United Kingdom Maritime Pilots’ Association

Pilot Boarding and Landing – use of the Hadrian Safety Rail Study

Introduction - Why the study?

In a specific UK port, the pilot boat operating company determined that it would be safe practise for all pilots (and other personnel) as well as company employed crew-members to be attached to the Hadrian Safety Rail when outside of the cabin during personnel transfers at sea.

The pilots concerned were immediately aware that this was a far more complex issue than the boat operators realised and conducted comprehensive research into various aspects and hazards of harness use and associated injuries and physiological traumas resulting from incorrect procedures and the use of incorrect equipment.

The CHAs concerned established a joint working group to conduct a formal study, comprising Harbourmasters, Pilots (UKMPA), the pilot boat operator and the manufacturer of a widely used Pilot Safety Coat.

The Pilot Boat

The design of the boats in question requires personnel to transit from the aft cabin door to the foredeck of the boat to enable boarding / landing of ships. The boat’s crews are instructed by their employers to clip-on to the fitted Hadrian’s Rail (Unirail) system utilizing the waist belt ring on their lifejackets. Pilots transit the narrow side decks by holding on with one or both hands (personal preference) and sliding them along the fitted hand-rail.

Perceived Problem

Management who operate the boats believed that there is a significant safety issue in the manner in which pilots transit the side decks from which they may fall overboard.

Evidence of requirement

There appears to be no published statistical evidence or records of a pilot (or crew) actually falling over the side of a pilot boat whilst transiting the side deck in the manner described above.

Risk Assessment

A documented, formal risk assessment was not carried out by the boat operator or any of the affected stakeholders to determine the actual risk that was perceived to exist prior to implementation of the operator’s regulation.

Equipment provided:

1. Boats – Fitted with hand rails bound with non slip boat-lacing. Unirail (Hadrian Safety Rail) system with cars fitted with lanyards (700mm length). The rail is 800mm above the deck, below waist height. Side decks are 600 mm wide.
2. Crew - Sole type lifejackets, integral harness type with simple waistband and D ring.
3. Passengers - (Pilots and others) Pilots – combination pilot safety coats fitted with simple single chest belt and D ring. Other passengers - own or pilot boat operator supplied lifejackets.

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ARGUMENTS AGAINST USING THE HSR

There is a significant operational issue for pilots, as to exactly when and where to clip on and off. Timing on the fore-deck during transfer operations is critical, and the pilot / passenger cannot be impeded by a clipped on harness.

Understanding fall prevention / arrest / recovery.

Prior to the study, concerns raised included:

• No consideration had been given to the practical issues, of a single crew member, required to rescue a casualty who has fallen overboard and suspended by the lanyard.
• No formal rescue techniques had been developed, taking into account the suitability of the crew’s harness and its restriction on mobility, including the requirement to keep the crew member safe whilst deploying and using additional rescue equipment.
• No consideration had been given to the nature of the equipment supplied to and worn by personnel in the form of harnesses.
• No consideration had been given to the different types of fall harnesses, their correct use and more importantly the consequences of the improper use of such harnesses.

Personnel Safety Equipment.

The harnesses fitted to the pilots’ safety coats and the supplied (for crew) stole type lifejackets are not designed for fall prevention or arrest.

• They are to aid in the recovery of personnel from the water.
• They are not designed to be load bearing.
• The lanyard carribenas fitted are not able to be released under load.
• The position of the Unirail (on the particular boat design in question), length of lanyard and the slack in the pilot-coat harness when considered with the width of the side-deck mean that in the event of a trip or fall, the wearer is able to become suspended over the side of the boat, unable to unclip himself and possibly (probably if injured / shocked etc.) unable to climb back onto the deck.

Medical Issues

There are numerous research studies available which indicate and state very clearly that a single belt type harness as fitted to Pilot safety coats and stole type lifejackets are dangerous if used in a fall prevention or arrest mode:

• It is possible to incur serious abdominal or chest injury.
• Studies have shown that suspension by a single belt harness for even a short period of time can result in death through hanging trauma.
• Lack of personnel training. Many boat crews and pilots are not trained in the correct techniques for lifting personnel suspended by harnesses and dealing with the potential injuries and toxic shock trauma which may be occasioned.

Expert opinion

Independent UK experts in the field of marine rescue (Mine Rescue UK) stated (referring to the single belt harness) that “…the position of the harness currently used is dangerous and will probably cause injury”. 
REGULATORY BACKGROUND

1. Part 22.4 of Article 25.6.3 of the 25.6 MGN 280, the Small Commercial Vessel (SCV) Code requires:

An efficient, uninterrupted/continuous safety rail system for clip-on safety harnesses should be provided. The system should allow the harness traveller to move freely and without adjustment over the full length of the safety rail. The rail system, its attachment to the vessel structure and the clip-on safety harnesses should be designed, constructed, installed, tested and maintained to appropriate personal protective equipment standards, to the satisfaction of the Certifying Authority.

Bibliography

- The UK HSE 451/2002 “Harness Suspension – Review and Evaluation of existing information”.
- UK P&I Club safety bulletin 33/2010 “Safety Harnesses – working at height and over-side”.
- UK MAIB report on the fatality aboard the sailing yacht Lion.
- USA Occupational Safety and Health Administration Fall protection information sheets.
  https://www.osha.gov/Region7/fallprotection/fall_protection_info.html
THE HADRIAN SAFETY RAIL (UNIRAIL) SYSTEM - HSR

http://www.hadriansafetyrails.co.uk

The Hadrian Safety Rail (HSR) is a rigid extruded aluminium rail system which provides continuous attachment via a four wheel carriage. It runs from the pilot cutter accommodation door to the Pilot boarding area at the bow of the cutter and enables a person to remain ‘clipped on’ to the boat at all times when moving from the accommodation to the bow and back again; its purpose is to prevent people falling overboard.

Fig 1 (left) clearly shows the HSR arrangement. The rail is fitted just below the handrail and the carriage is fitted to the rail which then slides freely along its length. A tether is secured to each carriage that enables the user to ‘clip on’; the carriage slides up and down the rail as the person moves about the boat. During Pilot boarding operations, the man standing is where the deckhand would normally be, using the leading carriage, the Pilot would use the after carriage and follow the deckhand down the deck to the bow.

Fig 2 (Below left) shows the carriages on the HSR with the safety lines or rope lanyards attached.

Fig 3 (above right) shows the spring clip by which the rope lanyard is attached to the D-ring on the safety harness, lifejacket, or Pilot’s integrated safety coat.

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Research and investigation methodology

Real time practical investigations and trials were carried out on a pilot boat in open water. The pilot boat crew demonstrated the use of the HSR equipment. Simulated recovery of a man overboard using a rescue industry standard dummy, Matesaver unit and tackle hoist was also demonstrated. The boat then returned to its berth where extensive analysis of the various stages of the procedures demonstrated at sea progressed. This included simulating the entire Pilot boarding and landing procedure using both a conventional “stole” lifejacket with harness and the specialist integrated Pilot Safety Coat.

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Analysis

The most important point that emerged from this practical examination, afloat and alongside, was that the HSR as fitted aboard the subject pilot boat would **not** prevent somebody falling overboard, although it would keep a person that had fallen overboard (for whatever reason) tethered to the boat. The recovery of the man overboard was remarked upon in detail by the various observers whilst the operation was being conducted. In a moving seaway (wind F3-4 and light swell) it was clear that one man alone (the boat crewman) would not be able to lift the casualty on board. It required the assistance of the coxswain, thus leaving the boat uncontrolled. It was stated that it is for this reason that some UK pilotage districts have two crewmen on the boat when working any distance offshore.

On the boat in question, where the side-decks are 600mm wide, anyone using the system that fell overboard would be suspended over the gunwale fendering (in a very painful manner) with ample opportunity for further serious injury through impact in the seaway as illustrated clearly in the figure 5 photographs below. It should be noted that the photographs show the position with a stole lifejacket and chest D-ring, and also using the integrated safety coat. This situation is potentially worse than with the lifejacket.

This is because the harness arrangement within the coat is adjusted and set for when the integrated lifejacket in the coat is inflated, which would be the position had the Pilot actually been immersed in the water. The HSR would prevent the Pilot from falling in the water, thus the lifejacket would not inflate, which would extend the harness so that the pilot would fall further over the side as illustrated.

In theory, a pilot in the position shown in figure 5 (above) is recovered by the crewman dragging the carriage of the HSR aft down along the rail, to the after end of the accommodation housing where final recovery is achieved by a simple block and tackle arrangement. This is not possible by one man alone and thus requires assistance from the coxswain.
The concept of the coxswain assisting the crewman is itself dangerous, (and potentially legally challengeable), especially in busy seaways where most pilot boats operate. Not only because the boat is not complying with ‘The International Regulations for Prevention of Collision at Sea’ Rule 5, but also no-one is in effective command and control of the boat.

This is an example of how the hazard and risk have not been fully identified and risk assessed in advance. Furthermore, whilst the recovery procedure was demonstrated in the benign daylight conditions (F 3-4). In reality, under deteriorated conditions and at night, the recovery of a waterlogged person, single-handed, would be an extremely difficult (if not impossible) operation.

**Positioning at the moment of transfer**

Fig 6 (below) illustrates the stage where the Pilot, is about to step onto the pilot boarding ladder of the ship to be served – the picture is taken “from the ship”. The deckhand is well placed to assist the Pilot with boarding and alighting from the pilot ladder.

**Deck hand Issues**

The deck hand is required to transfer his point of contact with the boat by unclipping from the HSR (out of shot to the right) and clipping to the foredeck pulpit rail, by a single lanyard. So he remains securely tethered to the pilot boat and cannot possibly fall over the side owing to the distance involved due to the length of the lanyard.

This operation could be made even safer from having two lanyards available. The deck hand could then transfer from the HSR to the pulpit rail without ever being detached from the boat at all. His point of contact is in front of him to enable the easy use of the clipping on arrangements. In rough, cold, inclement conditions, possibly wearing gloves, he may need to use both hands. Particularly when in rough weather, the clip is under load.

A double lanyard would thus prevent any point during which he was not secured to the boat.

Note the lanyard length supplied to the crewman is similar to that of the pilot, and potentially would not prevent him falling overboard and becoming suspended, whilst transiting when the side deck. Wider decks and / or a shorter tether would resolve this. However, there is a need to ensure that the lanyard length does not hamper the user from preparing the ship’s boarding ladder for the Pilot transfer, nor transferring safely from the HSR to the pulpit rail.
**Pilot Issues**

The lanyard has been unclipped from his belt and remains connected to the HSR carriage, which is now behind the Pilot. This is a critical period; the pilot must be fully able to observe the relative movement of the cutter and ship being served in order to properly assess the moment to make his transit from the pilot cutter side, onto the pilot ladder.

Clipping on and off is a protracted operation. Particularly in inclement conditions, when the clip will inevitably be under load and so not easy release, especially with gloved hands and whilst the boat is moving in the seaway. This is particularly distracting, at a time when the Pilot needs to fully concentrate on getting onto the boarding ladder.

Even without any loading on the clip, trials demonstrated that one-handed with gloves on, the clip is very difficult to use, and may both hands must be used.

At least one clip used on any lanyard must be able to be released under load by the wearer. The tethers themselves need to be of certificated tested construction with a CE mark. Their inspection and scheduled testing must also be recorded as part of the boat’s equipment schedule.

Therefore the practise of being clipped on can be demonstrated to be extremely dangerous to the Pilot, not only during transit along the outside of the cabin but importantly whilst exposed on the fore-deck prior to transfer operations.

**Crewman’s Harness**

Photograph at Fig 7 (below) illustrates the deck hand crouched down on-board the cutter simulating preparing the boarding ladder for the pilot to use.

![Deck hand](image)

**Figure 7**

This is a common operation during the Pilot transfer. In this position the crewman’s harness with its D-ring on the front does not permit full freedom of movement or proper bracing against loss of balance. If he slips there is a real danger of being twisted around.

Despite this, at least the crewman cannot fall overboard, highlighting the significance of the HSR to maintaining and ensuring his safety on the foredeck.
Practises across UK ports

Other ports were consulted on this issue with varying results and feedback:

**Mandatory used of the HSR by the Pilot and deckhand:** Some UK Competent Harbour Authorities (CHA’s) had mandated use of the HSR. However, every one of the ports consulted reported considerable difficulty in enforcing the mandate. No formal, documented, Risk Assessment has been carried out by any CHA in the UK apart from one which was conducted after the practise had been mandated. However, recognising the dangers, Pilots refused to comply.

All CHA’s contacted admitted that when discreet checks were undertaken, the Pilots ignored the mandate and did not use the HSR. Of greater concern is that in many cases the deckhand did not use the HSR either. It is evident that whatever solution is adopted, it must be proven that it is not dangerous and shown irrefutably both practically and medically that it is safe. Before its acceptance by the Pilot body and Pilot cutter crews, it’s worth and utility must be proven.

**Discretionary use of the HSR by the Pilot:** In some ports, the Pilot is offered the use of the HSR and decides whether or not he chooses to use it; this option is very common and this is the option currently in use in the ports served by this operator.

**Mandating use of the HSR by the deckhand only:** in all cases consulted, CHA’s claiming successful, practical use of the HSR, had established procedures for the deckhand, rather than the Pilot to use the HSR. If the deckhand is securely clipped on and tends the Pilot throughout, then safety overall is enhanced.

The research group spent some time ‘walking through’ this procedure; it works and is practical (notwithstanding the previously mentioned issues of correct safety harnesses etc).

The process also highlighted the usefulness of the webbing loop on the back of the Pilot Safety Coat to the deckhand in assisting the Pilot with accessing / leaving the boarding ladder.

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Hadrians safety rail study conclusions

• Acknowledging that the HSR system as currently fitted aboard the subject Pilot cutters does not prevent either the pilot or deckhand from falling overboard; it does keep anyone falling overboard tethered to the pilot cutter and so facilitate recovery on-board.

• However there is a real risk of serious injury to the person over the side, with the potential medical consequences. Highlighted by the UK H&SE with regard to short period term single point harness suspension. http://www.hse.gov.uk/research/crr_htm/2002/crr02451.htm

• The current equipment supplied to Pilots (and crew) is not designed as a fall arrestor harness which is the role it plays when used with the HSR system.

• Due to the position of the rail, length of lanyard and the slack in the pilot-coat harness, combined with the width of the side deck of the Pilot boat, means that in the event of a fall overboard, the wearer will become suspended over the side of the boat and be unable to either unclip themselves or to climb back on-board without assistance.

• The lifejacket and ancillary equipment are purpose and proven designs to facilitate rapid and safe recovery of a casualty from the water with no potential physical injury being occasioned by their use.

• There is considerable evidence available from numerous research studies, which indicate and state clearly that, a single belt type harness as fitted to pilot coats and stole type lifejackets, are dangerous if used in a fall prevention or arrest mode. Serious abdominal or chest injury can occur and even death through hanging trauma. Independent UK experts in the field of marine rescue, Mine Rescue UK, have stated that “the position of the harness currently used is dangerous and will probably cause injury”.

• Training in dealing with the recovery of personnel suspended and subsequent potential injuries including toxic shock must be taken into account.

• There is no question that it is better for the deckhand to be clipped on at all times in such a manner that not only are they are unable to fall overboard, but also be fully capable of assisting the Pilot. - At some point the Pilot must unclip and transfer from the deck to the ship’s boarding ladder and vice versa. – the most dangerous part of the whole transfer operation which requires split second judgment and timing by the Pilot, unencumbered by any outside impairment.

• The pilot should NEVER be clipped onto the ship under any circumstances. A ‘continuously clipped on’ facility is not practical indeed is widely determined (ref. International Maritime Pilots’ Association http://www.impahq.org) to be dangerous and so some compromise solution must be found.

• The HSR as fitted aboard the subject (and doubtless many other) Pilot cutters does not prevent anyone falling overboard and needs some modification such as a shorter tether to ensure that the deckhand is retained on-board. Any modification should also enable the deckhand to transfer from the HSR to the pulpit forward without ever being unclipped, the use of a double tether lanyard is recommended to achieve this.

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RECOMMENDATIONS

• Where a safe and proper effective system has been installed, there should be a requirement for the deck hand to receive full comprehensive training with the rail system, which incorporates safety awareness, rescue procedures for dealing with a suspended casualty and the associated medical risks. Best Practice should be established by the relevant manufacturers, professional bodies and boat operating organisations.

• HSR systems are equipped so that the deckhand’s rig has a double tether of suitable length to ensure that the deckhand cannot fall over the side and is still able to tend the Pilot and prepare the boarding ladder for the pilot.

• Equip the crewman with a proper industry standard harness for the task with rear D-ring(s).

• Develop procedures such that the deckhand makes full use of the HSR and also tends the pilot without risk to his own safety.

• Mandatory use of the HSR by pilots is stopped.

• Work should continue with national and international Pilot and Harbour Authorities to develop a system, compatible with international standards for boarding by Pilot ladder, whereby the Pilot remains safe at all times. A significant improvement would be the mandated use of shell side doors / stairways / trunkings in all ships thus reducing the length of a pilot ladder to a minimum. This may facilitate in the majority of cases a “step across” transfer rather than “onto a ladder”. However, it is recognised that this mandating is unlikely to reach reality any time soon due to the ambivalence of ship owners and classification societies.

• If part of the HSR is faulty then full consideration should be taken to removing the boat from service until the repair is completed.

• At the design stage of pilot cutters, consideration to the minimum width of the pilot boat’s side deck walkways should be taken. In order to ensure any trip / fall by the deck hand / Pilot would not result in being suspended overboard.

• Investigate optimising the rail systems (e.g. along coach housing roof), in order that a casualty will not be suspended out board of the pilot boats side. Note there is potential here to assist with recovery on-board as well.

• Lanyard clips must be capable of use in all weather conditions, whilst wearing gloves and under load.

• In conjunction with manufacturers and National bodies, develop standards required for a certified harness to be fully compatible with rail systems on pilot boats.

• Pilot boat operator’s and pilotage authorities should develop full action plans for the recovery and immediate treatment of suspended casualties with an appropriate associated training programme.

UKMPA.
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