



**BERMUDA**

**ARCADIA**

**ACCIDENT INVESTIGATION REPORT**

**ACCIDENTAL FAILURE OF LIFE BOAT No.5 LIFTING HOOK DURING  
RECOVERY**

**5<sup>TH</sup> JANUARY 2018**

**BERMUDA SHIPPING AND MARITIME AUTHORITY**

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## SUMMARY

On the 5<sup>th</sup> January 2018 the passenger vessel ARCADIA was alongside in Ponta Delgada, Azores, this was the final port call of a 25 day cruise from Southampton out to the Caribbean and back to Southampton. ARCADIA is a Bermuda registered passenger ship operated by Carnival, UK, based in Southampton, UK.

During the port stay in Ponta Delgada, the vessel's crew carried out a full Fire and Abandon Ship Drill. This drill included a fire fighting exercise, followed by launching and recovery of the outboard (starboard side) lifeboats.

As part of the launching procedure, it is standard practice to lower the boats to just above the water, start the engines, then fully lower the boats into the water and release the hooks. Once the boats are released they are normally test run in the water, after which they are re-connected to the hooks and recovered. However, due to unfavorable swell conditions in the port on the 5<sup>th</sup> January 2018, the boat drill was limited to lowering the boats to a position one metre above the water, starting the engines then lowering the boats into the water. After a short time running in the water while still connected to the hooks, the boat engines were stopped and the boats recovered.

It was during recovery of Lifeboat No.5 that the forward fall became detached while the boat was being raised for disembarkation of the operating crew, which caused the boat to fall into the sea.

An alarm was raised by the bridge team announcing the boat accident and among other things the order was given to launch the Starboard Fast Rescue Craft (FRC).

Lifeboat No.5 fell into the water bow first, then bobbed out of the water to land in an upright position. As the boat hit the water two members of the operating crew were thrown clear and into the sea, while the other three members of the boat crew remained within the boat.

The FRC arrived on the scene promptly and picked up the two crew members who were in the water. Subsequently, the FRC maneuvered the damaged lifeboat alongside the ship's starboard pontoon where all five lifeboat crew members were landed for medical assessment and care. Four crew members had suffered minor injuries and were treated on board in the ship's hospital, while the fifth crew member was assessed as requiring hospital treatment ashore and was sent to the local hospital in Ponta Delgada. Upon his recovery was repatriated home. The other four crew members were also repatriated home upon completion of their on-board medical treatment.

The damaged Lifeboat No.5 was inspected by the ship's crew and the local port authorities, and was stowed securely in Ponta Delgada for further examination. The Bermuda accident investigator arrived in Ponta Delgada later and examined the lifeboat and collected the relevant evidence.

A combined preliminary investigation was conducted into the lifeboat accident by the Bermuda Shipping & Maritime Authority and the ship operator, Carnival UK. Following the investigation it was identified that the existing boat launching and recovery systems need to be reviewed in light of this accident, in consultation with the manufacturers of these systems. This consultation was conducted by the ship operator with the lifeboat hook manufacturer and other interested parties in attendance. Currently, the ship operator is awaiting the manufacturers' response.

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## THE CASUALTY INVESTIGATION

On receiving notification of the incident from the vessel operator, the Bermuda Shipping & Maritime Authority (BSMA), as the Flag Administration of the vessel, initiated a marine safety investigation into the failure of Lifeboat No.5 in accordance with Section 228 of the Bermuda Merchant Shipping Act, 2002, to ascertain the circumstances which lead to the above accident.

A BSMA Senior Surveyor attended ARCADIA on its arrival at Southampton on 9<sup>th</sup> January 2018 to commence the investigation into the incident. In addition to this, BSMA engaged an Independent Accident Investigator to assist the BSMA investigation team.

The Deck & Safety Superintendent for Carnival UK also attended the vessel at the same time for the purposes of conducting the Company's own investigation.

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## FACTUAL INFORMATION

### **The Ship**

|                           |                                                          |
|---------------------------|----------------------------------------------------------|
| Name                      | ARCADIA                                                  |
| Type                      | Passenger ship                                           |
| Call Sign                 | ZCDN2                                                    |
| IMO Number                | 9226906                                                  |
| Port of registry          | Hamilton, Bermuda                                        |
| Official Number           | 733771                                                   |
| Gross Tonnage             | 84342                                                    |
| Net Tonnage               | 46086                                                    |
| Length Overall            | 285.23 m                                                 |
| Passenger Capacity        | 2120                                                     |
| Vessel's Crew             | 844                                                      |
| Engine Power              | 35.2 Mw                                                  |
| Service Speed             | 22.0 knots                                               |
| Date of Build (Keel Laid) | June 2002                                                |
| Builder                   | Fincantieri Cantieri Navali Italia SPA, Marghera, Italy. |
| Ship Operator             | Carnival UK, Southampton, Hampshire, UK                  |

### **Lifeboat No.5**

|               |                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------|
| Manufacturer: | Schat Harding                                                                                         |
| Type:         | MPC 32                                                                                                |
| Dimensions:   | 9.5m long x 4.5m wide x 3.55m high                                                                    |
| Capacity:     | 150 persons, nominally made up of 145 Passengers and guides and the 5 operating crew of the lifeboat. |
| Weight:       | with equipment only: 5630Kg<br>fully manned & equipped: 16880Kg                                       |

### **Lifeboat Davits**

|               |                              |
|---------------|------------------------------|
| Manufacturer: | Tecnimpianti S.p.A. of Italy |
| Type:         | SGSHD L 150P                 |

### **Lifeboat On Load Release Hooks**

|               |                      |
|---------------|----------------------|
| Manufacturer: | Fr. Fassmer GmbH Co. |
| Type:         | Duplex 140E2         |

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## NARRATIVE OF EVENTS

***Note: All times quoted within this report are given in local time in Azores – (UTC -1 hr.)***

The following narrative has been written using:

- i. Statements from interviews conducted with the witnesses who were involved with the lifeboat drill, including the operating crew of the Lifeboat and the personnel involved with the recovery of the lifeboat to deck
- ii. Documents provided by the ship, which include:
  - Copies of technical specifications of the equipment in use, including their operating instructions
  - Copies of the Official Log Book (OLB) and Deck Log Books
- iii. Photographs taken by the attending BSMA Surveyor during the vessel's call in Southampton.
- iv. Investigator's notes from the visit to the vessel during its call at Bridgetown, Barbados.
- v. Investigator's notes following inspection of the damaged lifeboat at the Ponta Delgada boat yard.

On the 5<sup>th</sup> January 2018 the vessel ARCADIA was berthed port side to the quay at the Portos Do Mar Cruise Terminal, Ponta Delgada, Azores. During the course of the vessels stay in port a full crew Fire and Abandon Ship Drill was scheduled. The abandon ship portion of this drill entailed lowering the outboard (starboard side) lifeboats to the water with their operating crews onboard for a test run.

When the command for boat muster was given, the crew assigned as lifeboat crew completed their fire drill duties and then proceeded to their designated lifeboat muster positions. Once all crew were accounted for, the In-Charge of each lifeboat reported to the Command Team that everyone was present.

On the day of the accident, at around 1100 hrs., the boat muster stations were called and all crew proceeded to their assigned positions.

Present on the Boat Deck (Deck 3) by Lifeboat No.5 were:

- Able Seaman, designated - 'In-Charge' of lifeboat 5
- Ship Security Officer, designated - 'Second In-Charge' of Lifeboat 5
- Asst. Technical Storekeeper, designated - 'Engine Operator' of Lifeboat 5
- Comms Chief A, designated lifeboat crew – 'Bowman' of Lifeboat 5
- Comms Chief B, designated lifeboat crew – 'Sternman' of Lifeboat 5

*The above persons made up lifeboat operating crew.*

At approximately 1115 hrs., the Operating Crew were instructed to board the Lifeboats.

According to the lifeboat launching procedure, the first to enter the lifeboat is the person In-Charge who makes the following checks:

- The hook release handle is in the correct upright position
- The handle securing pin is in the correct place
- The hook indicator is displaying red
- The interlock bar is fully down behind the manipulation protection bar
- The glass cover is intact
- The override pin is in place

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Once these checks have been completed, the following items on both the forward and aft hooks are also checked:

- The stop-pawl is in the correct position
- The hook is set correctly
- The padlock to padlock sign settings are correctly aligned
- The training pin (fall preventer device) is in place and secured with the spring-loaded clip

Only once these checks have been completed is the rest of the boat operational crew instructed to board.

Following instruction given by the In-Charge, the other four operating crew members boarded lifeboat No.5. The Second In-Charge immediately made the above six checks of the release handle arrangement to re-confirm the In-Charge's actions. The Second In-Charge and Sternman then stationed themselves at the After Hook. The Engine Operator and Bowman stationed themselves at the Forward Hook. As a team, they then inspected their respective hooks to confirm the earlier checks that were conducted by the In-Charge were correct.

Once all operating crew were onboard and all checks had been completed, the boat crew sat on the thwarts and waited for their boat to be lowered to the water.

Due to the adverse swell conditions in the harbour it had been decided by ARCADIA's command team that the boats would be lowered to the water without releasing the hooks, before being recovered to the embarkation deck.

At approximately 1130 hrs, lifeboat boat No.5 was given permission to launch and the In-Charge gave the order for the bowsing-in tackles forward and aft to be slackened off. When this was done and the boat was positioned directly under the davit heads, the order was given by In-Charge for the bowsing-in tackles to be released. Once it had been confirmed that the area beneath the lifeboat was clear the order was given to lower the lifeboat to a position 1 meter above the water.

Normal practice would be to remove the fall preventer device (FPD) pins from each hook at this position, and then start the lifeboat engine. Once confirmed that the pins had been removed and the engine started, the boat would be lowered to water and the hooks opened.

However, due to the swell conditions on the day the boat falls were not going to be disconnected from the hooks so the FPD's remained in position while the boat engine was started as normal and the boat was lowered to the water.

The lifeboat was in the water for approximately one minute before the order came from the boat deck to raise the lifeboat to one metre above the water.

At this point the FPD's would normally be replaced in each hook assembly, but on this occasion they had not been removed, and the lifeboat engine was stopped. The In-Charge then conducted the same six checks on the release handle and release unit, and also visually inspect the hooks, conducting the same checks as when the boat was first entered. This procedure was part of the normal practice for the operation of the boat in the drill. These checks were conducted as required and the Second In-Charge also did the same to confirm the In-Charge's actions.

Once all the checks were completed, a report was made to the Officer In-Charge on the boat deck, and the boat operation crew onboard lifeboat No.5 took a seated position. The order was then given to recover the lifeboat to the boat deck. Accordingly, the lifeboat was hoisted to a position approximately

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two metres above the boat deck and the lifeboat crew at either end was instructed to attach the bowsing tackles.

The bowsing tackle at the after end of the boat was attached without any problem but the bowsing tackle at the forward end had a 'twist' in it that had to be released and corrected. This took several minutes, but once completed the forward bowsing tackle was also attached and the boat crew took their seated positions in readiness for the boat to be lowered and triced-in alongside the boat deck, to enable the boat operating crew to disembark safely.

At approximately 1158 hrs, the order was given to lower the boat to the Boat Deck. As this operation was in progress the lifting-link of the forward lifeboat falls suddenly came out of its hook assembly with a loud bang and a jerk, allowing the bow of the lifeboat to fall free. This placed the full weight of the lifeboat and its crew onto the after falls of the lifeboat and the attached bowsing tackle.

Sudden transfer of the full weight of the boat onto the after falls resulted in large forces being exerted on the after-hook in a direction in which it was not designed to be loaded, causing the whole hook assembly to be ripped from its mountings along with part of the transom. The boat then fell into the sea bow first, an estimated drop of 12 metres.

During the witness interviews, one witness from the lifeboat operation crew who was in the boat at the time of the incident stated that he felt a sudden jerk and heard a loud crack. Another witness who was on the boat deck had reported hearing a loud bang and seeing the lifting-link of the forward lifeboat falls coming out of the hook assembly.

Having landed bow first in the water, the boat partially submerged and bobbed back out of the water and then landed in an upright position.

During the fall, the In-Charge and the Second In-Charge of the lifeboat were thrown clear of the lifeboat into the sea. The other three boat operational crew members remained within the lifeboat and suffered various injuries.

Noting the developing situation relating to the fallen lifeboat, a Man Overboard call was made to the bridge and an announcement was made at 1159 hrs.

Hearing the announcement, the crew of the Fast Rescue Craft (FRC) manned the boat and readied it for lowering. Some life-buoys were thrown into the water to assist the two crew members who were in the water although they were wearing lifejackets.

The FRC was launched promptly and was in the water by 1202 hrs. The Starboard Pontoon was opened to allow the FRC to come alongside and disembark the casualties from the fallen lifeboat.

Meanwhile, in the water, the Second In-Charge swam over to the In-Charge who was experiencing difficulties swimming. The Second In-Charge supported and assisted the In-Charge towards the fallen lifeboat, which was floating nearby. They both clung on to the grab lines of the lifeboat and waited for assistance. While holding on to the boat the Second In-Charge established contact with the other three lifeboat crew members who were still inside the fallen lifeboat.

During this time the FRC had been launched, was in the water and recovered the In-Charge and the Second In-Charge from the where they were clinging to the side of lifeboat no 5. The FRC then maneuvered the damaged lifeboat alongside the Starboard Pontoon where the ship's medical party was waiting to provide medical assistance to the injured lifeboat crew.

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Once the lifeboat was brought alongside the pontoon, the condition of the injured crewmen was assessed by the ship's medical team and they were escorted to the ship's medical centre where they were treated for their injuries. The injuries to the In-Charge were assessed to be serious enough to justify transfer to a hospital ashore, whereupon he was promptly taken to the local hospital in Ponta Delgado for observation and for further treatment.

The damaged Lifeboat was eventually towed away and secured to a boat mooring near the Pilot Boat station in Ponta Delgado.

After some delay, ARCADIA sailed for her next port of call, Southampton, UK at 2300 on the 5<sup>th</sup> January 2018.

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## ANALYSIS

The following picture shows the forward on load release hook of Lifeboat No.5 as it was fitted on board the boat.

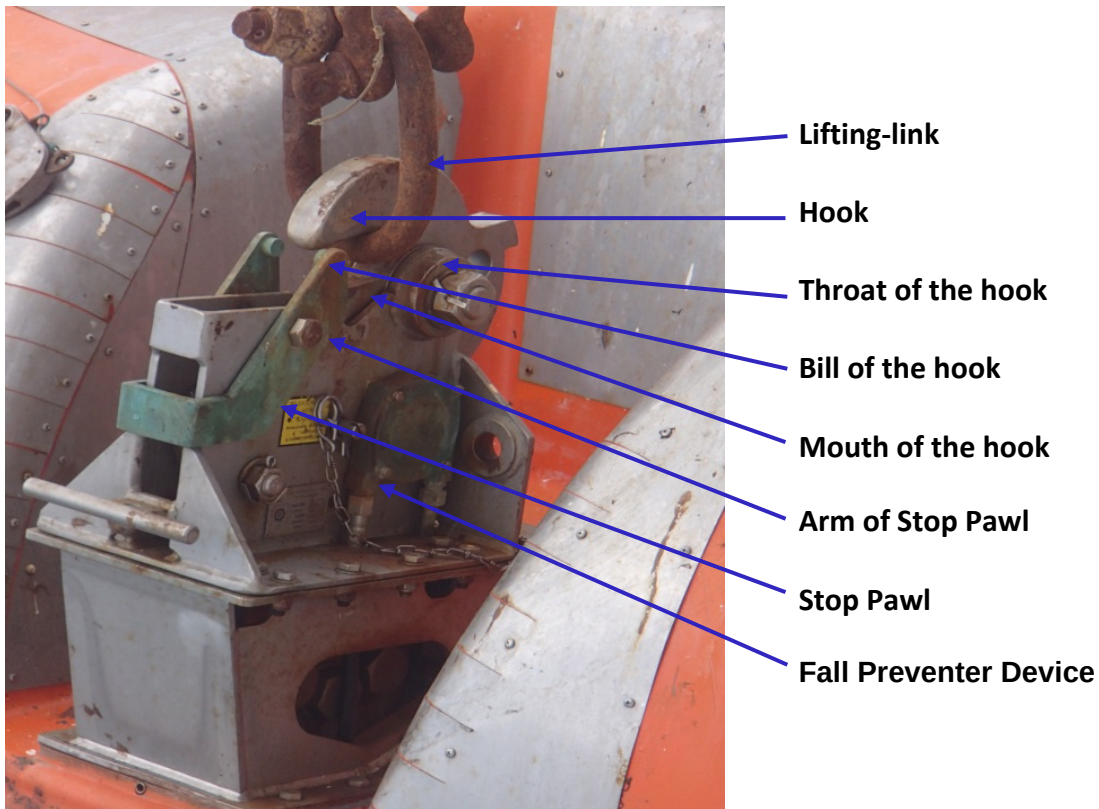


Figure 1: Fassmer GmbH Co., Lifeboat Hook

The different parts of the hook assembly as referenced throughout this report should be identified using the above diagram.

**Tricing Pendant:** A tricing pendant is a wire stop of a specific length and is used to bring a lifeboat alongside the ships' hull to facilitate boarding.

**Bowsing Tackle:** A bowsing tackle is used to slowly release the lifeboat from its position against the ships' side back to the vertical position underneath the davit heads.

Please refer to Annex A for a pictorial description.

During the investigation, a review of the vessel's safety equipment was conducted. The records on board relating to maintenance of Life Saving Appliances (LSA) and Fire Fighting Equipment (FFE) indicated that this equipment has been maintained properly and in accordance with the equipment manufacturer's guidance and instructions, and the Company's policies and procedures. It is also noted that the Company has in place on all their ships a comprehensive training program for the lifeboat operation crew.

The crew on board Arcadia was found to be knowledgeable and competent in their assigned tasks relating to launching, maneuvering, recovery and stowing of the boats. It is further noted that in addition to the LSA training program conducted by the vessel's Operator, the manufacturer of the

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lifeboat hooks - 'Fassmer GmbH Co.,' had provided an additional model of the hook for training purposes.

Similar to other lifeboats on board the vessel, lifeboat No.5 had conducted lifeboat drills regularly, whenever the weather conditions permitted, with no reportable incidents.

On 5<sup>th</sup> of January 2018 during the lifeboat drill, the operating crew of Lifeboat No.5 had carried out their respective duties and reporting procedures properly and there was no evidence to indicate to the contrary.

It was also noted that the lifeboat operating crew were properly rested and had not exceeded their hours of work, and none were under the influence of any substance.

Throughout the launch and recovery procedure and until the bowsing tackles were attached, nothing untoward was reported by the boat crew. The boat was raised to the top of the davit and the bowsing tackles reattached without incident, the accident occurred when the lifeboat was being triced-in using the bowsing tackle to bring the boat to the embarkation position alongside the ship at the boat deck level. (On ARCADIA the bowsing tackles are adjusted to the required length and locked to perform the function of tricing pendants).

In order to clearly understand what may have caused this accident a review of the means adopted to bring the lifeboat alongside the ship side to the embarkation position may be useful.

#### **Procedure for tricing a lifeboat.**

When lifeboat davits are fully extended the lifeboat will be positioned a certain distance from the ship's side to allow it to be lowered to the water unimpeded by the ship. To enable crew and passengers to embark/disembark the lifeboat, there needs to be a means by which the lifeboat can be brought alongside the ship at the boat deck.

The process of moving the boat laterally, from its position hanging vertically under the davit heads to the embarkation position alongside the boat deck, is known as 'tricing'. This involves use of a specifically constructed arrangement known as the "tricing pendant".

Conversely, when the boat needs to be released from the triced-in position alongside the ship's side to the lowering position below the davit heads, another arrangement known as a "bowsing tackle" is used to gradually ease the boat away from the ship's side by gradually slackening the tackle.

Lifeboats and tenders fitted on Arcadia are not provided with separate tricing pendants and bowsing tackles. The bowsing tackle functions both as a tricing pendant and a bowsing tackle depending on the mode in which it is used.

When connecting the tricing pendant, one end of the pendant is secured to a fixed point on the body of the davit above the level of the hook assembly, and the other end of the pendant is secured to the lifting-link of the lifeboat falls. This arrangement means that as the boat is lowered the tricing pendants take a proportion of the weight of the lifeboat which causes the lifeboat to move in towards the ship's side.

It must be noted that this process needs to be carefully conducted to ensure a smooth and gradual transferring of load from the boat falls to the tricing pendant, to avoid jerks that would induce undue forces on the boat lifting link, falls, tricing pendant or the hook and their fittings.

On Lifeboat No.5 the hooks are fitted with their mouths facing outwards. Due to the geometry of the hook and the fact that the hook opens in the same direction as the pull exerted by the bowsing tackle on the lifting-link. In the event of the failure of the stop-pawl or the arm of the stop pawl being bent away from the hook the mouth of the hook would be open and it would be easier for the lifting-link to exit from the hook when subjected to a pull leading outward.

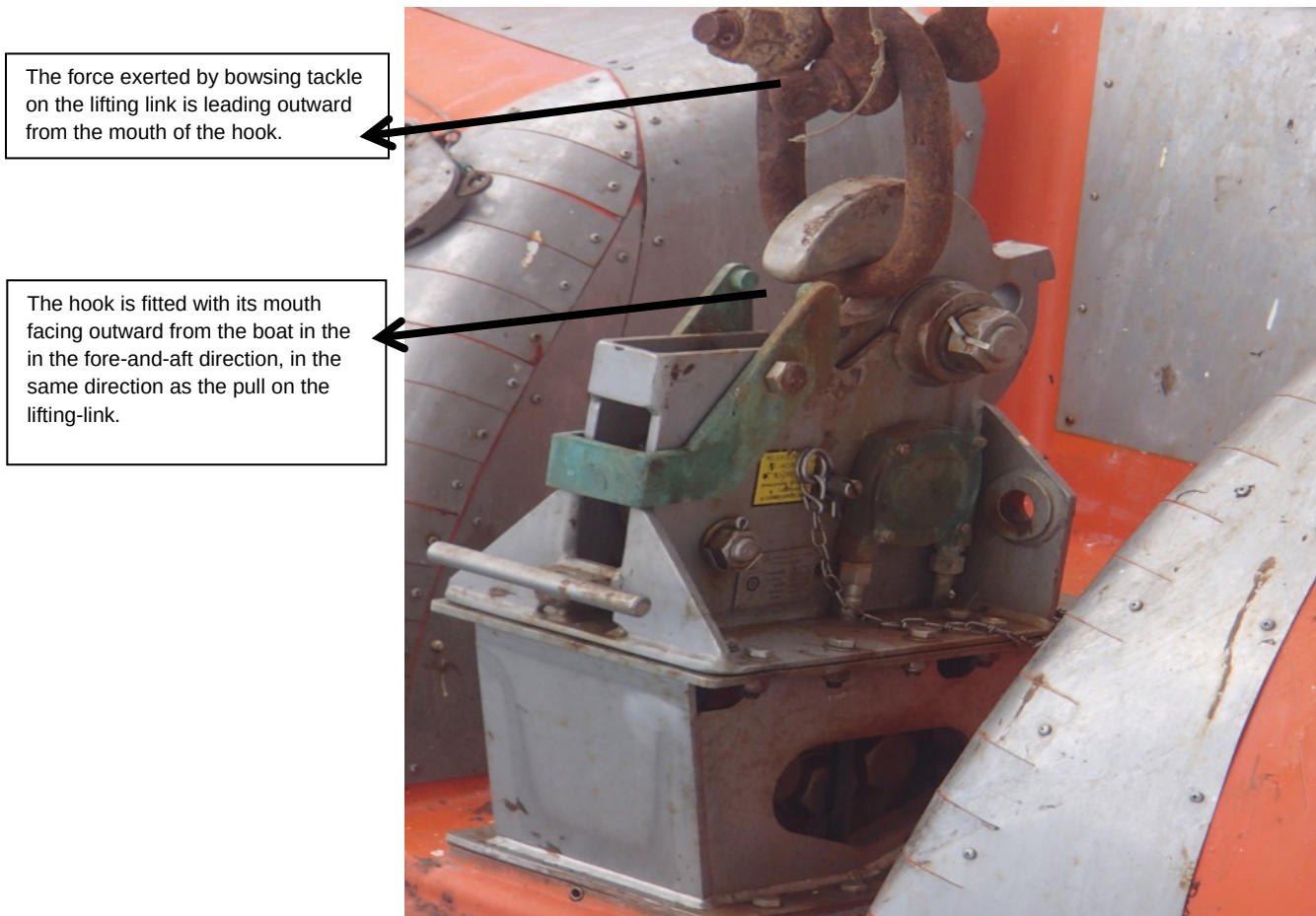


Figure 2: Representative Image of a Lifeboat Hook on ARCADIA

The force exerted on the link at the end of the falls by the bowsing tackle should be perpendicular to the length of the lifeboat in order to bring the boat alongside the ship. On lifeboat No. 5 the forward and after bowsing tackles are connected to points on the davits which are offset from the boat falls by approximately 63 cm. This arrangement induces a longitudinal component to the force being applied by the bowsing tackle on the lifting link which acts to pull the lifting link in the fwd and aft directions, out of the hook.

The shipboard end of the bowsing tackle (acting as the tricing pendant) is fitted 63 cm away (forward) from the line between the forward falls and the hook.

Note the arm fitted on to the davit head for fitting the top blocks for the lifeboat falls. By this arrangement it has been possible to have the lifeboat hanging on its hooks vertically below the top blocks. However, a similar arrangement is not fitted for connecting the bowsing tackles, therefore the shipboard end of the bowsing tackle is connected to the body of the davit (63 cm) away from the line with the boat falls. This arrangement induces a fore and aft force on the lifting link, and a twist to lifting-link, it also pulls the lifting link outward towards the mouth of the hook.



**Figure 3:** Forward Hook Assembly - Hook Mouth Facing Forward **Figure 4:** After Hook Assembly – Hook Mouth Facing Aft

The bowsing Tackles are connected to points high up on the davits meaning they lead away from the hook at an angle in the region of  $45^\circ$  from the vertical plane. This creates a twisting and pulling force on the lifting-link when the bowsing tackle takes load from the falls and tightens.

The angular moment created by the bowsing tackle induces a twist on the lifting link pulling the ring towards the mouth of the hook.

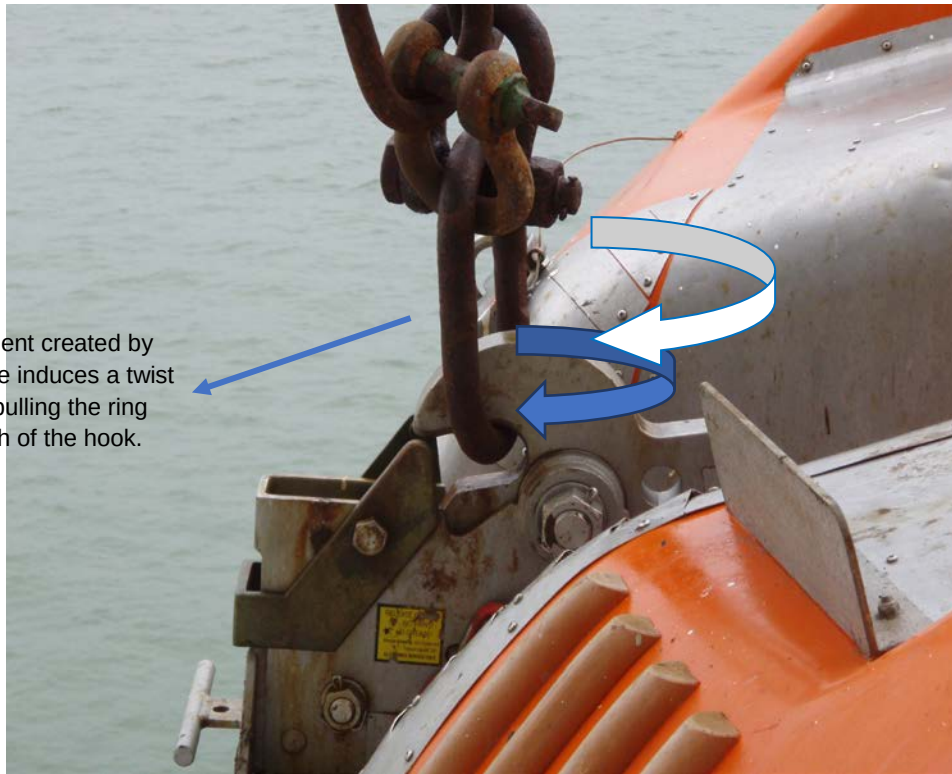


**Figure 5:** Depiction of Angular Moment Applied to Hook Assembly through the Bowsing Tackle

The recovery process was demonstrated a number of times in the presence of the investigator and it was noticed that the twisting moment varies depending upon the speed of descent of the boat. In some instances a pronounced jerk was witnessed as the various shackles within the system came under tension and aligned themselves.

The stop pawl is the safety device fitted to the hook assembly to prevent the lifting link coming out of the hook mouth. In the case of Lifeboat No.5 the inboard arm of the stop pawl of the forward hook was bent away from the hook which allowed the lifting-link to come free when pulled by the bowsing tackle.

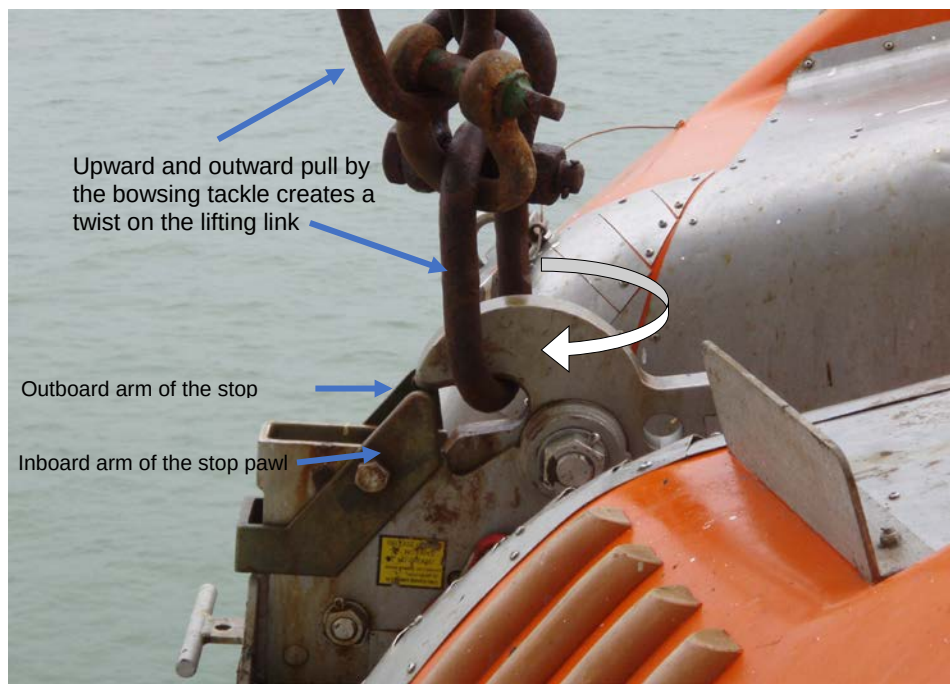
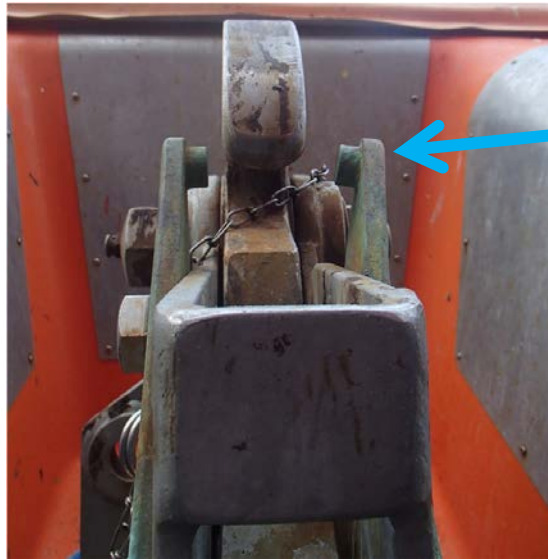


**Figure 6:** Forces on Lifeboat Hook During Recovery Process

There are several important aspects of the stop-pawl to be considered:

- Twisting of the lifting-link around its vertical axis brings the inboard side of the lifting-link closer to the inboard arm of the stop pawl. This same action moves the outboard side of the link away from the outboard arm of the stop pawl
- As the bowing tackle continues to pull the lifting-link, the inboard side of the link lands against the inboard arm of the stop pawl
- Due to twisting, the outboard side of the lifting-link has moved away from the outboard arm of the stop pawl therefore the full twisting force transmitted to the lifting link acts on the inboard arm of the stop pawl alone
- The inboard arm of the stop pawl was not designed to resist force applied in this plane of movement and could not withstand the force exerted on it by the inboard side of the lifting-link so became deformed

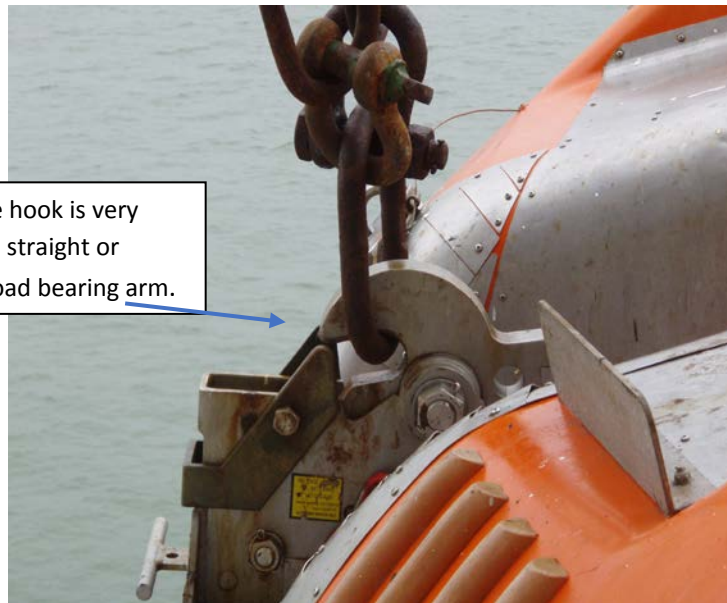
It should be noted that while the inboard arm of the stop pawl has been deformed on Lifeboat 5, there were other lifeboats where the stop pawl was observed to be deformed to a different extent, and this did not lead to an accident in these cases.



The inboard arm of the Stop-Pawl bent. The two arms of the stop-pawl are open ended and are susceptible to bending by a lateral force.

**Figure 7:** Forward Hook of Lifeboat No. 5 Following Recovery From the Sea – Note the bent arm

The lifeboat hooks are very shallow, they do not provide the protection normally afforded by a hook having a deeper curved construction.



The shape of the hook is very shallow having a straight or nearly straight load bearing arm.

**Figure 8:** Image Showing Standard Lifeboat Hook Arrangement - Note the shallow hook shape

The load bearing part of the hook is very shallow and can be seen to be almost flat. The location of the stop pawl at the mouth of the hook is designed to negate the risk of the lifting link falling out of the hook as a result of this shallowness. However, if the inboard arm of the stop pawl were to become deformed - as happened in the case of Lifeboat No.5, the hook shape would increase the risk of the lifting link coming free. It is noted that the Lifeboats and Tenders onboard ARCADIA were re-hooked from the original Schat Harding hooks, to Fassmer Duplex E2 hooks in November 2013.

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Following the accident the hook manufacturer, Fr. Fassmer GmbH Co, was requested to attend the vessel in Southampton on the 9<sup>th</sup> January 2018 to check the remaining lifeboats onboard and confirm that the hooks were all in satisfactory condition and suitable for service.

The subsequent Fassmer report recommended the size of the lifting-link in the fall termination to be 38mm in diameter. The lifting links fitted on board the vessel were 32mm in diameter.

It is understood that when the boats were re-hooked in 2013 it was decided by Carnival UK to replace all the lifting-links of the fall assemblies with new links but that this was carried out on a 'like-for-like' basis.

It is noted that the link connecting the fall assembly to the boat hook is smaller than the size recommended by the hook manufacturer for use with this type of hook. Additionally, the links used on the lifeboats differ to the ones used on the tenders in that they do not have either a centre stud (cross bar) or the squaring of the link at the base.



**Figure 9:** Image of a Tender Hook Arrangement. Note the lifting link centre stud and squaring at its base

**Shown below are photographs of the damaged Lifeboat No.5 when it was inspected by the Investigator at Ponta Delgada boat yard, Azores.**



**Figure 10:** Lifeboat No. 5 Starboard Side Damage



**Figure 11:** Lifeboat No. 5 Starboard Side Bow Damage



**Figure 12:** Lifeboat No. 5 Stern Damage



**Figure 13:** Lifeboat No. 5 Stern Damage – Note absence of aft hook



**Figure 14:** Interior of Lifeboat No. 5 - From Forward



**Figure 15:** Interior of Lifeboat No. 5 - From Aft

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## CONCLUSIONS

A likely explanation of the failure of the forward hook of lifeboat no. 5 is that the inboard arm of the stop pawl of the forward lifeboat hook failed in its intended function and did not retain the lifting link in the hook mouth. A contributing factor to this failure was the link bouncing around in the mouth of the closed hook and then being pulled at a slight angle during the tricing in part of the recovery operation.

At the time of the accident Lifeboat No.5 was being triced in to the embarkation position alongside the boat deck. In order to bring the lifeboat alongside the boat deck the fore and aft bowsing tackles were connected to the lifting links on the falls as per the procedure. During the lowering process the forward bowsing tackle suddenly became tight and exerted a sudden excess force on the lifting-link. This caused the bowsing tackle to drag the lifting link along the bill of the hook, to the hook mouth where it came against the inboard arm of the stop pawl. The bowsing tackle continued to pull against the stop pawl in a twisting motion which may have bent the stop pawl arm outward. This opened a gap between the beak of the hook and the stop pawl arm and allowed the lifting link to be pulled out of the hook.

The stop pawl is the critical safety device fitted to the hook to prevent the lifting-link accidentally coming out of the mouth of the hook. The safety pawl of the forward hook of No. 5 lifeboat failed to do this because it was loaded in a manner for which it was not designed; by the attachment of the bowsing tackle to the lifting link.

It was noted that stop pawls fitted on other lifeboat hooks had become deformed during service. The manufacturer of the hooks also found a number of deformed stop pawls during their inspection and had recommended that they be replaced with new ones. This evidence, in conjunction with the condition of the stop pawl of No.5 lifeboat indicates that the existing stop pawls are not sufficiently strong to withstand the forces being applied by the bowsing tackle. If the two arms are joined together with a cross bar arrangement it would offer better strength and resistance to the forces applied by the bowsing arrangements.

The manner in which the forward bowsing tackle is connected between the davit and the boat with an offset in the fwd and aft direction creates a pulling force on the lifting link towards the bow of the boat and out of the hook mouth. This arrangement also creates a twisting force on the lifting link which the stop pawl is poorly designed to withstand.

The decision not to release the lifeboat from the falls when the boat was floating in the water could have allowed the last link of the fall end termination to move freely around within the hook, as the hook is very 'shallow'. When the weight was re-taken on the falls, the final link may not have settled correctly back into the throat of the hook.

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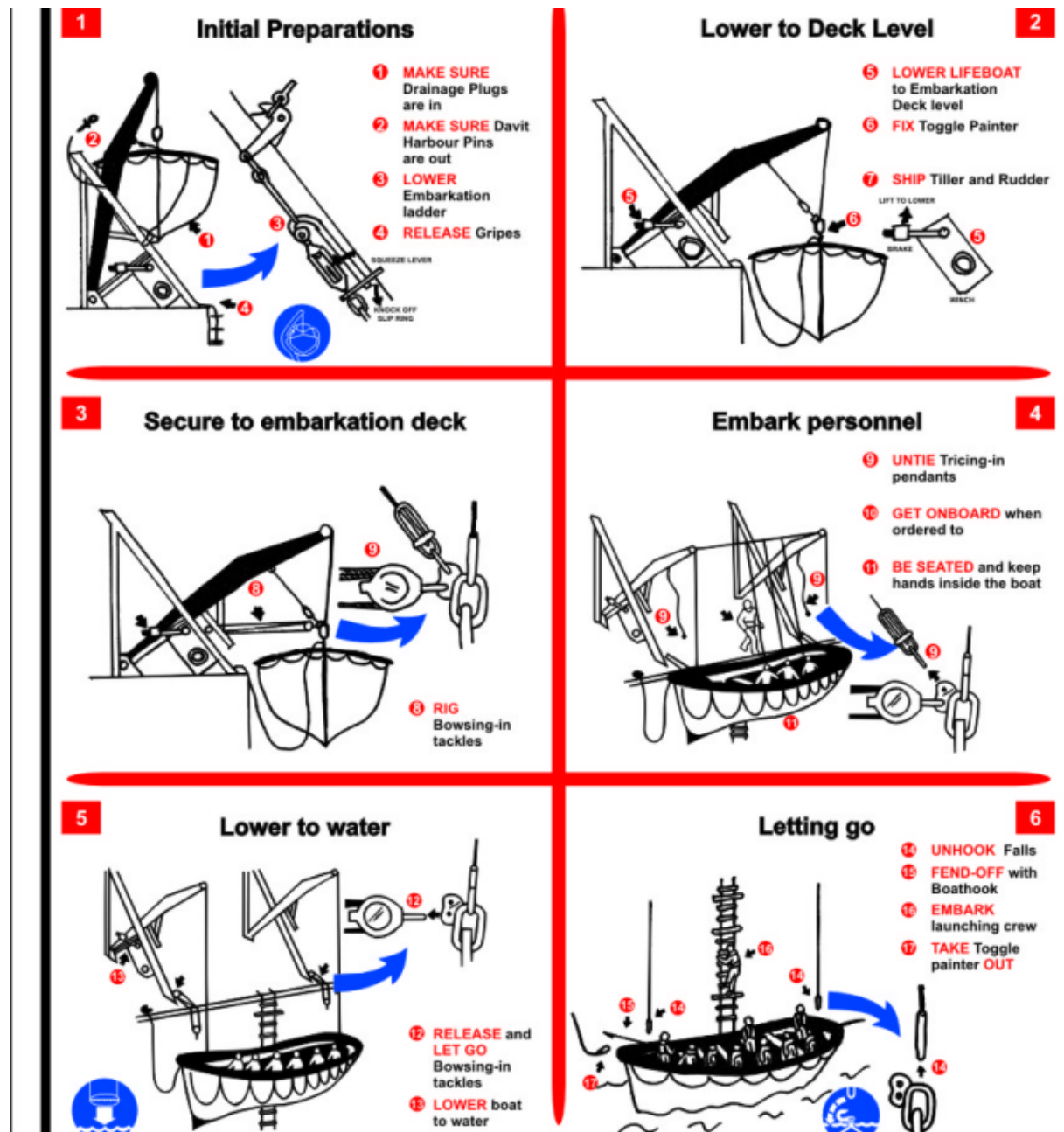
## RECOMMENDATIONS

- i) Procedures are rewritten to ensure that when launching the lifeboats the hooks are released and then reset, or in instances that this is not possible boat crews are to check and confirm that the lifting link is correctly placed within the hook prior to hoisting
- ii) The current lifting links on the ARCADIA lifeboats and other similar vessels in the CUK fleet are replaced with links meeting the hook manufacturer's recommended dimensions and of a similar design to the ones used on the ship's tenders.
- iii) It is recommended that the company and hook manufacturer design and install an amended stop-pawl system.
- iv) It is recommended that the company, in consultation with the boat hook manufacturer, review the fitting arrangements for the bowsing tackle.
- v) It is recommended that the company, along with the davit manufacturer, check the movement of all the winch braking systems on all company vessels.

Safety recommendations are intended for improving safety of life at sea and shall in no case create a presumption of blame or liability to any party.

## ANNEX 'A'

### Boat Launching and Recovery and use of "Tricing-Pennant" and "Bowsing Tackle"



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## ANNEX B

### Onboard Training Model for the Fassmer Gmbh Co., Hook assembly

The constituent parts of the Fassmer Gmbh Co., hook are as per the following picture, this is a model set up which is used onboard the vessel for training purposes.

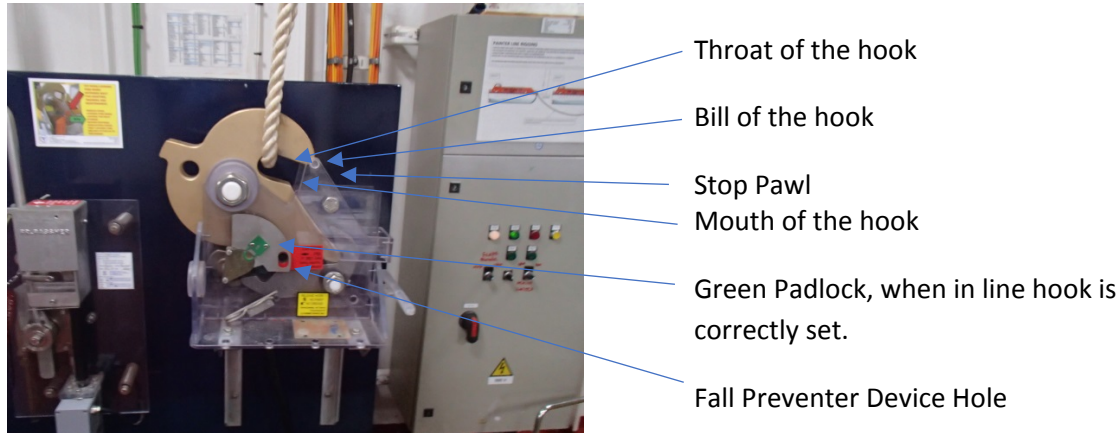


**Figure 16:** Arrangement of the Training Hook Fitted on ARCADIA

#### **The hook assembly is generally made up of the following parts:**

- The Throat of the hook, the area furthest into the curve of the hook
- The Bill of the hook, the point right at the front of the hook.
- The Stop-pawl, on a swivel, this is designed to be pushed out of the way when the ring is connected to the hook and is weighted so that it falls back into place and prevents the hook from disconnecting.
- The Fall Preventer Device Hole, the Fall Preventer Device is a pin that goes through the body of the hook and is designed to prevent the release of the hook if it is accidentally released. This pin is always used during training and drills.
- The Green padlock indicator, when this padlock is aligned it means that the on-load release hook is correctly set.