloping windows above his head.

The quartermaster was wearing lace-up steel capped working shoes at the time of the incident. An examination of the shoes after the incident found that they were not laced up tightly, possibly to allow them to be slipped on and off when moving through passenger areas of the ship. These loosely laced shoes may have been insecure and unstable on his feet when working on the catwalk, a fact which, combined with the catwalk construction, may have led to him losing his footing.

The quartermaster's shoes were found on the wharf about five metres from where he landed. The impression of one witness was that the quartermaster's shoes had come off his feet as he landed on the wharf. The shoes coming off the quartermaster's feet when he landed is consistent with the fact that his shoe laces were only loosely tied.

3.4 Shipboard procedures

The International Safety Management (ISM) Code requires that all ship operators and ships develop a safety management system (SMS) to ensure the safe operation of ships and for pollution prevention.

Section 7 of the ISM Code requires that:

The Company should establish procedures for the preparations of plans and instructions including checklists for key shipboard operations concerning the safety of the ship and the prevention of pollution. The various tasks involved should be defined and assigned to qualified personnel.

Working aloft has been identified by P&O Cruises as a key shipboard operation concerning safety. To meet the requirements of the ISM Code, a working aloft procedure and associated work permit system had been developed for use whenever working aloft. In addition, a workplace risk assessment had been conducted for work over the side of the vessel to identify and mitigate the risks associated with these types of tasks.

Section 9.1 of the ISM Code states that:

The SMS should include procedures ensuring that non-conformities, accidents and hazardous situations are reported to the company, investigated and analysed with the objective of improving safety and pollution prevention.

Procedures had also been implemented by the company to report and investigate any accidents, injuries or near-miss incidents. It was revealed during the investigation that a total of 29 injuries were reported in the 10 months prior to the incident for the entire crew of 665. Apart from personnel injuries, only three hazardous incidents had been reported in the previous 12 months. Although P & O Cruises Australia has only operated the ship since September 2004, no near-miss incidents relating to working aloft had been reported on *Pacific Sun* in the previous five years. Given the size of the crew, these low numbers suggest that a significant number of incidents or near misses may not have been reported.

3.4.1 Working aloft procedure

The company's safety management system contained a procedure for working aloft. Fleet Regulation SAF.1.19, 'Working Aloft and Outboard', was the procedure to be followed by personnel who were required to perform work including cleaning the outside of the bridge windows.

The working aloft procedure was largely based on Chapter 15 of the Code of Safe Working Practice for Merchant Seamen and part one of the procedure refers to the code, and states:

Personnel working at height may not be able to give their full attention to the job and at the same time guard themselves against falling. Proper precautions should therefore always be taken to ensure personal safety when work has to be done aloft or when working outboard.

Of particular relevance to the incident was part 2.1 of the working aloft procedure which stated:

A safety harness with lifeline is to be continuously worn when working aloft, outboard or overside. Additionally a fall arrest device or safety net should be rigged when necessary or appropriate.

The wording of this part of the procedure could be clearer in its intent. While it states that a safety harness with a lifeline must be worn continuously, this is based on the understanding that a lanyard (or fall arrest line) fitted to a harness may only be considered to be a 'lifeline' when it is attached to a strong point. It is common for seamen to refer to the harness lanyard as a 'lifeline' regardless of whether or not it is attached. Thus the wording of the procedure could lead to some ambiguity in the requirement for the harness wearer to be continuously attached, not just wearing a harness fitted with a lanyard, which may be attached or detached at the discretion of the wearer.

The quartermaster's work, cleaning the outside of the bridge windows, required him to detach and then reattach his harness lanyard when moving past the brackets on the grab rail. In this situation, using a harness fitted with a single lanyard, he could not possibly comply with the intent of the working aloft procedure. There was no way that he could be continuously attached to a lifeline.

Chapter 15 of the Code of Safe Working Practice for Merchant Seamen stipulates that personnel working aloft: '...should be under observation from a person on deck.' While the ship's working aloft procedure does refer to chapter 15 of the code, the procedure does not contain any further guidance on the appropriate level of supervision. On the day of the incident, the senior second officer periodically checked the quartermaster and observed that his harness was still connected about every ten to fifteen minutes. The quartermaster's experience as a seaman in general, and with this task in particular, suggests that this level of supervision should normally have been adequate.

3.4.2 Workplace risk assessment and permit to work

Pacific Sun's SMS included a workplace risk assessment process which was used for assessing the risks of a particular task. The process was based on a standardised risk assessment form which included; a list of general hazards to be used by the assessor to help identify the hazards associated with the work, a risk assessment matrix and a place to record precautions to be followed to mitigate the risks.

The workplace risk assessment, which was applicable to cleaning the bridge windows, assessment number D009 dated 29 July 2004, was a generic risk assessment, performed at a point in time, for all tasks involving work over the side for all ships in the fleet. It was not specific to the task of cleaning the bridge windows on board *Pacific Sun*.

Risk assessment form, D009, identified two major hazards for working aloft:

- 1) Personal injury as a result of falling from the staging or bosun's chair.
- 2) Injury to persons below from falling tools or objects.

The precautions and protective equipment specified for the task were listed as:

- 1) Follow the permit to work and fleet regulations.
- 2) Ensure lifejacket/safety harness is worn according to fall hazard.
- 3) Ensure all tools are secured with a lanyard.

The form recorded that the chance of either of the two major hazards occurring when working aloft was assessed as 'highly unlikely' if the precautions listed were followed. It also indicated, however, that the consequences were 'extremely harmful'.

The problem with the risk assessment was that the advice it contained was too general to be useful in the context of the quartermaster's work cleaning the bridge windows. The risk associated with unclipping the harness to move it past the brackets on the hand rail was not identified nor were the risks associated with using the rust remover chemical. While the risk assessment referred to the permit to work and fleet regulations (or procedures) neither of these documents contained more detailed job specific instructions which addressed these risks. Indeed, the risk assessment 'precaution' with respect to wearing a lifejacket/safety harness 'according to fall hazard' is inconsistent with the fleet regulations which stipulate that a harness must be worn continuously.

A permit to work was correctly filled out for the quartermaster on the day of the incident. The senior second mate had ticked a number of boxes on the permit to indicate checks including: 'Safety lines', 'Safety harnesses', 'Protective clothing/lifejacket', and 'Tools with lashings'. The permit to work also stated:

In all cases the work to be carried out must be fully discussed with the participants using the Workplace Risk Assessment and a proper system of work agreed upon before commencement. All tools and equipment must be of an approved type.

While the permit had the appropriate reference to the workplace risk assessment, which in turn referred to the Fleet regulations, neither of these documents were detailed enough to be useful in identifying the task specific risks. The system effectively became a circular process with one document referring to another. As a

result no effective risk assessment was carried out to address the risks specific to the bridge window cleaning work on board *Pacific Sun*.

3.5 Human factors

The ATSB investigation revealed that the quartermaster had telephoned his wife shortly before going on watch on the day of the incident, as was his usual practice when the ship was in Sydney. During this telephone call, he seemed normal to his wife. He planned to call again and to send some money home when the ship next returned to Sydney. While it is not known exactly what was said during this telephone conversation, he may have been distracted at the time of the incident by thinking about this call, or the issues he discussed.

It was reported by one crew member that his behaviour seemed a little different on watch on the day of the incident. Apart from that statement, there were no reported changes in his behaviour or demeanour over the preceding few months. This reported change in his body language and demeanour could possibly be attributed to some personal stress or to him being preoccupied with thoughts of home after his telephone conversation.

An autopsy report, conducted for the New South Wales coroner, confirmed that there was no evidence that alcohol or drugs contributed to the incident. There was also no indication that the quartermaster suffered from any medical condition that may have contributed to his fall. A review of his work and rest balance for the preceding few days gave no indication that fatigue was an issue.

The human ability to focus attention on more than one task simultaneously is possible because well learnt skills become increasingly automatic with experience and require less of a person's attention. Any conscious task (including daydreaming or worrying) can occupy the attention and block out other information⁷. The quartermaster was familiar with the task of cleaning outside the bridge windows. He had done it often since he joined the ship. While the task exposed the quartermaster to the risk of falling, he had probably become comfortable with working outside the bridge wings, and the risks involved, through experience.

The quartermaster was an experienced seaman who had been adequately inducted in the ship's safety management system. He was familiar with the task, having completed it on many other occasions, most recently on 28 January 2006. On 5 February, he may have experienced some loss of attention to the task he was performing while being preoccupied with thoughts of home and he may have become de-sensitized to the risks through his familiarity with the task.

7 Alan Hobbs. Human Factors for Transport Safety Investigators.

4 FINDINGS

From the evidence available, the following findings are made with respect to the fatality of the crew member on board *Pacific Sun* on 5 February 2006 and should not be read as apportioning blame or liability to any particular organisation or individual.

4.1 Contributing safety factors

These findings identify the various events and conditions that increased safety risk and contributed to the incident.

1. The structure of the catwalk, providing only a small contact area between the steel and the quartermaster's shoes, made the footing insecure for the quartermaster while he was working on the catwalk.
2. The absence of a safety rail on the outboard side of the catwalk increased the risk of falling and required the quartermaster to wear a safety harness with its lanyard attached to the ship at all times.
3. The quartermaster probably lost his footing on the catwalk, possibly partly the result of having very loosely tied work shoes, while moving his harness lanyard past a grab rail bracket.
4. The single harness lanyard securing arrangement was inadequate in that it needed to be disconnected from the ship's structure in order to move it past brackets without having a secondary method of securing the quartermaster.
5. The workplace risk assessment process was inadequate in that it failed to identify the risks associated with the task of cleaning the bridge windows and specify appropriate precautions to mitigate the risks.
6. The working aloft procedure was inadequate in that it did not unambiguously specify the necessity to be continuously attached to a strong point on the ship.
7. The quartermaster was highly experienced in the task and may have become de-sensitized to the risks associated with it. In addition, he may have had his attention diverted by non-work related issues.

4.2 Other safety factors

These findings identify other events and conditions that increased the safety risk.

1. The quartermaster was not wearing full face protection while using the rust removing chemical, Metalbrite HD, as specified by the MSDS and may have splashed a small amount of the chemical into his eyes or onto his face.

4.3 Other key findings

These are findings that are not defined as safety factors or may be positive events and conditions that reduced the risks associated with the incident.

1. There was no evidence to support the suggestion that the quartermaster intentionally jumped from the bridge wing.

5 SAFETY ACTIONS

5.1 Safety action by Princess Cruises

The ATSB has been advised that the following safety action has been taken as a result of the fatality on board *Pacific Sun*.

1. Immediately following the incident, Princess Cruises issued a fleet regulation instruction letter requiring that any person working aloft, who needs to move a safety harness lanyard, must use a harness with two lanyards and have at least one lanyard securely attached at all times.

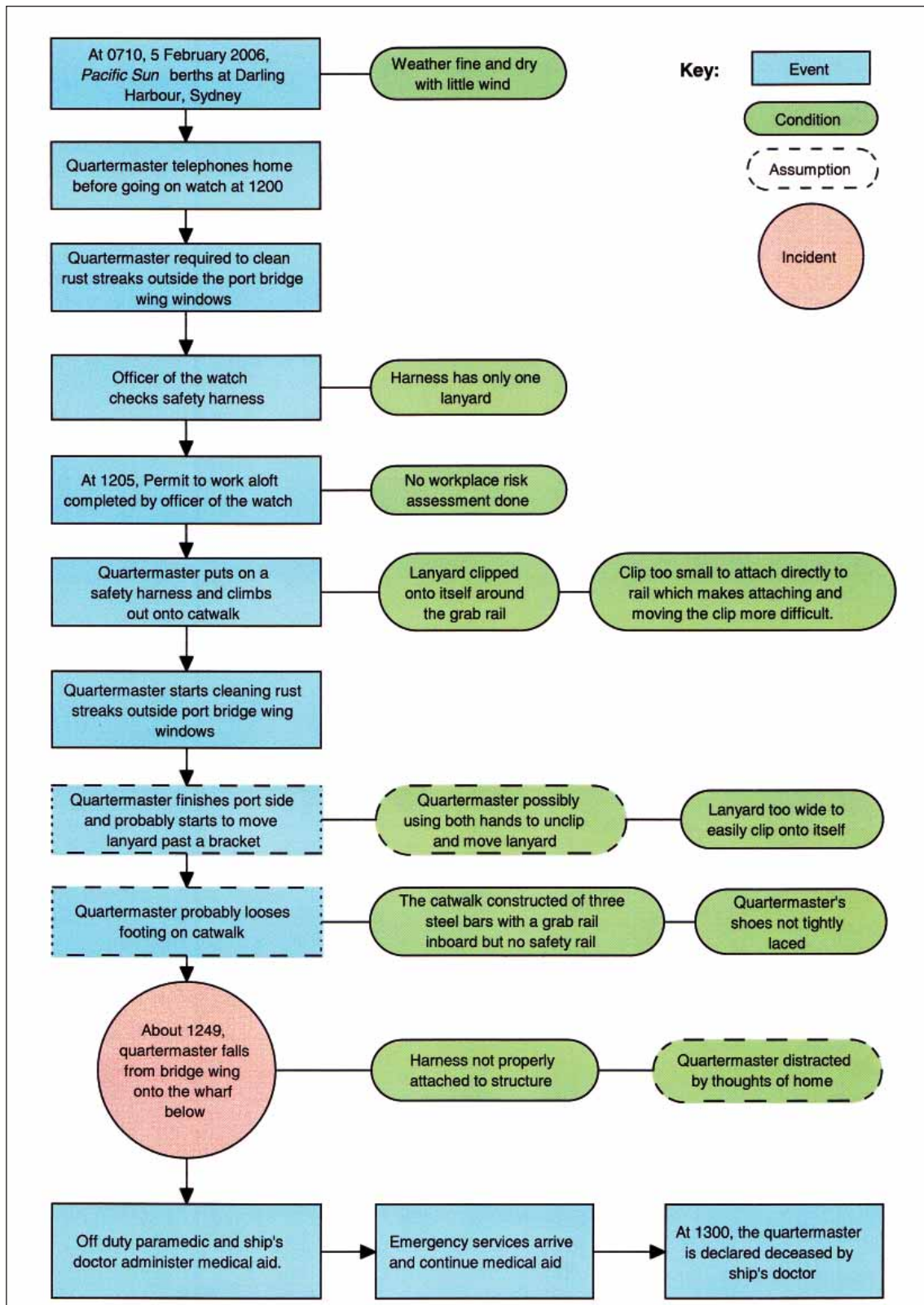
5.2 ATSB recommendations

MR20060033

Ship owners, operators and masters should ensure that safety harnesses and lanyards used by personnel when working aloft are appropriate for the purpose considering all aspects of the tasks to be performed.

MR20060034

Ship owners, operators and masters should ensure that the procedures, permits and risk assessments for personnel working aloft identify all of the hazards and stipulate measures to mitigate all of the risks.



IMO Number	8314122
Call sign	C6FM7
Flag	Bahamas
Port of Registry	Nassau
Classification society	Lloyds Register
Ship Type	Passenger
Builder	Kockums AB – Malmo
Year built	1986
Owners	Carnival PLC
Ship managers	P & O Cruises Australia
Gross tonnage	47 262
Net tonnage	25 387
Deadweight (summer)	6 453 tonnes
Summer draught	7.63 m
Length overall	224.82 m
Length between perpendiculars	190.81 m
Moulded breadth	28.01 m
Moulded depth	28.20 m
Engines	2 x Sulzer 7RLB66
Total power	22 706 kW

8.1 Sources of information

The master and crew of *Pacific Sun*

Independent witnesses from ashore

The Australian Maritime Safety Authority (AMSA)

Carnival Australia

New South Wales Water Police

New South Wales Coroner's Office

8.2 References

Code of Safe Working Practice for Merchant Seamen, Marine and Coastguard Agency, 2004 Consolidated Edition including 2005 amendments.

8.3 Submissions

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

The final draft of this report was sent to the master, staff captain, senior second officer, boatswain, doctor and security officer on board *Pacific Sun*, the NSW State Coroner, the paramedic, the NSW Water Police, AMSA and P&O Cruises Australia.

Submissions were received from Princess Cruises and were included and/or the text of the report was amended where appropriate.

Crew member falls to his death from passenger ship

A crew member on board the P&O cruise ship, *Pacific Sun* fell to his death because his safety harness was not properly secured, according to an Australian Transport Safety Bureau report released today.

On 5 February 2006, *Pacific Sun* berthed at number eight wharf Darling Harbour, Sydney. The quartermaster on the twelve to four watch was assigned to clean rust streaks from the outside of the port bridge wing. At 1205, before the quartermaster started work, the officer on watch checked his safety harness and completed a work permit. The quartermaster then climbed out onto an open catwalk and started to work outside the bridge wing of the ship, 24 m above the concrete wharf.

At about 1249 the quartermaster apparently lost his footing and fell onto the wharf below. He died as a result of the injuries he sustained in the fall.

The ATSB's investigation report states that the quartermaster was probably in the process of moving the safety line on his harness from one strong point to another at the time that he lost his footing and fell. The factors which contributed to his fall include a safety harness that was fitted with only one lanyard and workplace risk assessment and procedures that were inadequate. The quartermaster may also have been distracted from the task at the time by non-work related issues.

The ATSB report recommends that ship operators should ensure that the procedures, permits and risk assessments for personnel working aloft adequately identify the hazards and stipulate measures to mitigate the risks. The report also recommends that ship operators should ensure that the safety harness and lanyard used by personnel working aloft are appropriate for the purpose considering all aspects of the tasks to be performed.

Copies of the report can be downloaded from the internet site at www.atsb.gov.au, or obtained from the ATSB by telephoning (02) 6274 6478 or 1800 020 616.

Independent investigation into the crew member fatality
on board the Bahamas registered passenger ship *Pacific Sun*
while berthed in Sydney, Australia, 5 February 2006