AUSTRALIAN TRANSPORT SAFETY BUREAU

MARINE SAFETY INVESTIGATION

REPORT 160

Independent investigation into the lifeboat incident on board the Philippines flag bulk carrier

Washington Trader

at Abbot Point, Queensland
on 6 August 2000

COMMONWEALTH DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

Department of Transport and Regional Services
Australian Transport Safety Bureau

Navigation Act 1912
Navigation (Marine Casualty) Regulations
investigation into
the lifeboat incident on board the Philippines flag bulk carrier
Washington Trader
at Abbot Point, Queensland on 6 August 2000

Report No. 160
December 2002

ISSN 1447-087X
ISBN 1 877071 21 8

Investigations into marine casualties occurring within the Commonwealth's jurisdiction are conducted under the provisions of the Navigation (Marine Casualty) Regulations, made pursuant to subsections 425 (1) (ea) and 425 (1AAA) of the *Navigation Act 1912*. The Regulations provide discretionary powers to the Inspector to investigate incidents as defined by the Regulations. Where an investigation is undertaken, the Inspector must submit a report to the Executive Director of the Australian Transport Safety Bureau (ATSB).

It is ATSB policy to publish such reports in full as an educational tool to increase awareness of the causes of marine incidents so as to improve safety at sea and enhance the protection of the marine environment.

Australian Transport Safety Bureau
PO Box 967
Civic Square ACT 2608
AUSTRALIA

Phone: 02 6274 6478
1800 621 372
Fax: 02 6274 6699
E-mail: marine@atsb.gov.au

Contents

Figures

FIGURE 1:
***Washington Trader* alongside the Abbot Point coal loader**

Incident Summary

At 2036 on 5 August 2000, the Philippines flag, panamax bulk carrier, *Washington Trader* arrived at the anchorage at the Abbot Point coal loader in Queensland. The ship was in ballast and intending to load a full cargo of coal for export to Japan.

While at anchor on 6 August, the master decided to take the opportunity to conduct an emergency steering and fire drill, followed by an abandon ship drill using the ship's totally enclosed lifeboats. At 1600, the crew commenced the abandon ship drill. As there had been a full lifeboat drill some seven weeks previously, the drill involved a boat muster, followed by the lowering of the unmanned lifeboats to deck level.

By 1612, the boat muster had been completed and both lifeboats prepared for lowering. The master ordered the starboard lifeboat to be lowered first and this was completed without incident.

The master then ordered the port boat to be lowered. The mate, who was the officer in charge of the port boat, started lowering the boat by operating the brake release lever on the davit winch. When the boat was approximately halfway to the deck, the master saw the after end of the boat swing and jerk twice followed by the after fall detaching from its on-load release hook. When the after fall detached, the boat's stern fell and swung forward and the boat was seen to jerk twice more followed by the forward on-load release hook releasing its fall. The boat then fell stern first approximately 15 m to the water below.

After the incident, the lifeboat was brought back alongside. There was obvious damage to the stern of the lifeboat and a jacobs ladder was rigged to allow the mate to enter the boat to inspect the damage. He found that the boat was flooded and severely damaged at the stern with the canopy broken and set-in. He also found that the after deck around the on-load release hook had been damaged by the impact.

After initial unsuccessful attempts to recover the lifeboat, it was secured alongside overnight. It was recovered early the next morning using the auxiliary lifting shackles on the on-load release hook units. The lifeboat was re-stowed in its davit and secured with additional lashing.

Sources of information

The master and crew of *Washington Trader*

Nishi-Nippon F.R.P. Shipbuilding Company Pty

Australian Maritime Safety Authority

Transportation Safety Board of Canada

Bureau Veritas

References

Safety of Life at Sea Convention, (SOLAS) 1974 and subsequent amendments, International Maritime Organization

Narrative

Washington Trader

Washington Trader is a Philippines flag bulk carrier of 74 228 deadweight tonnes at its summer draught of 13.821 m. The vessel is owned by St Vincent Shipping Company and is managed by Victoria Ship Management Inc. of the Philippines. It is classed, I 3/3 E[1] Bulk Carrier ALT[2] ESP[3] Deep Sea[4] , with Bureau Veritas.

Washington Trader was built in 1999 by Sasebo Heavy Industries Company of Sasebo in Japan. The ship has an overall length of 225 m, a moulded breadth of 32.2 m and a moulded depth of 19.2 m. Propulsive power is provided by a 6-cylinder B&W 6S60MC single acting, direct reversing 2-stroke diesel engine, of 8 826 kW. The main engine drives a single fixed pitch propeller, which gives the ship a service speed of 14.5 knots.

The ship is of standard bulk carrier design with seven cargo holds located forward of the accommodation superstructure.

Washington Trader has a crew of 20 comprised of a master and three mates, chief and three engineers, boatswain and five deck ratings, four engine room ratings, a cook and a messman.

At the time of the incident, the master of *Washington Trader* held a foreign-going master's certificate of competency issued in the Philippines, and had 20 years experience at sea, the last two in command. The mate at the time of the incident held a foreign going mate's certificate of competency, also issued in the Philippines, and had two years experience as chief officer. Both the master and the mate had been on the ship since the delivery voyage in January, 2000.

Lifeboats

Washington Trader is equipped with two 25-man totally enclosed lifeboats. The lifeboats are type CML-19 boats constructed by Nishi-Nippon F.R.P. Shipbuilding Company of Yamaguchi, Japan. The lifeboats are stowed in davits located on the port and starboard sides of 'A' deck, the first deck of accommodation above the main deck.

The lifeboats are constructed of fibre-reinforced plastic and each boat is 5.3 m in length, has a breadth of 2.3 m and a depth of 1.0 m. The unladen weight of the boats is 1 670 kg with a fully laden design weight of 3 870 kg.

The internal configuration of the lifeboats is typical of many modern totally enclosed boats. The coxswain's thwart is located at the stern of the boat and is raised to allow all-round vision from a small 'conning' bubble in the top of the canopy. All of the boat's controls are accessible from this position, including the davit winch brake remote release cable and the on-load hook release lever. Seating for the rest of the crew is provided around the periphery of the boat with some seating also provided along the centre-line forward of the coxswain's position. There are hatches located midships on the inboard side of each boat for boarding the crew and additional hatches at the forward and after ends of the cabin to allow the crew access to the on-load release hooks.

---

1 Vessel class, division I ships are to meet the BV rules requirements for construction and scantlings of the hull and essential components relating to propulsion and safety, as applicable. Rating fraction 3/3 is assigned to ships the condition of which is considered satisfactory to BV. Equipment symbol E, placed after the rating fraction indicates that the ship's anchors and chain cables meet the applicable requirements of the BV rules.

2 ALT notation for ships designed in such a way that certain cargo spaces may be empty at a draught up to and including the scantling draught.

3 Enhanced Survey Programme.

4 Notation assigned to vessels which are capable of deep sea navigation in any area and at any period of the year.

Propulsive power is provided by a Daihatsu CLMD-30 4-stroke diesel engine, which gives the boat a fully laden speed of 6.1 knots.

Washington Trader's lifeboats are fitted with 'NS-Hook Release Mechanism' on-load fall release systems designed and manufactured by the boat builder, Nishi-Nippon F.R.P. Shipbuilding Company. The main components of each system are the forward and after hook units, the operation unit located on the after bulkhead behind the coxswain's seat and a pressure switch and alarm light control box mounted on the port bulkhead adjacent to the coxswain's position. Flexible operating cables connect the operating unit to the two hook units (figure 2). The system is designed to be operable by one person with simultaneous release of both hooks occurring when the release handle is actuated.

The main components of each hook unit are the hook, side plates, blocker and blocking knob, cable reset lever, latch and auxiliary lifting shackle (figure 3). When the operating lever is actuated the operating cable moves the cable reset lever down until its quadrant clears the notch on the back of the blocker. The blocker is then free to rotate and release the toe of the hook which allows the hook to rotate to the open position. Resetting the hook unit is a two-handed operation it involves;

- rotating the hook to the closed position,
- rotating the blocking knob to move the blocker into position to lock the toe of the hook, and
- then moving the cable reset lever up until the blocker is locked in position.

The blocking knob is fitted with an indicator which the operator must align with a corresponding mark on the hook side plate during the resetting operation. Similarly, the end of the cable reset lever is painted orange to correspond with reference marks painted on the side plates. These marks indicate when the cable reset lever is in the fully reset position. The latch is fitted to the hook opening to retain the suspension ring within the closed hook. It is swivel mounted to allow the suspension ring to be placed on the hook and retained during lifeboat recovery and may be manually tripped to disconnect the fall from the hook during launching if required.

The main working components of the operation unit (figure 4) are the release handle, the cable connection arms connected to each hook unit operating cable, the interlock and the solenoid

FIGURE 2:
Lifeboat release system schematic

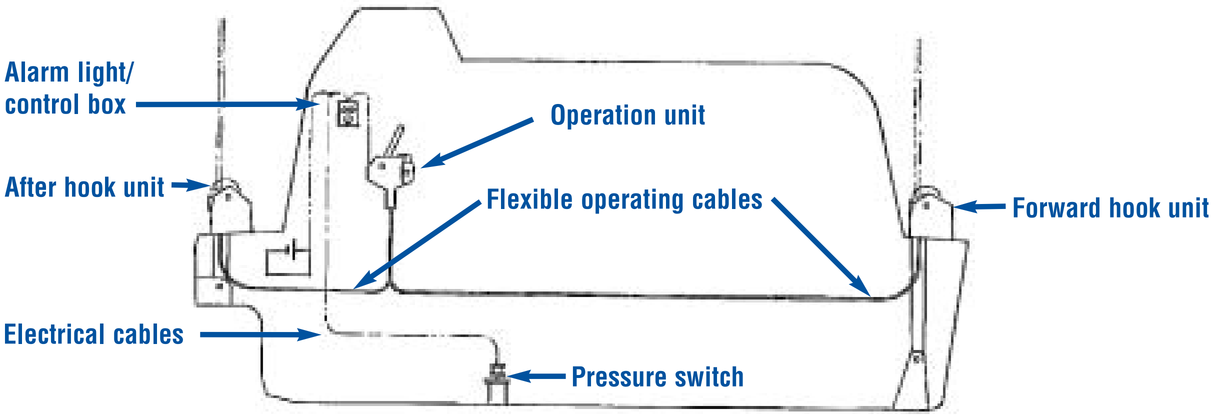
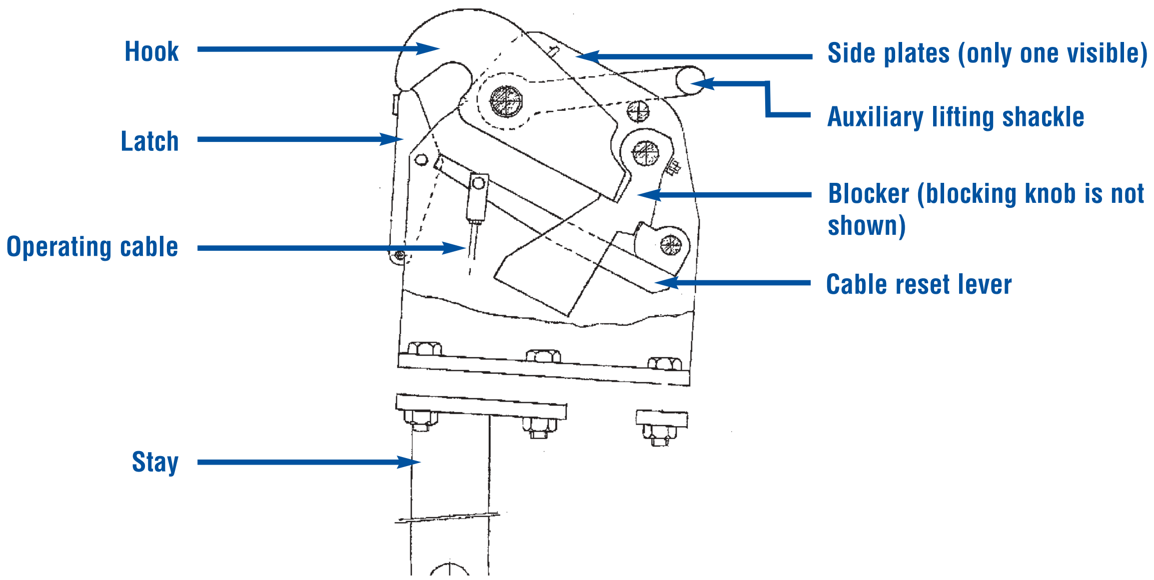


FIGURE 3:
Hook unit



which drives it. Actuation of the release handle (when the interlock is not in the blocking position) raises each cable connection arm with the resulting motion transmitted to each hook unit via the operating cables. There is a safety pin to lock the release handle in the stowed position.

The solenoid, three limit switches within the operation unit (one on each cable connection arm and the third on the interlock) and the water pressure switch are wired to the pressure switch and alarm light control panel.

The pressure switch and alarm light control panel indicate the status of the release system with red (LR) and green lights (LG) and controls the hydrostatic interlocking (figure 5). The limit switches on each cable connection arm (LS1 and LS2) are wired in series with the

FIGURE 4:
Operation unit

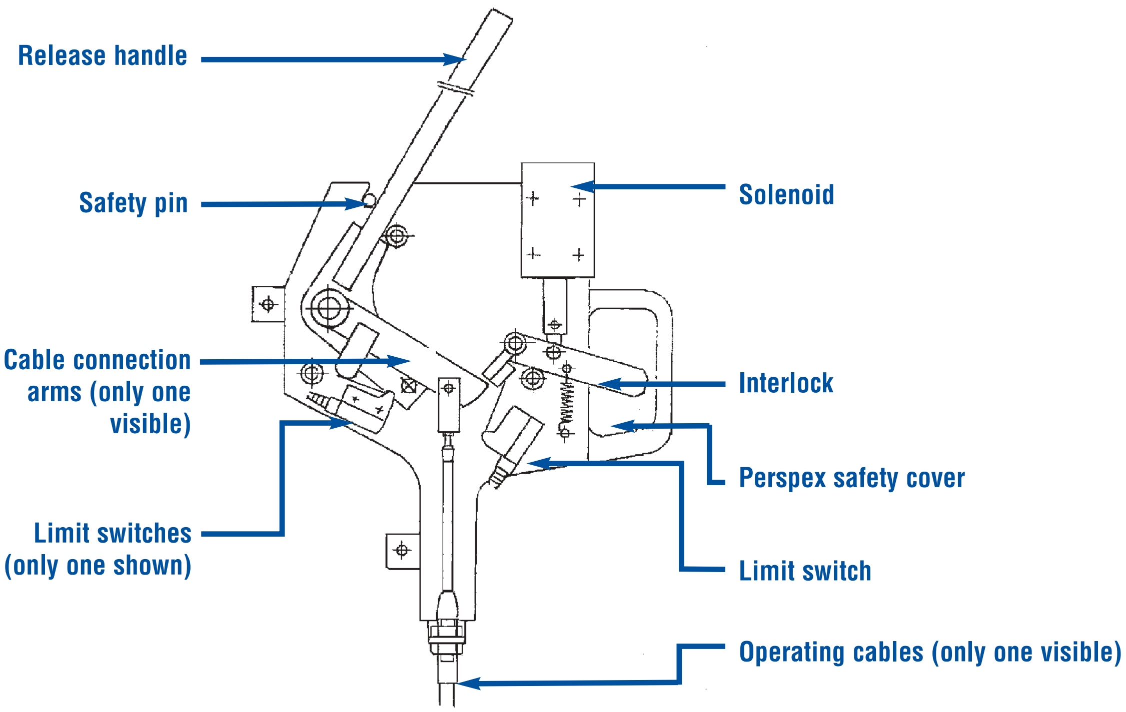
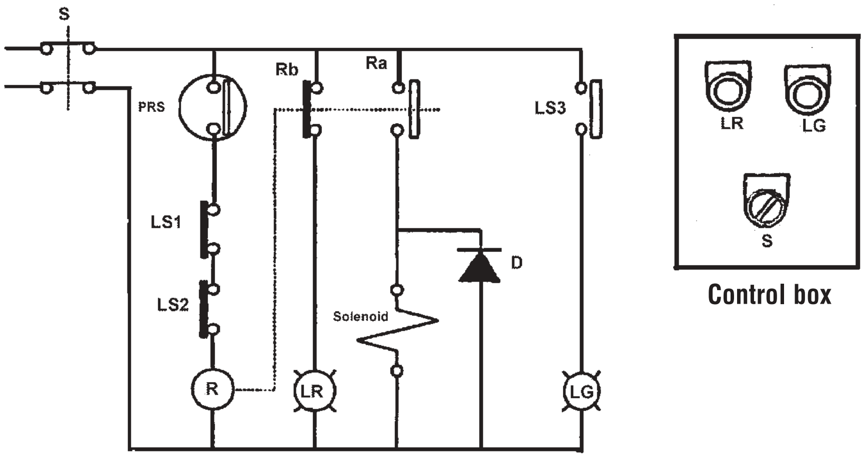


FIGURE 5:
Pressure switch and alarm light control box



water pressure switch (PRS) and are used in the control circuit to energise the relay (R). The relay contacts in turn control the power supply to the red light and the solenoid.

Under normal circumstances if the power switch (S) is on, the red light will be lit if either of the hooks are not in the reset position or the boat is not waterborne. When the boat is afloat (assuming the hooks are in the reset position) the relay will be energised. The relay contact supplying power to the red light will open (the light will go out) and the second relay contact will close and energise the solenoid. The energised solenoid moves the interlock to the unblocking position. At this time the interlock limit switch (LS3) will close and light the green light to indicate to the operator that it is safe to operate the release lever. Once the hooks are tripped, LS1 and LS2 will open to de-energise the relay which in turn will de-energise the solenoid and relight the red lamp. The interlock will be returned to the blocking position by the spring and when LS3 is opened the green light will be extinguished.

When the hooks are reset with the lifeboat still afloat, the control system will return to the same state it was in before the release lever was operated ie. LS1, LS2 and PRS closed, relay R and the solenoid energised, and the green light lit. At this time the green light indicates to the operator that the hooks are reset and that it is safe to lift the lifeboat.

Washington Trader's lifeboat davits consist of the frame, forward and aft cradles, boarding platform, suspension blocks and falls and a gripe system (figure 6). In the housed position each lifeboat is suspended in the cradles by the suspension blocks with the fall wires running from each suspension block, via a series of sheaves, to the davit winch. Lashing units adjacent to the boarding platform are used to secure each cradle to the davit frame when they are in the stowed position. The cradles are pinned at the base to the davit frame to allow them to pivot; outboard initially when the boat is lowered, and inboard at the final stage of raising the boat. The davits are also equipped with a wire-operated winch brake remote release. The remote release allows an operator inside the lifeboat to lower it from the stowed position. The davit and lifeboat are designed so that normal boarding of the crew takes place with the boat in the stowed position.

A gripe system is used to secure each lifeboat in its cradles when stowed for a sea passage. It consists of two plastic coated yellow wires, one at each end of the lifeboat, which are passed around bollards fitted to the boat's bow and stern. The lower end of each wire is fixed to the base of the davit frame and a ring on the upper

FIGURE 6:
***Washington Trader*'s starboard lifeboat**

end of each wire is secured by a rotating hook mechanism (lashing lever) attached to each davit cradle. A turnbuckle allows the tension of each gripe to be adjusted. The gripes must be fitted manually when the lifeboats are stowed but are automatically released by the rotating hook mechanism when the boats are lowered.

On *Washington Trader* each crew member is allocated a position in either the port or starboard boat. The mate is the designated officer in charge of the port boat and the second mate is the officer in charge of the starboard boat.

The incident

At 2036 on 5 August 2000, *Washington Trader* arrived at the anchorage at Abbot Point north of Bowen in Queensland. The ship had arrived after completing an uneventful passage from Kawasaki in Japan to load a cargo of coal at the Abbot Point coal loader.

On 6 August, the day following the ship's arrival at the anchorage, the master made the decision to conduct some safety drills. There was a south-easterly wind of approximately 25 knots blowing through the anchorage and a 1–1.5 m sea. The ship was lying at anchor on a heading of approximately 120°.

At 1500 an emergency steering drill was conducted followed by a fire drill and then an 'abandon ship' drill. The 'abandon ship' drill commenced at approximately 1600 and involved preparing and lowering the empty lifeboats to deck level only, as both lifeboats had been lowered to the water and taken away by the crew on the previous lifeboat drill about seven weeks earlier.

Initially the crew were mustered in life jackets at their boat stations and the roll was called. The master was stationed on the bridge. After all the crew had been accounted for, the mate and second mate checked the life jackets and attire of the crew at their respective boat stations and then prepared the lifeboats for lowering. At approximately 1612, both officers advised the master that they were ready to lower the lifeboats. The master then gave the order to lower the starboard boat. The starboard boat was subsequently lowered to deck level by the second mate without incident.

At 1615, the master ordered the port lifeboat to be lowered. After giving the order, the master made his way to the port bridge wing to oversee the lowering of the boat. The mate started lowering the boat by operating the brake release lever on the davit winch while standing on deck. When the boat was approximately halfway to deck level, the master, from his vantage point on the bridge wing, observed the aft section of the lifeboat seem to swing followed by a jerk, then a second jerk and then the after suspension ring came out of its hook. Once the after fall had detached, the master saw the stern of the lifeboat drop and swing forward with the forward hook still attached. The lifeboat appeared to jerk twice more before the forward hook opened, releasing its suspension ring. After the forward fall detached, the boat fell stern-first to the water some 15 m below.

The master went to the boat deck and saw that the lifeboat's forward painter was taut with the boat floating at the ship's stern. He ordered the crew to pull the boat forward using the painter. Once the boat was pulled in, the crew observed that the stern of the lifeboat was damaged. The master ordered the boat pulled further forward alongside number six hold and secured by the forward and aft painters. A jacobs ladder was rigged and the mate went down to inspect the boat. The mate reported that the boat was flooded and the after section of the canopy was damaged and set in. He also indicated that the deck around the after hook mounting was damaged and that he felt that the boat could not be lifted using this hook.

The master considered the problem of recovering the boat and decided to use the ship's provisions crane with a sling secured around the stern of the lifeboat. The lifeboat was hauled to the starboard side of the ship and the ship's main engine was prepared for manoeuvring to make a leeway while recovering the boat. From about 1720, attempts were made to recover the lifeboat. After some problems securing a line around the stern of boat, the master remembered that the after hook is secured to the keel of the boat by a strong steel stay. He thought that it may still be possible to lift the boat using the lifeboat davit attached to the after hook despite the damage to the after deck. The mate subsequently checked and found that the stay attaching the hook to the keel of the boat appeared to be undamaged.

At 1829 the master decided to abandon the attempt to recover the lifeboat for the day as the light was failing and the wind was becoming stronger. The lifeboat was subsequently re-secured, on fenders, on the port side of number six hold with painters fore and aft. A watch was posted overnight to ensure that the lifeboat did not sink.

The master called the crew at dawn the next morning and by 0600 he was manoeuvring the ship to make a leeway to recover the lifeboat. The lifeboat was brought under its davit with the mate aboard and he attached the falls to the auxiliary lifting shackles of the lifeboat's forward and aft hook units. The davit winch was then used to lift the boat clear of the water. When the lifeboat had been hoisted to the stowed position, the gripes were resecured and an additional 20 mm synthetic rope was used to lash the boat into the davit cradle. The recovery of the port lifeboat was completed by 0900 on 7 August.

Comment and analysis

Lifeboat inspection

Initial observations

Washington Trader arrived alongside the Abbot Point coal loader on the evening of 8 August 2000. An investigator from the Australian Transport Safety Bureau (ATSB) attended the ship and conducted an initial inspection of the port lifeboat.

Externally, all of the damage to the lifeboat was confined to the stern (figure 7). The canopy at the stern was extensively damaged with several large cracks and small sections missing. It was set-in in way of the after hatch which was hanging ajar from its damaged frame. The after deck was extensively damaged with much of the deck around the on-load hook broken up. There were several large cracks in the hull at the transom. The rudder/propeller nozzle had been broken away from the rudder stock and keel block, both of which had been deformed by the impact.

Inside the boat the damage was limited to the fixtures on the after bulkhead with the mounting brackets for the hook release operation unit twisted. The engine exhaust skin fitting on the transom was also damaged.

A close examination of the on-load release system was conducted on the morning of 9 August. The master and mate stated that the on-load release system had not been adjusted,

FIGURE 7:
Damage to the stern of *Washington Trader*'s port lifeboat

FIGURE 8:
The after hook as found

FIGURE 9:
The forward hook as found

reset, or handled in any way between the time of the incident and the investigator's inspection.

The after hook

The after hook was found to be in an un-tripped or closed position (figure 8). The cable reset lever on the after hook was in the reset position although the end of the lever was approximately 20 mm lower than the painted reference marks on the hook side plates. The retaining latch on the hook was damaged with both of its side members bent outboard. The lug at the top of the outboard side member was missing. There were a number of witness marks (scores or damage) on the latch and the suspension ring which were consistent with the ring having been forced past the retaining latch with the hook in a closed position.

The forward hook

The forward hook was found to be in a tripped or open position (figure 9). The cable reset lever was in a partially reset position with the end of the lever approximately 25 mm above the fully tripped position. There was no damage evident to any part of the forward hook mechanism including the suspension ring or retaining latch. The position of the cable reset lever indicated that the forward hook may not have been fully reset after the previous boat drill, or that the hook may have been forced open when the full weight of the boat was transferred to the forward fall.

The operation unit

The release handle of the operation unit was in the un-tripped position with a piece of twine fastened around the handle and the safety pin (figure 10). The pivoting safety pin was slightly bent adjacent to the eye at its pinned end and thus could not be seated in the notch of the opposite operation unit side plate. The after hook cable connection arm was found to be in the reset position with the forward hook cable connection arm in a tripped position, ie. the after arm was down and forward arm was up. The hydrostatic interlock lever was disengaged due to the tripped position of the forward cable connection arm. There was no sign of damage to any component of the operation unit other than

FIGURE 10:
Operating unit as found

some deformation of the mounting brackets attaching it to the after cabin bulkhead.

The pressure switch and alarm light control box also showed signs of impact damage with the metal box deformed and both indicator light lenses broken.

Further examination

Several tests were performed on the on-load release system after the initial inspection. The tests were performed in-situ with the lifeboat in the stowed position. Initially, both hooks were reset; the forward cable reset lever was found to be quite stiff and a bar was required to move the lever up to its fully reset position, the after cable reset lever however, was found to be easily moved under light finger pressure. The hydrostatic interlock lever was then manually tripped and the release handle moved to release the hooks. The system was found to operate satisfactorily with both hooks tripping almost simultaneously. This process of resetting and tripping the hooks was repeated several times. The forward cable reset lever remained stiff despite the repeated movements. The forward hook was tested next by moving the cable reset lever to the same partially reset position 'as found' with the hook closed. A load was then applied to the hook with the intention of breaking the hook open. The hook remained closed under the limited load.

The whole system showed slight surface corrosion on all galvanised components and signs of lubrication on all moving parts.

After completing the inspection of the port lifeboat, the starboard lifeboat on-load release system was checked. Both release hooks were found to be fully reset. The hydrostatic interlock was found to be fully engaged with the safety pin correctly seated in its notch in the side plate of the operation unit. The presence of lashing twine fastened around the release handle and safety pin, in the same fashion as the port lifeboat, was noted.

Other evidence

The master and mate were interviewed and provided detailed accounts of the incident. Copies of relevant ship's documents were obtained including the lifeboat davit and on-load release instruction manuals, lifeboat certificates of survey, and lifeboat maintenance records. Records of past drills and on-board safety training were also obtained and provided an indication of the crew's level of training in respect of the lifeboats.

On 15 August 2000, Nishi-Nippon F.R.P. Shipbuilding Company, the manufacturer of the lifeboat and on-load release system, were contacted by the Australian Transport Safety Bureau. They were provided with details of the incident and were asked to supply the design specifications of the on-load release system. A copy of the design specifications was subsequently provided to the investigation.

The incident

Although it was not possible to definitely ascertain what had occurred, considering the statements of the witnesses and the physical evidence presented in the form of the release system as found, the sequence of events that led to *Washington Trader*'s port lifeboat detaching from its falls and falling to the water appears to be:

- The lifeboat tilted forward and/or bounced during lowering causing the after suspension ring to slide or bounce to the point of the after hook and then force its way past the retaining latch.
- When the after fall detached, the stern of the boat fell to leave the boat suspended only by the forward fall and hook.
- The full weight of the swinging lifeboat was applied to the forward hook, which opened shortly after this large transient load was applied, causing the lifeboat to fall stern-first to the water.

Pac Monarch incident

On 26 October, approximately 10 weeks after the *Washington Trader* incident, the port lifeboat on board the Bahamas registered bulk carrier *Pac Monarch* released prematurely from its falls. The lifeboat fell to the water from a height of 15 m with four crewmembers aboard. There were three fatalities and one serious injury. The ship was in the port of Vancouver at the time and the Transportation Safety Board (TSB) of Canada investigated the incident.

Pac Monarch is a sister ship to *Washington Trader* and was also constructed by Sasebo Heavy Industries Company, in 2000. The lifeboats and davits fitted to *Pac Monarch* are identical to those on *Washington Trader*.

The circumstances of the *Pac Monarch* incident are very similar to those on *Washington Trader*. The lifeboat was in the process of being lowered and, just after the davit hit the stops at deck level, the after fall released from its hook followed by the forward fall a short time later. The after fall retaining latch was found to be in a similar condition to that on *Washington Trader* indicating that the means by which the after fall had released was probably very similar.

Unfortunately there were no eye-witnesses to the hooks releasing on *Pac Monarch*, but the lone survivor recalls a 'different kind of jerk after the davits hit the stops'. The TSB took possession of the lifeboat and conducted a number of tests on the boat and release system. These included a load test of the on-load release hooks to ascertain how the forward hook responded when subjected to the load of the swinging boat.

The TSB testing also established, from the damage to *Pac Monarch*'s after hook retaining latch and suspension ring, that the ring exited its hook at an angle between 45 and 60 degrees. This would indicate, as in the case of *Washington Trader*, that the lifeboat either: tilted forward and the suspension ring slid off its hook or bounced in such a fashion that the suspension ring was at an angle at the instant it was forced past the latch.

An investigator from the ATSB revisited *Washington Trader* at the Hay Point coal loader in Mackay, Queensland on its next voyage to Australia. A series of tests were performed on the port lifeboat (which had been replaced since the incident) in an effort to understand how the after suspension ring detached from its hook. The tests involved repeated lowering of the lifeboat from the davit head under the similar conditions to those which existed at the time of the incident. The tests were video-taped for later examination.

The after hook

At the time of the incident on 6 August, the master said that he saw the after end of the boat swing and then jerk, twice, before the after fall detached. The lifeboat was approximately halfway to the deck level at the time. There is little doubt that it was these motions of the boat that caused the after suspension ring to bounce or slide and exit the closed hook. For the lifeboat to have swung and jerked in this fashion there must have been abnormal interaction with the davit during the lowering process.

A number of hypothesis were formed about the cause of the lifeboat's observed motions at the time of the incident. These included:

- possible interaction between the hooks at the head of each cradle and the fall suspension blocks,
- the lifeboat impacting on some part of the davit or the ship during the lowering,
- a momentary 'hang up' caused by some part of the lifeboat or davit fouling,
- or the impact when the cradles reached their stops at deck level.

These hypothesis were tested at Hay Point and it was concluded that the most likely explanation for the observed motion was related to the action of the automatic gripe system.

Automatic gripes

Washington Trader's lifeboat davits have been designed to facilitate the rapid launching of a stowed boat. Initial preparation of the davit for launching a boat consists of removing the locking pin from the davit winch brake lever, then disengaging the two cradle stoppers located on the embarkation platform.

Release of the gripes is automatic, and occurs when the lashing levers which connect the top end of each gripe to the davit cradle, are allowed to turn out as the cradle moves away from the davit frame. This progressively slackens the gripe in the initial stage of lowering, until the lashing levers swing free and the gripes are fully released. If the forward and after gripes are not released by the lashing levers simultaneously, or a gripe wire fouls on the boat as it falls away from its lashing lever, there is a possibility that the one end of the lifeboat may be 'hung up' momentarily.

The lifeboat testing conducted at Hay Point showed that the gripe wires had a propensity to 'take a turn' around the lifeboat's bollards during lowering. During several of the tests the top of the wire, fitted with a heavy steel ring, fell rapidly after being released from the lashing lever, swinging around the point where the wire was led over the lifeboat bollard. It did not complete a full turn around the bollard during the tests, and thus did not foul and hang up the stern of the boat, but the potential for such an event to occur was clearly demonstrated. If the after gripe wire had fouled in this fashion at the time of the incident the after end of the boat would have been hung up and allowed the after suspension ring to slide/bounce to the opening of the hook. When the weight of the boat came back on the fall, the ring would have been pulled through the retaining latch. Such a hang-up would account for the master's observation of the aft end of the boat seeming to swing and jerk when the lifeboat was approximately halfway to the deck at the time of the incident.

The forward hook

The forward hook, as found after the incident, was open with the painted end of the cable reset lever approximately 25 mm above the fully tripped position. Full travel of the lever from the tripped position to the fully reset position involves a movement of approximately 140 mm. Providing the forward cable reset lever had not been moved after the incident, the position of the lever indicates two possibilities. Either the hook had not been correctly reset after the previous lifeboat drill and/or the transient load on the hook at the time of the incident was large enough to force the hook open, moving the cable reset lever to the partially reset position in the process.

The International Maritime Organization's Safety of Life at Sea Convention (SOLAS) Chapter III, Regulation 41, section 7.6.4 requires, in respect of on-load release mechanisms, that:

> The mechanism shall be designed with a factor of safety of 6 based on the ultimate strength of the materials used, assuming the mass of the lifeboat is equally distributed between the falls.

The design calculations provided by Nishi Nippon F.R.P Shipbuilding Company indicated that the safety factor for each component of the on-load release system was in excess of six. As part of the Nippon Kaiji Kyokai type approval process a prototype of the mechanism was also tested and the safety factor of six verified under load.

An analysis of the design of the on-load release mechanism revealed that it was unlikely that the cable reset lever could have been moved, from the fully reset position to the position found after the incident, by the full weight of the swinging lifeboat. The direction of the force applied on the cable reset lever quadrant by the blocker does not induce a tripping motion in the lever regardless of its magnitude if the point of contact is in alignment with the centre line of the cable reset lever pin. In addition, the hydrostatic interlock effectively bars the travel of the operating cable, and thus the cable reset lever, when the system is fully reset. The TSB conducted static load tests on the hooks recovered from *Pac Monarch*'s lifeboat and these tests also showed that the hook would not have opened under load from the fully reset position.

In submission Nishi-Nippon F.R.P. Shipbuilding stated:

> We have reviewed the reset procedure for the release system that should be followed during the recovery operation for the released boat, and, as a result, we insist that the hook will not accidentally open unless the release system is actuated, provided that the interlock system has been inspected as instructed by the lifeboat operating manual.

In light of this analysis, it is likely that the hook was not fully reset the previous time the port lifeboat was lowered to the water and the release system actuated on June 7, 2000. There may have been a number of reasons why the hook was not properly reset on this occasion.

Resetting each hook unit is, because of the limited access to the forward and aft decks, a one-man operation. In the final stage of resetting, the cable reset lever must be moved, without any mechanical advantage assisting, against any resistance in the length of the operating cable and the operation and hook unit mechanisms. *Washington Trader'*s forward hook unit cable reset lever was found to be very stiff. When resetting the hook after the incident, considerable force was required to move the lever through its full range of movement. Resetting of the lever was made even more difficult because the bar at the bottom of the retainer latch obstructs access to the lever in one section of travel. The force opposing the movement of the lever was due mainly to friction in the operating cable. The operating cables are fitted with oil seals at each end, and so it is unlikely that the cable friction was a result of the boat's immersion in seawater. Further evidence of past difficulty resetting the forward hook was found in the form of a short, bent, extension pipe in the bottom of the lifeboat. The investigator noted that this pipe was just the right size and shape to fit over the end of the cable reset lever to assist in resetting it. This difficulty in moving the cable reset lever may have been why it appears that the forward hook was not fully reset during the previous lifeboat drill.

Basic on-site tests showed that the forward hook would support weight when the cable reset lever was only partially reset with the implication of the design being that the full weight of the boat could be taken on a partially reset hook. However, with the cable reset lever in a partially reset position, the hook blocker is held closed by a relatively small area of contact with the quadrant on the cable reset lever. With this type of limited contact it is possible that a high dynamic load placed on the hook would force the hook blocker to the open position moving the cable reset lever downward in the process.

On-load release design

The design of the NS-Hook on-load release system complies with the requirements of SOLAS and has been approved by a number of classification societies including Bureau Veritas and Nippon Kaiji Kyokai (Class NK). Nevertheless, the design has some aspects which may have contributed to the incident on board *Washington Trader*. Some aspects of the hook units, hydrostatic interlock and the system indicator lights exhibit design inadequacies, difficulties or ambiguities for the lifeboat operators.

Hook orientation

Both the forward and after on-load hook release units fitted to *Washington Trader*'s lifeboats are identical and are mounted so that each hook throat faces aft. If *Washington Trader*'s after hook unit had been mounted with the throat of the hook facing forward, there would have been significantly less chance that the suspension ring would have been freed from the hook as the boat tilted forward and/or bounced when being lowered on August 6. In addition, operating the hook would be simplified, as in the current orientation, the cable reset lever is located at the after end of the hook unit and must be manipulated by the operator while almost unseen.

There is no standard with regard to the orientation of lifeboat release hooks. Various lifeboat manufacturers fit their on-load release hooks in various ways. Only both hooks mounted with their openings facing inboard provides for maximum fall 'failure safety'. With this hook orientation, if one fall should prematurely release, the remaining fall suspension ring will still be positively located in the throat of its hook to take the weight of the vertical boat. With other methods of mounting, there will be cases where the remaining fall will be free to pull through the retaining latch or link stopper, and off the hook, as the boat falls to the vertical.

SOLAS requires that lifeboats fitted to vessels over 20 000 tonnes must be capable of being launched with the ship making 5 knots headway in calm water. The design rationale for fitting the hooks with both openings facing aft, in the case of *Washington Trader*, appears to be to allow both hooks to take the weight of the lifeboat if it is being towed astern of the davit when the ship is making headway. A secondary consideration may be to allow the suspension rings to move freely out and away from the hook units, when the hooks are released with the boat making forward way, minimising the risk of fouling the falls during release.

In their submission Nishi-Nippon F.R.P Shipbuilding stated that they had orientated the after hook with its opening aft 'considering the launching process at 5 kt speed.'

The retaining latch

The design of the retaining latch on *Washington Trader*'s after on-load release hook was significant in this incident. The damage to the latch and the marks on the suspension ring show that the ring was forced past the latch to detach the after fall. A latch of stronger design fitted to close the opening of what is a relatively shallow hook may have prevented the ring from coming off the hook.

Retaining latches, or link stoppers, are fitted to on-load release hooks with the intention of trapping the fall suspension rings inside the hooks. This is necessary to ensure that the rings are retained in the hooks when the boat is waterborne either prior to releasing the hooks or on completion of a lifeboat exercise, when the suspension rings are placed in the reset hooks prior to lifting the boat. Under normal circumstances when the boat is suspended from the falls, there will be no weight on the latches as the suspension rings are located well within the throat of the hook.

On *Washington Trader*'s lifeboats, the relatively light construction of the hook latches would indicate that they are only designed to guard the suspension rings when they are loose in the hook. They are not designed to restrain a suspension ring under load. When the after suspension ring slid or jumped to the point of the hook during the incident, the lightly constructed latch would have presented minimal resistance to the heavily loaded suspension ring (of 20 mm cross-sectional diameter) as it exited the hook.

As fitted, no part of the latch makes contact with the hook. There is a clearance of more than 10 mm between the latch lugs and the point of the hook and thus the hook opening is not completely barred by the latch. In addition, the placement of the latch, so that its side members are well outside the line of the point of the closed hook, means the side clearance between the side member of the latch and the hook is approximately 15 mm. The combination of these clearances means that a bouncing or sliding suspension ring, at an angle, may be passed through the clearance between the latch and the point of the hook with only the light side member on one side providing any significant restraint. The damage to *Washington Trader'*s aft latch would indicate that this was probably what occurred in the incident. If the latch had been of stronger construction with a continuous horizontal top member with a smaller clearance from the tip of the hook, or bearing on the inside the hook, it would have prevented the loaded suspension ring from exiting the hook.

In their submission Nishi-Nippon F.R.P Shipbuilding stated with respect to the retaining latch:

> Note that the latch is not designed to bear the working load on the hook but is intended to prevent the non-loaded suspension ring from being disengaged from the hook. To be able to avoid a rare accidental situation, your suggestion (increased mechanical strength, smaller clearance) will be helpful.

Hydrostatic interlock

An aspect of *Washington Trader*'s on-load release design that raises concern is the operation of the hydrostatic interlock. The interlock is rendered useless if both hook mechanisms are not fully reset. In addition, the interlock does not engage to lock the hooks in the fully reset position until the lifeboat is lifted clear of the water and the water pressure switch de-energises the solenoid.

The action of the interlock, when engaged, is to physically block the upward tripping travel of the cable connection arms and thereby also lock the release handle. When resetting the hooks, both cable connection arms must be in the fully reset position to allow the interlock to move to the blocking position when the boat is raised clear of the water. If either of the cable connection arms is not fully reset, or the operating cables are out of adjustment, then the interlock will be prevented from moving to the blocking position and the thus the release handle will still be free to move to trip the hooks. Only a small clearance between the interlock and the cable connection arms is allowed in the design of the release mechanism for system maladjustment or ‘lost motion’ in the operating cables or hook mechanisms.

During the time between resetting the hooks and raising the lifeboat from the water there is a danger that the cable reset levers (unrestrained by the action of the interlock on the cable connection arms) will fall from the fully reset position. With no load on the hooks, there is no force transmitted by the blockers to the quadrants on the cable reset levers to prevent them from moving downward. At this time the only thing restraining the levers is the friction in the operating cable. Once the boat is lifted clear of the water, if one of the cable reset levers has moved down, the interlock will not engage.

If the hydrostatic interlock is not fully engaged, the on-load release system may be tripped using the release handle at any time with neither of the hook mechanisms in a 'locked' state. In this condition the lifeboat is prone to accidental release.

SOLAS 1997, Chapter III, 41, 7.6.2.2 contains a clarification with regard to the operation of lifeboat on-load release system interlocks:

> To prevent an accidental release during recovery of the boat, the mechanical protection (interlock) should only engage once the release mechanism is properly and completely reset.

The interlock system fitted to *Washington Trader'*s lifeboat on-load release system seems to comply with the SOLAS requirement; however it only engages when the system is fully reset and the lifeboat is lifted clear of the water.

The resetting instructions require that a visual check of the cable connection arms and the position of the interlock is performed to ensure that the interlock is engaged prior to lifting the boat. In addition, the status of the indicator lights will indicate whether the hydrostatic interlock is engaged. However, for an inexperienced crew, the complexity of resetting the system with multiple checks may be confusing.

Indicator lights

The red and green lights on *Washington Trader*'s lifeboat release system pressure switch and alarm light control box are multi-indicative. Each lamp indicates to the operator two different things depending on the system condition and lifeboat operation being performed. When the lifeboat is being launched the red light indicates that the boat is not yet waterborne and that it is unsafe to operate the release lever. When the hooks have been tripped with the lifeboat floating, the red light indicates that the hooks are tripped. When launching the lifeboat the green light indicates that the boat is waterborne so the release lever may be operated. It also indicates to the operator, once the hooks have been reset, that it is safe to lift the boat from the water. This multiple indication function of the lights may have been a source of confusion for the crew of *Washington Trader*.

Accepted safe practice when designing critical control and instrumentation indication systems is to have a single light indicating a single condition. Multi-indication is bad design from a human performance perspective as it relies on the operator having not only a complete understanding of the operation of the system but also thorough situational awareness, in this case, when the crew are conducting a lifeboat operation. For an inexperienced crew recovering a lifeboat in possibly adverse sea conditions it would be easy to confuse the meaning of the indicator lights.

During the previous boat drill, the release system indicator lights would have shown that the forward fall was not fully reset– if this was indeed the case. The red indicator light should have remained illuminated in the time between resetting the hooks and raising the boat, rather than the green light coming on to indicate that the hooks had been properly reset and that it was safe to hoist. Whether the crew checked the indicator lights, or misinterpreted their meaning, is a matter for conjecture. After the boat had cleared the water, the red light should have been lit in any case, as a result of the open water pressure switch, and from this time, the crew would have had no indication from the lights that the forward hook was not fully reset.

Operation and Maintenance of the 'NS-Hook' release system

The manufacturer's operation manual for the NS-Hook release system contains detailed instructions for operating and maintaining the release system. The operating instructions provide adequate explanation for the operation of the system together with appropriate warnings. Included in the instruction manual is a detailed periodic inspection and maintenance schedule.

The operating instructions include detailed release and resetting instructions including a flow chart for releasing the hooks. A copy of the flow chart was mounted on the bulkhead inside the lifeboat, however there were no instructions inside the boat for resetting the release system. There were no additional ship-specific operating procedures for the on-load release system and, when asked, the master referred solely to the manufacturer's instruction manual.

The operating manual contains maintenance instructions for the release system and the shipboard records indicate that the lifeboat release gear was being checked as per manufacturer's instructions. The ship's records were in the form of completed checklists, a wall chart showing weekly safety equipment checks, and in the ship's maintenance recording system.

Included in the weekly checks on the release system is a check of the cable reset levers on each lifeboat hook unit. The ship's records indicate that these checks were performed on each lifeboat on the days of 10, 17, 24, 29 June, and 8, 15, 22, 30 July. That is, the status of the release system on the port lifeboat including the position of the forward cable reset lever was checked, according to the maintenance records, on eight separate occasions since the last time the system was actuated on June 7. Given that the forward cable reset lever was, in fact, not reset properly on June 7, and that the maintenance records are accurate, then the crew's subsequent checks failed to detect the incorrect position of the cable reset lever. This may have been the result of a poor knowledge of the system, or carelessness on the part of the crew performing the checks.

Crew Training

Washington Trader's safety management system includes a standard form for recording the training and education of the crew. Records of the drills conducted since the delivery of the ship in January 2000, and the training received by the crew on these occasions, were recorded in this format.

Since the delivery of the ship, there had been no change of the crew. Any training conducted over the previous eight months had involved the crew on board at the time of the incident. The boat drills conducted since January consisted of six 'abandon ship' drills, where both boats had been lowered to deck level, and four lifeboat drills, where one boat had been lowered to the water and released. The port and starboard lifeboats had been released from their hooks and taken away twice each by their respective crews prior to the incident.

The crew had received instruction on the operation of on-load release systems during some of the 'abandon ship' drills but the port lifeboat crew had actually reset the system on only one occasion prior to the lifeboat drill conducted on 7 June. It is likely that the crew member resetting the forward hook on this occasion was not completely conversant with the operation, given such limited hands-on experience.

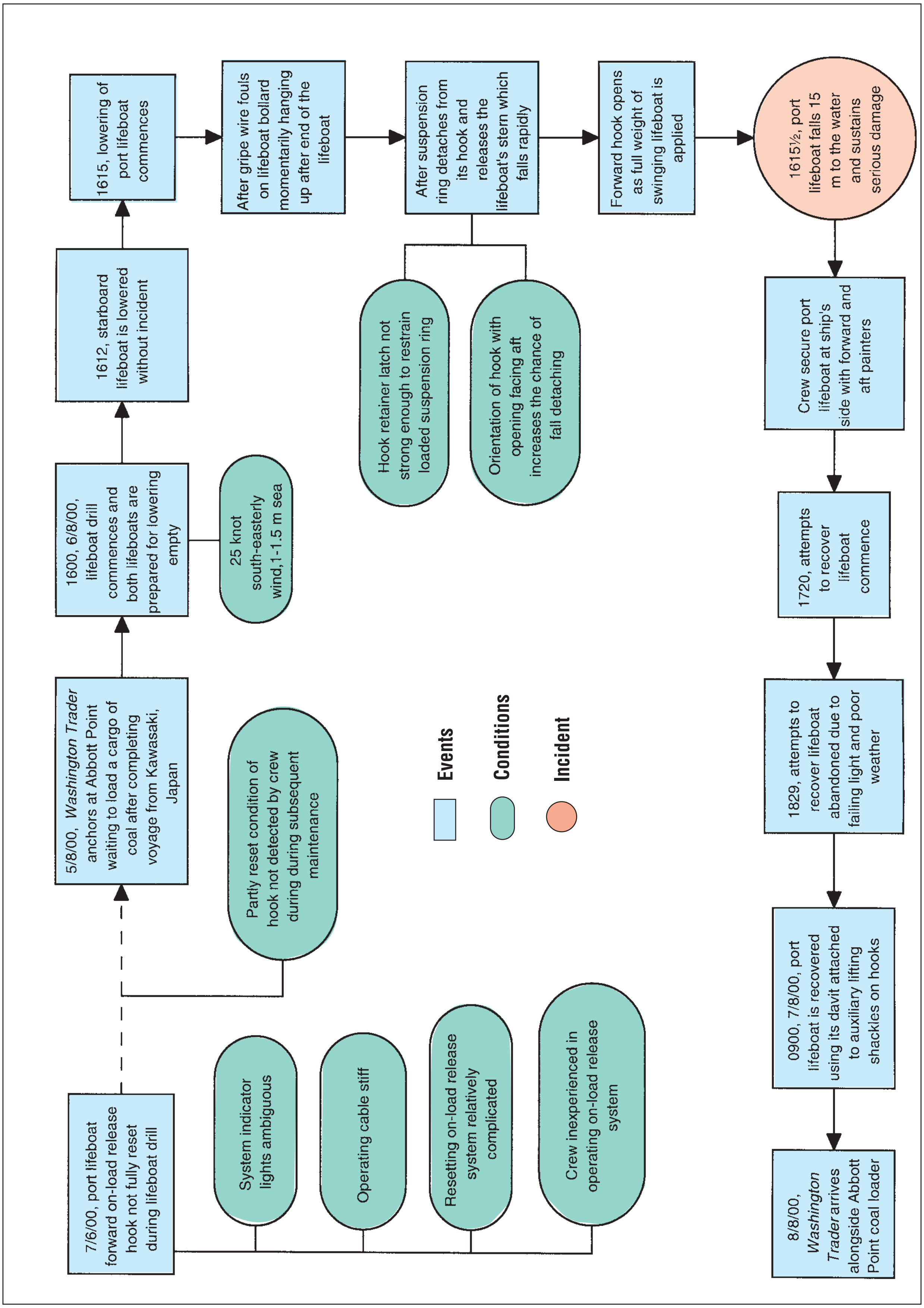
Conclusions

These conclusions identify the different factors contributing to the incident and should not be read as apportioning blame or liability to any particular individual or organisation.

Based on the evidence available, the following factors are considered to have contributed to the incident involving *Washington Trader*'s port lifeboat on 6 August 2000:

1. The lifeboat bounced and/or tilted forward during lowering, probably as a result of the after gripe wire fouling on the boat, which led to the after suspension ring sliding and/or bouncing out of the closed hook.
2. When the after fall was released the lifeboat's stern fell with the boat suspended only by the forward fall. Almost immediately, the forward on-load release hook opened and released the forward fall.
3. The forward hook was not fully reset when the previous lifeboat drill was conducted on 7 June 2000.
4. Lifeboat checks after 7 June 2000 did not detect that the hook was only partially reset.
5. Reasons why the forward hook was not reset fully during the previous drill include:
   - the relative complexity of resetting the system,
   - the cable reset lever was stiff to operate,
   - poor knowledge of the operation of the on-load release system,
   - ambiguous system indicator lights.
6. The retaining latch on the after hook was poorly designed as it was neither of sufficient strength nor fitted in a way which would provide an adequate safeguard to prevent the suspension ring exiting the hook under load.
7. The orientation of the after hook increased the likelihood of such an incident occurring and in addition made resetting the hook difficult.
8. The design of the hydrostatic interlock was inadequate as it did not engage once the hooks were in a fully reset position prior to the lifeboat being lifted from the water. It was also rendered completely ineffective if either cable connection arm was not in the fully reset position.

FIGURE 11:
***Washington Trader*: Events and causal factors chart**



Recommendations

It is recommended that:

1. Nishi-Nippon F.R.P Shipbuilding Company review the design and construction of their NS-Hook release system, in light of the similar incidents aboard *Washington Trader* and *Pac monarch*, with a view to minimising the risk of such an incident occuring again.

2. All ship operators should ensure that shipboard safety management system classify lifeboat on-load release operations as 'critical' with appropriate ship-specific operating and maintenance procedures.

3. All ship operators should ensure that personnel responsible for operating and maintaining on-load release equipment are provided with type-specific training.

Submissions

Under sub-regulation 16(3) of the Navigation (Marine Casualty) Regulations, if a report, or part of a report, relates to a person's affairs to a material extent, the Inspector must, if it is reasonable to do so, give that person a copy of the report or the relevant part of the report. Sub-regulation 16(4) provides that such a person may provide written comments or information relating to the report.

The final draft of the report was sent to *Washington Trader*'s master at the time of the incident, Nishi-Nippon F.R.P. Shipbuilding Company, Victoria Ship Management, Bureau Veritas, the Transportation Safety Board, Canada, and the Australian Maritime Safety Authority.

Submissions were received from the president of Nishi-Nippon F.R.P. Shipbuilding Company and the manager of Victoria Ship Management's marine department. The Transportation Safety Board of Canada provided a copy of the draft of their *Pac Monarch* investigation report. Some factual material has been incorporated in this report which was drawn from the *Pac Monarch* investigation.

The following are extracts from the submissions from Nishi-Nippon F.R.P. Shipbuilding Company and Victoria Ship Management which are not included in the body of the report.

With regard to the conclusions of the report Nishi-Nippon F.R.P. Shipbuilding Company submitted:

Conclusions

5. Reasons

    - Relative complexity

      The resetting procedure will be completed after completion of three consecutive steps on the hook side and the final visual check on the lever side.

    - Stiff to operate

      Stiff cable that does not allow smooth operation needs a maintenance work.

    - Ambiguous

      The indication with the lamp is intended to indicate whether or not the boat is afloat on the water.

      In addition, the resetting procedure is indicated based on the detected motion of arm in the actuator (this arm is synchronized with the reset lever of the hook). Therefore, the indication by the lamp does not mean the completion of resetting operation. Remember that the resetting process is complete only after the status of the interlock is visually checked.

6. Retaining latch

   Note that the latch is not designed to bear the working load on the hook but is intended to prevent the non-loaded suspension ring from being disengaged from the hook.

7. Orientation of the after hook

   Unlike the operation of the forward hook, the after hook necessitates a work with the upper body of the operator being exposed out of the hatch. This posture, however, is not demanding for the operator - the after hook can be reliably and readily reset this hook.

   Supported by this fact, we have oriented this hook to the stern direction considering the launching process at 5 kt speed.

8. Design of the hydrostatic pressure detector

   The hydrostatic pressure detector is intended to assist the operator in a sequence beginning with lowering and ending with releasing of the lifeboat. Note that the resetting sequence (which begins with recovering and ends with stowing of the lifeboat) is complete only after the operator has verified the interlock is in the engaged state in the final check process.

Victoria Ship Management submitted:

> We impartially acknowledged your analysis, and conclusions mentioned in page 23 of your draft, with emphasis on items Nos. 3 – 8, the plausible factors that may have contributed to the stated incident.

Furthermore, we would like to hand on our observations that may be weighted as likely contributing components leading to lifeboat fall accidents:

a) The maker's design on the releasing/re-setting mechanism is rather complicated. There should have a modification on the maker's view to devise components and operation in uncomplicated, sturdy and dependable mode - simple to the understanding of the officers and crewmembers involved.

b) On the other hand, the ship personnel should maintain fixed focus on safety during the actual lowering operation, and to be totally aware of the consequence involved when an oversight is committed. A constant review of the procedures (disengaging and engaging) to the whole team prior to exercise is essential in order to avert mistakes.

c) These are lined in parallel to draft stipulated in page 17, paragraph 2:

1) Gripe wires have a tendency to entangle or to mess up around the bollard or to any protruding object adjacent to the forward and after hook components that may suspend the forward of after body of lifeboat, causing imbalance or misalignment of davit while in progress of lifeboat lowering.

2) Unequal tension of wires when tightening the forward and after lashings during stowing/securing of lifeboat into davit, may affect the unlashing operation prior boat lowering, and may contribute to the entanglement, if left unchecked.

d) Improper procedure of stowing the lifeboat. The boat keel should be rested first to its resting bar or plate before tightening the lashing wires. This means the whole weight of the boat rests on the bar, not on the boat falls. This may affect the smooth operation during lowering of the boat.

e) Uneven rigging or adjustment of boat fall either forward or aft is another contributing factor.

f) Abrupt release of brake lever during initial lowering resulting extreme twitch to the boat. This should be practiced and carefully tended by the assigned person.

g) Uneven swing out of forward and aft davit arms, or delayed swing out of one of the arms (at the time of initial lowering of the boat) caused by temporary freezing of one of the davit arm due to poor greasing maintenance, may cause excessive jerk to the boat when that is arm is suddenly freed.

Washington Trader

Name	*Washington Trader*
IMO No.	9211602
Flag	Philippines
Classification Society	Bureau Veritas
Vessel type	Bulk carrier
Owner	St Vincent Shipping Co. Ltd
Year of build	1999
Builder	Sasebo Heavy Industries Co. Ltd, Japan
Gross tonnage	38 928
Summer deadweight	74 228 tonnes
Length overall	225.00 m
Breadth, moulded	32.20 m
Draught (summer)	13.821 m
Engine	B&W 6S60MC
Engine power	8 827 kW
Service speed	14.5 knots
Crew	20 (Filipino)

Independent iinvestigation into the lifeboat incident on board the Philippine flag bulk carrier Washington Trader, at Abbot Point, Queensland on 6 August 2001

ISSN 1447-087X
ISBN 1 877071 21 8

www.atsb.gov.au
1800 621 372