RECOVERY OF PERSONS IN WATER (PIW)

Guide to Good Practice for Small Vessels

BTA

Acknowledgements & Disclaimer

This product has been produced by members of the British Tugowners Association, as part of the UK Chamber of Shipping.

For their expertise and input special thanks are extended to:

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The Workboat Association & its members

www.britishtug.com

www.ukchamberofshipping.com

Foreword

Professor Mike Tipton MBE, FTPS

Professor of Human and Applied Physiology at the University of Portsmouth

Immersion in cold water represents a serious threat to life. But this threat can be significantly reduced with the correct knowledge, procedures, equipment, and training. This comprehensive guide provides the information needed to significantly reduce the chances of a tragedy if an individual goes overboard. It follows that reading this guide, and implementing the recommendations contained herein could, quite literally, be lifesaving.

In the area of cold water survival, knowledge = survivability.

I commend this Guide to Good Practice to you, and the knowledge it provides.

Professor Mike Tipton MBE, FTPS.

October 2022, Extreme Environments Laboratory, Portsmouth

https://researchportal.port.ac.uk/en/persons/mike-tipton

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Introduction & Purpose

PURPOSE

The adage, that prevention is better than the cure, could not be more relevant in the case of persons inadvertently entering the water and requiring recovery. The premise of this guide to good practice is to accept that on occasion individuals will require recovering from the water, whether they be over-board from the vessel itself, or a third party.

As such, the British Tugowners Association offers this guide to good practice on the recovery of persons from the water. This review of recovery tools and techniques has been created not to recommend any means of recovery nor show any positive or negative bias to any specific equipment detailed within. Its basis is to consider all common equipment and new & innovative equipment that is being and can be utilised for the purpose of recovering persons from water. The core of the equipment reviewed is that of which is most commonly found harbour tugs, workboats, and small vessels around UK operating waters.

This guide considers limitations in areas of operation, considering various environmental and operational situations and explores possible options to overcome any issues found through drills and rescue situations.

SCOPE

Ultimately the scope of this review will be to cover the equipment that is available for overboard recovery based on the factors below and the regulatory guidelines.

One of the main limitations of effective casualty recovery onboard tugs and workboats is the number of crew. This guide is aimed at small vessels which may often carry a crew of three, meaning that single person recovery operation is a necessary scenario to plan and be equipped for. It is of little advantage to prepare a recovery technique using equipment requiring two people if only a single crew member is available to effect the rescue.

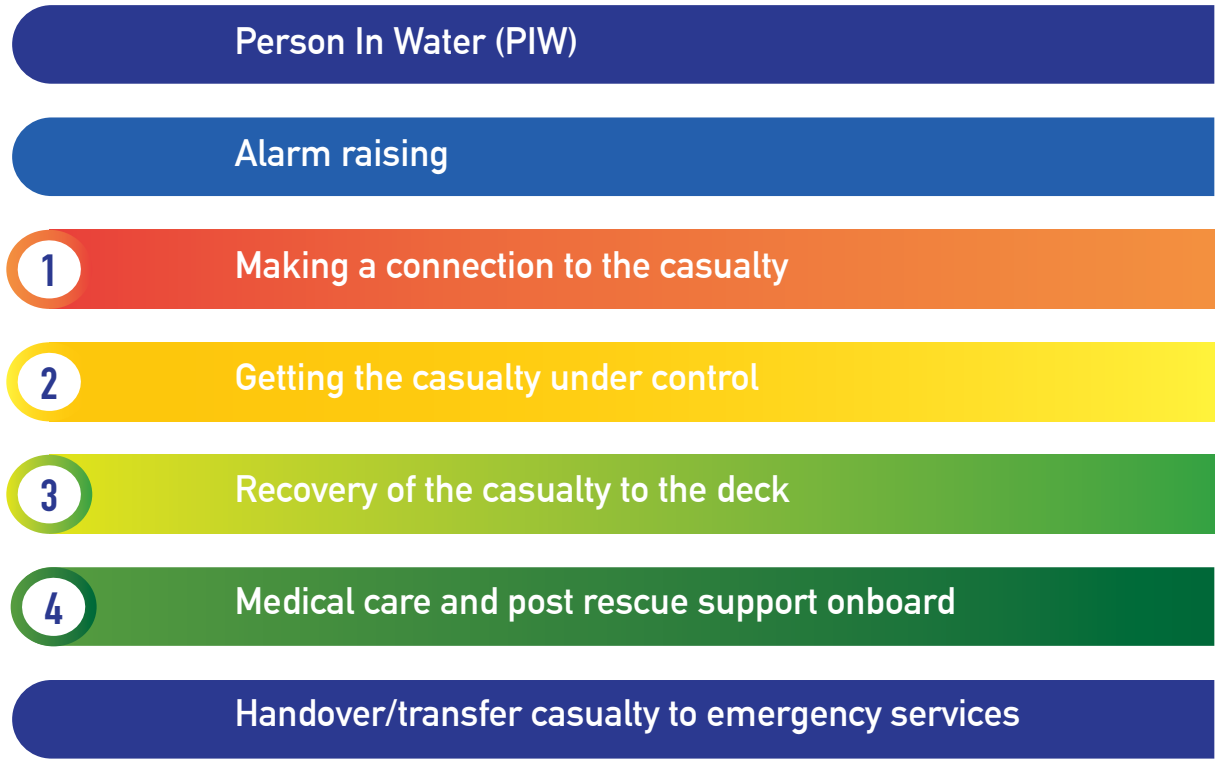
Whilst it may be assumed that the person being recovered from the water is a member of the vessel's crew, this may not always be the case and this guidance and the equipment it describes is equally applicable for affecting recovery for third parties.

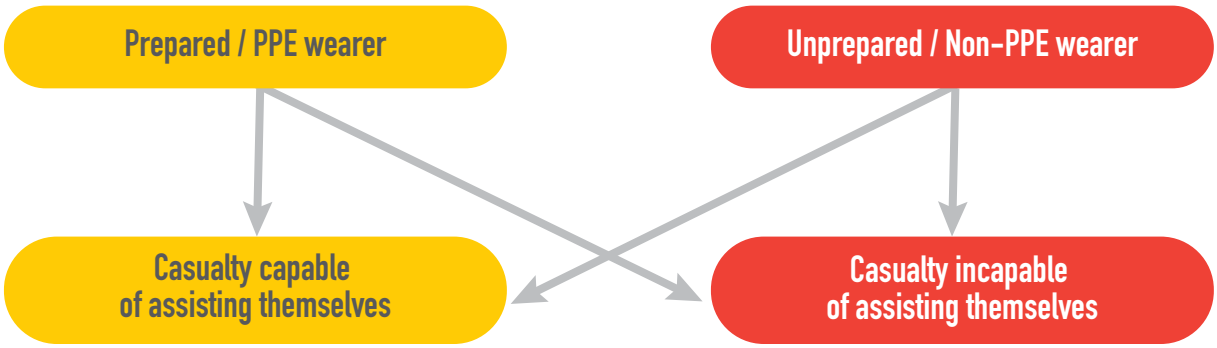
This guide has restricted itself in not discussing in detail vessel design and build issues of existing craft with available space, physical characteristics, and manoeuvrability, although it could be considered obvious and clear that vessel characteristic, of all kinds, must be borne in mind when selecting, fitting, and using equipment intended for the recovery of persons in water. This the authors believe to be an area of future enhancement or further work.

PERSON IN WATER (PIW) RECOVERY METHODOLOGY

The review of existing equipment has determined that the process of successfully recovering any casualty from the water can be broken down into four distinct phases:

The first three phases must then be tested against the status and capabilities of the casualty (see below). Fundamentally, the question that immediately arises, is the casualty capable or able to assist themselves? Furthermore, was the casualty prepared for entry into the water (i.e., wearing PPE, a lifejacket, etc).





Crews must consider a wide range of possible circumstances and be provided with a suite of complementary tools that can be adapted to suit the challenge faced in each case. Consider the extent of this suite of equipment available onboard, understanding its limitations.

Any issue raised concerning the equipment should be addressed as soon as reasonably practicable by shore management and worked through with the crew.

The primary focus must be to ensure the casualty is retrieved safely, in a quick and effective manner. However undue haste can create greater risk and lead to a situation deteriorating. Operators need to be careful that expectations are clearly communicated as many factors affect recovery whether positively or negatively.

The primary focus of the fourth phase, emergency care on board, is to deliver prompt and effective first aid and treatment to the casualty and manage the handover to emergency services.

The following sections will explore each of the four phases in turn, providing details of the equipment available, maintenance considerations and where possible, experiential guidance concerning usage and limitations.

Raising the alarm & requesting assistance

It is essential that any person who sees someone going overboard or in the water raises the alarm on board before going to initiate any rescue attempt.

Distress alert followed by Voice Mayday to the Coastguard must not be delayed.

It is often a misconception for vessels that operate predominantly in the same area where crew become familiar with the Vessel Traffic Services (VTS) operators that the VTS will provide the quickest response in an emergency. However, His Majesty's Coastguard (HMCG) advise the most helpful method of notification is a DSC distress alert followed by calling on VHF Ch 16.

A person in the water alert will result in the direct tasking of a lifeboat and/or helicopter (if available). This provides vital support in the scenario where a casualty cannot be easily recovered onboard, it also provides for swift medical and evacuation assistance where required.

Some ports have local emergency response plans from which assistance can be rendered.

When requesting assistance thought should be given to:

1. Where has the incident taken place and what facilities are in the local area?
2. Who is going to assist you? (Boat/Helicopter)
3. Where will they be coming from?
4. How much time should you expect before their arrival?

Attendance times may vary considerably depending on location and operation, it may be 30 minutes or three hours – prepare accordingly and understand help may not be coming immediately.

FLOAT TO LIVE

The Royal National Lifeboat Institute (RNLI) operates around the British Isles, however its "Float to Live" advice is applicable worldwide and the capacity of the casualty will be greatly enhanced if they follow it.

"Float to Live" advice can be verbally conferred to a PIW before a connection to the casualty has been made.

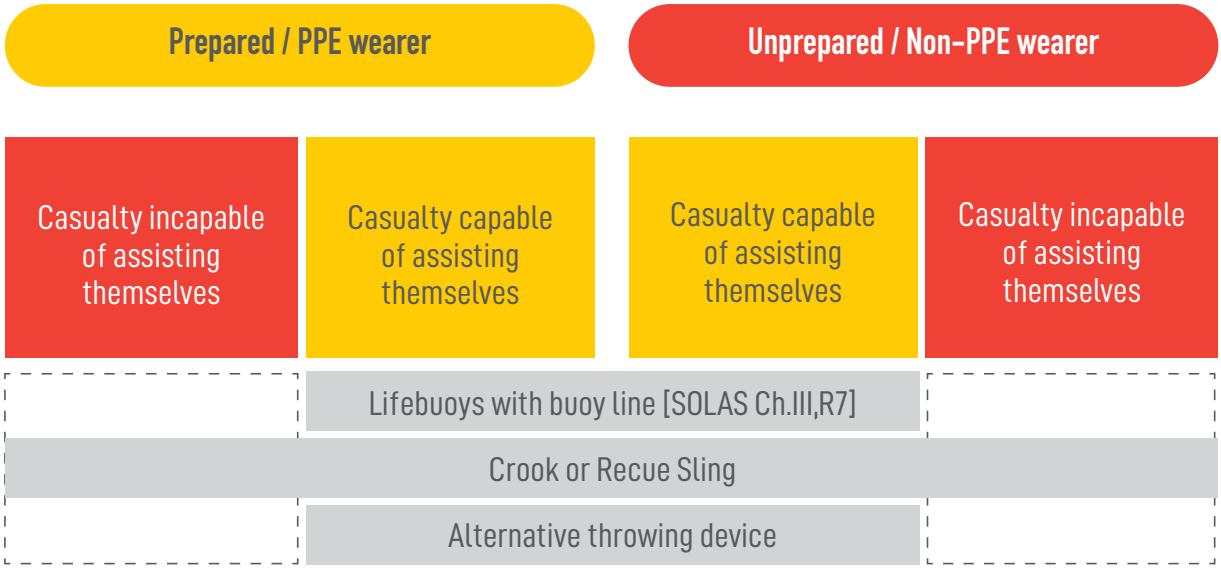
If you enter the water unexpectedly:

- **Take a minute. The initial effects of cold-water pass in less than a minute so don't try to swim straight away.**
- **Relax and float on your back to catch your breath.**
- **Try to get hold of something that will help you float. Keep calm then call for help or swim for safety if you're able.**

THESE ACTIONS WILL SAVE LIVES

1 Making a connection to the casualty

How the rescuer makes contact will be governed by the capacity of the casualty. The motivational benefits of reassurance and encouragement given by the rescuer should not be underestimated to someone who has unexpectedly entered the water. Even when the casualty is deemed able to assist themselves it is still advisable to require them to do a little as possible during a rescue. At this stage it will be impossible to know if the PIW is really OK or deteriorating fast.



LIFEBUOYS

Lifebuoys (or Perry buoys) should be distributed to be readily available on both sides of the vessel and as far as practicable on all open decks extending to the vessel's side with at least one placed in the vicinity of the stern. They should be stowed ready to be quickly deployed, and not permanently secured. They may be fitted with a buoyant lifeline and self-illuminating lights. At least two of the lifebuoys are required to be provided with self-activating smoke signals.

They are a non-mechanical device that can provide a conscious casualty with an additional means of buoyancy. The limitation for this device concerns the rescuer's ability to throw the buoys, especially into a strong wind and the length of the lifeline. They also require the casualty to have sufficient physical capability to use them – which is lost comparatively quickly on immersion in cold water.

CROOKS

Lightweight, swimming pool-style shepherd's crooks can provide a useful and agile device for reaching out from the safety of the vessel, to aid positioning of the casualty into a cradle or other rescue device.

Source: Targe Towing

RESCUE SLINGS & POLES

Slings can be operated by one person and are typically four or five metres long. They are heavier than the crooks described above but may still be used to make the connection with the casualty. Limitations may include size, weight, reach, depending on the vessel size.

Source: Solent Towage & Svitzer

Source: Solent Towage

ALTERNATIVE THROWING DEVICES

Several devices are available in the market for the purpose of sending a projectile [safely] to or towards a casualty. These may include, simple throwing lines, normally stored ready for immediate use in a bag, or more specific devices that include a weighted projectile to increase the distance the attached line may be thrown. Strong winds may prohibit their effectiveness if thrown into or across the wind.

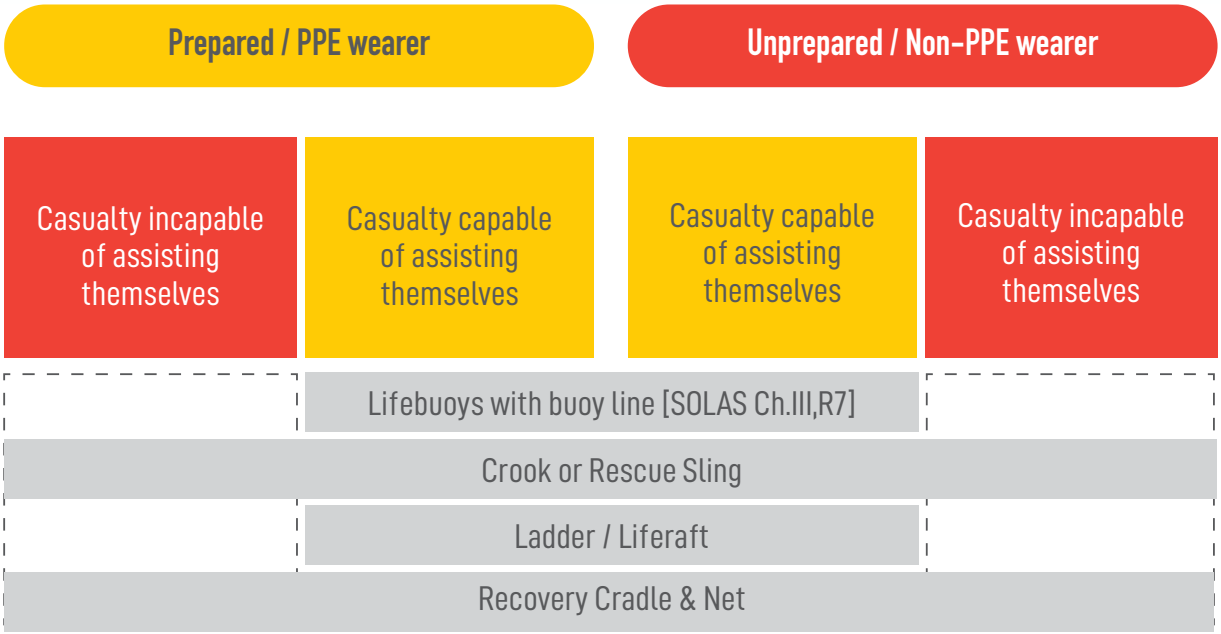
Source: Shetland Islands Council Towage

2 Getting the casualty under control

Once a connection has been made with the casualty, it is vital that the in-water situation is stabilised (as far as practicable) prior to the extraction of the casualty. Depending on the conditions experienced, there may be a need to swap to other equipment, or simply to ensure the casualty is correctly positioned for recovery to the deck.

THE IRRATIONAL CASUALTY

- It is possible that a person who has entered the water unintentionally will panic. If they entered the water without a lifejacket or buoyancy aid, the degree of panic could increase. Similarly, the longer their life is at risk, the greater the panic could become.
- Consequently, a person in the water may appear irrational when communicating with their rescuers. This could display as non-sensical responses to questions or verbal abuse towards rescuers.
- Crews should be prepared for all eventualities when effecting rescue of a person in the water.
- What is said to the casualty at this stage may influence outcome. There is evidence of "pre-rescue collapse" which may be caused by telling casualties they are "safe", "we've got you". Thus, it is recommended to reassure the conscious casualty but encourage them to keep fighting for their survival.



LIFEBUOYS / CROOKS / SLINGS

Use as previous section

LADDERS

A conscious and able casualty could hold onto a ladder, portable or fixed, whilst the crew ready the recovery equipment.

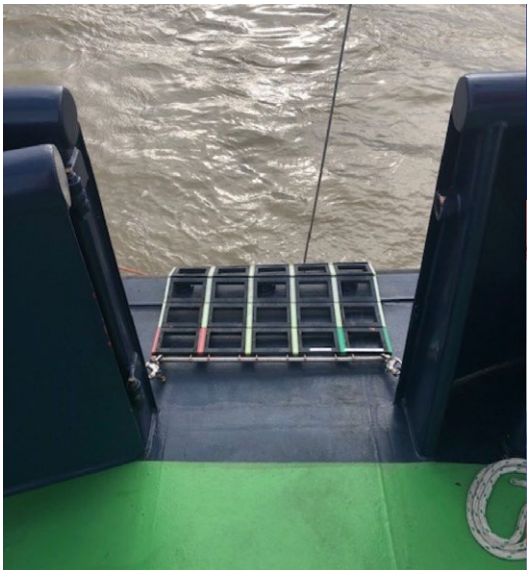
LIFERAFTS

A liferaft can be deployed in the vicinity of the conscious casualty for them to hold onto or enter where able to do so.

Liferafts may be deployed in particularly poor weather or heavy seas when the crew do not wish to approach directly with the vessel for fear of injury.

RECOVERY CRADLE & NETS

A conscious and able casualty could hold onto recovery cradle or net whilst the crew ready the recovery equipment.



Source: Boluda Towage

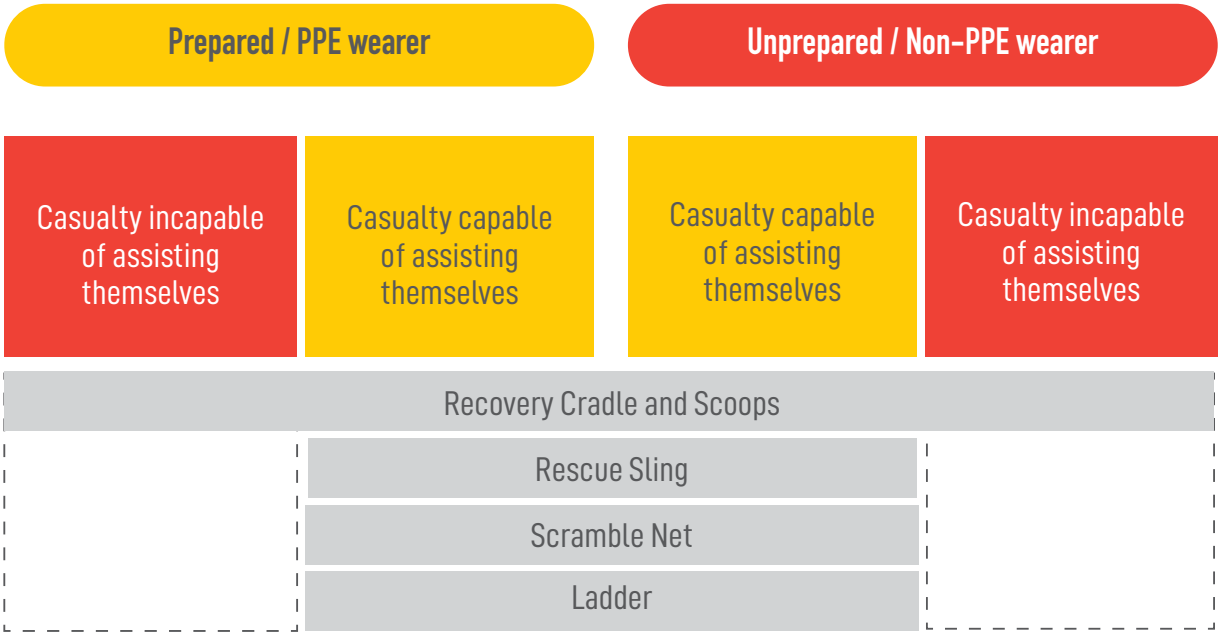
AN ABLE CASUALTY?

Crew should be careful not to over-estimate what a conscious casualty can achieve in terms of grip strength and ability to manoeuvre in the water etc. Whether using a ladder, recovery cradle or net, the casualty's grip strength can fail or weaken quickly. This is simply physiology unrelated to Cold Water Shock or Hypothermia.

The time window for active crew recovery may be limited or shorter than expected. Observe the casualty closely to ensure they can do physical tasks effectively.

Switch to unconscious casualty recovery mode if the conscious casualty has insufficient physical capacity to assist in their own rescue.

3 Recovery of the casualty to the deck



RECOVERY CRADLES & SCOOPS

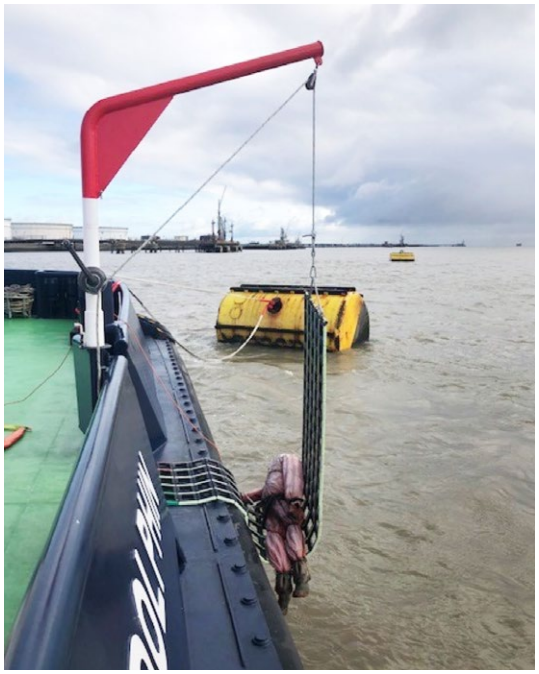
The cradle rescue device can be suspended over a rail or lowered from a davit. The recovery cradle has stiffener batons which make it easier to climb for the conscious and able casualty. It can also take the form of a hammock or stretcher for the recovery of persons when both ends of the cradle are lowered into the water so the casualty can be lifted out horizontally.

Be sure the casualty has the necessary physical capability and coordination to climb. If they have been in very cold water for more than 10 minutes avoid asking them to self-rescue.

Recovery cradles allows the retrieval of casualties who are unable to assist themselves due to injury, physical incapacitation from cooling, or high freeboard. A cradle should be of sufficient width to span most of the casualty in a stable manner.

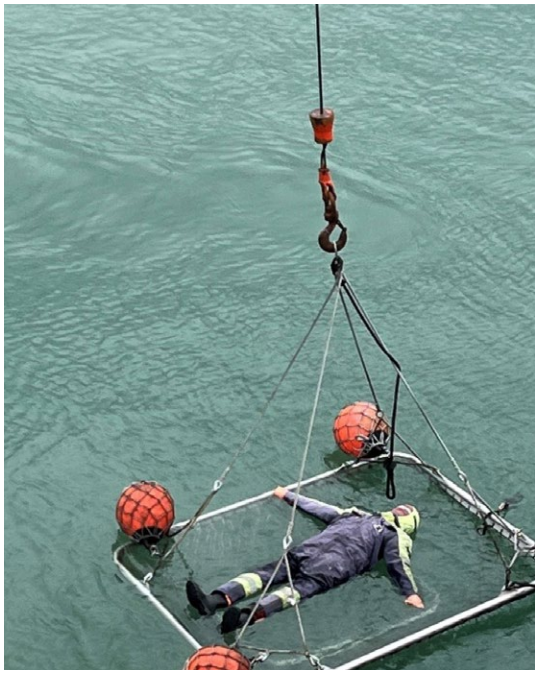
The scoop can be suspended over a rail or lowered from a davit. It is a semi-rigid, manoeuvrable rescue net which can be manually, or power assisted by a standard deck crane or davit.

Source: Solent Towage & Targe Towing



Source: Svitzer & Boluda Towage

RECOVERY BASKET



Source: Solent Towage

RESCUE SLING

A rescue sling typically involves positioning a sling under the arms of the casualty using a pole, which is then attached to a davit or similar device for hoisting on board or to deck level.

SCRAMBLE NETS & LADDERS

A scramble net is a lightweight and mobile device being made of woven material for ease of climbing up and storage. A scramble net is hung from the bulwark and enables a conscious and able casualty to climb back on board.

Fixed or portable ladders can be used to enable a conscious casualty to climb on board if they are able to make the ascent. This is typically only applicable for very short immersion times and for casualties without trauma.

Scramble nets and ladders may be used where there is insufficient space to use the davit to effect recovery.

TRUTH ABOUT VERTICAL OR HORIZONTAL RECOVERY

It is a myth that horizontal recovery is always necessary or recommended.

Horizontal recovery is only necessary due to hypothermia and the hydrostatic pressure of the water (hydrostatic squeeze).

The physical hydrostatic pressure of water causes fluid adjustments in the body, which will affect the human body if more than 30 minutes spent in it. Therefore, if casualties are removed in the first 30 minutes there are no requirements to consider these effects, and the mitigation of their removal at the point of rescue.

With consideration for any trauma (e.g., spinal), crew should focus on recovery by the fastest safe means in first 30 minutes, then defaulting to horizontal if required after 30 minutes.

Horizontal recovery is only important and required if casualty has been in the water longer than 30 minutes AND/OR they show signs of semi-consciousness AND they will be hauled over a significant distance vertically or for an extended period (time).

At any time if there are concerns of the casualty's airway or if the casualty deteriorates rapidly then immediate recovery should be made regardless of time spent in the water.

4 Medical care and post rescue support onboard

WATER TEMPERATURE

Cold water is typically defined as that which is below 15°C, the coastal waters of the UK are frequently below this temperature, which means that the effects of cold water shock and immersion are likely to be a factor during the majority of person in water situations.

In the waters around the UK, the water temperature is typically warm enough that hypothermia will not be an issue unless in the water for prolonged period (an hour or more). However cold water shock and swim failure are real threats.

COLD WATER IMMERSION

STAGE 1 – INITIAL COLD WATER SHOCK – 3 MINUTES

Occurs immediately upon immersion and lasts around 3 minutes. It is characterised by involuntary gasping followed by rapid breathing coupled with an inability to hold or control one's breath. A significant raise in heart rate and blood pressure are also associated with the Cold Shock Response.

Death can occur in this stage either by a fatal inhalation of water whilst the casualty is unable to control their breath (drowning) or, in some cases the stress on the cardiovascular system may trigger unstable heart rhythms that cause a fatal cardiac arrest, or an incapacitating stroke that can lead to drowning.

The chance of drowning on initial immersion can be reduced by:

1. Floating until breathing is back under control
2. The wearing of a lifejacket and crotch straps can help keep the head out of the water and airway clear whilst breathing is uncontrollable and enable relaxation.

STAGE 2 – SWIMMING FAILURE – WITHIN 30 MINUTES

Breathing will return to controlled level inside 3 minutes, and the heart rate will start to stabilise.

Self-rescue may now be possible, provided that the situation allows. However, the loss of heat from the body can now begin to affect the superficial nerves and muscles particularly in the arms and legs.

This can lead to physical incapacitation (loss of strength, co-ordination) within 15 minutes of immersion in cold water. This can prevent casualties holding onto objects, assisting in their own rescue or swimming/sculling to keep their airway clear of the water. Death at this stage occurs again from drowning but is due to an inability to keep the airways clear off the water surface. Thus, a properly fitted lifejacket with crotch straps can be an essential piece of lifesaving equipment at this time.

The addition of a splash hood can help to prevent a lethal dose of water being inhaled during choppy weather from waves and spray.

Swim Failure will only lead to death if crew are not wearing an appropriate lifejacket (150N inshore, 275N outside sheltered water).
CROTCH STRAPS SAVE LIVES – ENSURE THEY ARE FITTED

STAGE 3 – INAPPROPRIATE CLOTHING – MORE THAN 30 MINUTES

If a rescue hasn't been affected by around 30 minutes, then heat loss begins to have the effect of reducing the body's core temperature. This is the stage where symptoms of hypothermia will begin to show i.e., dulling of consciousness.

Death from hypothermia, normally due to drowning or cardiac arrest, occurs on average up to 6 hours in 15°C water, reducing to potentially 1 hour in 5°C water. These times are for a lightly dressed 'typical male' and many factors including clothing, use of a lifejacket and differing body types will have an impact on survivability at this stage.

Wearing clothing with close fitting neck, ankles, and wrists will reduce skin contact with water and constant flushing through clothing and increase survivability.

STAGE 4 – POST RESCUE COLLAPSE

Up to 17% of cold-water immersion deaths occur just before, during or immediately after rescue. There are two primary causes.

1. Response of casualty to imminent rescue – possibly compounded by what is said to the casualty (see Irrational Casualty section)
2. Ongoing drowning
3. Collapse of arterial pressure on being lifted form the water vertically after a prolonged immersion or placed in a rescue craft with head above feet.

Death is far more likely due to drowning on initial immersion

3 STATES OF RECOVERY

Simply put, a casualty may be recovered to the deck in three states:

1) CONSCIOUS

- Check for injuries and treat them
- Keep them warm
  - Insulate all around the body including between them and the deck
- Keep under observation

2) UNCONSCIOUS AND BREATHING

- Keep them warm
  - Insulate all around the body including between them and the deck
- Maintain their airway
- Consider recovery position
- Keep under observation

3) CASUALTY UNCONSCIOUS BUT NOT BREATHING

- Commence Resuscitation.
  - Use Defibrillator if one is available, along with effective compressions and ventilations.
- Understand that depending on the mechanism that has led to cardiac arrest (e.g., drowning, or cold shock induced arrest), a defibrillator may not offer a shock.
  - In this case continue vigorous chest compressions and ventilations and await the defibrillator reassessing in 2 minutes.

HANDOVER & ATMIST CARD

Professional medical care may be accessed quicker in a harbour setting than if the recovery is made whilst escorting out of port limits, therefore any post rescue plan should be tailored to the operating profile of the vessel and its typical location.

Handing over the casualty to Emergency Services is a crucial stage in the rescue and can be done with the assistance of an **Age – Time – Mechanisms – Injury – Signs – Treatment (ATMIST),** handover card, which succinctly summarises the key information relating to the casualty.

The ATMIST handover is used by emergency medical services, coastguard, RNLI, and hospitals as it facilitates a rapid accurate handover of a potentially time critical patient.

An ATMIST card is not shown here but is available as part of the BTA's Flash Card System for Emergency Care and Handover, available via www.BritishTug.com.

AUTOMATIC EXTERNAL DEFIBRILLATORS (AEDS)

A defibrillator is a device that gives a high energy electric shock to the heart of someone who is in cardiac arrest. Cardiopulmonary Resuscitation (CPR) should be continued until the casualty regains consciousness, other people/teams takeover the resuscitation, ambulance service personnel or rescue teams instruct you to stop, or it is no longer safe for responders to continue resuscitation attempts. Stopping/starting CPR is not dependent on the presence of an AED.

Automatic External Defibrillators (AEDs) are present on many vessels.

MODERN AEDS HAVE SEVERAL MYTHS TO BUST:

1) AEDs **can** be used on a wet casualty – just expose and dry the chest area where the pads will be fitted
2) AEDs **can** be used on a metal deck
3) AEDs **will not** shock a casualty that has a normal heartbeat
4) AEDs **will not** shock a casualty without any heartbeat
5) AEDs **will no**t shock someone who should not be shocked

DEFIBRILLATOR LIMITATIONS

Operators should consider the suitability and type of the defibrillator on board. Through testing it has been found that many types of AED are sensitive to vibrations that may be found on a small vessel, i.e., engine vibration at certain revs or pitch.

AEDs have software with an inbuilt safety mechanism to prevent them from providing an electric shock should they sense such vibrations and may issue a false no-shock warning, or "motion detected" alarm.

Prior to purchase operators should enquire with manufacturers as to their testing and suitability in the marine environment.

When using an AED, if operators find the AED is alarming, they should consider changing engine revs/pitch, or moving the casualty to a better insulated position to reduce any external vibrations to a minimum.

To note, they are **not** impacted by wave motion.

LATER COMPLICATIONS OF THE DROWNING EVENT

Drowning can lead to a casualty who is conscious, unconscious, or apparently "dead" requiring CPR.

Drowning is defined as a process of experiencing respiratory impairment from submersion/immersion in a liquid medium. To delineate the incident's outcome, this is further divided into descriptive terms such as death, morbidity, and no morbidity. The volume of water required to enter the lungs is often not large, just 5ml taken deep into the lungs may be serious.

Later complications following drowning are likely to be akin to pneumonia and will start to become apparent up to 72 hours after the event, typically starting with a continuous annoying cough. In such an instance or should the casualty feel unwell in the days following an immersion, do not delay in seeking medical assistance.

POST RECOVERY TRAUMA & COUNSELLING

Unexpected rescues and resuscitations are potentially very traumatic events for the rescuers. They may experience psychological trauma and anguish following the rescue experience, particularly if the casualty is dead upon recovery or dies during post rescue support. This is a normal psychological response; it is also normal to have minimal psychological trauma following such events. Each persons' response may vary from incident to incident, and different people will have different responses.

Operators should ensure that all crew members have access to suitable support after the event. This may be through facilitated debriefs, and referral to external healthcare professionals if required. Psychological counselling is rarely required and can be harmful to the normal process of psychological recovery.

Equipment

There is not yet a single item or sophisticated piece of equipment that can solve all the various challenges of recovery of persons from the water. Simplicity and consistency are key. The industry needs to keep things simple and ideally standardised across the same vessels in a given organisational unit wherever possible.

To achieve this, requires several organisational departments to work together, this may include:

UK Conformity Mark for Marine Equipment

- Procurement is standardised by ensuring the specification of any supplied equipment conforms to the current approved mark (e.g., the 'wheel' or UKCA mark)
- Testing, validation, sign off data are maintained via the Planned Maintenance System (PMS) for company with valid certificates available on-board but not superseding visual inspections before each use of any part of the equipment
- Change management – effectively tracking decisions through the organisation bringing in upon implementation a fleet standardisation of the core parts of any PIW system.

Source: Solent Towage

SUITABILITY OF EQUIPMENT

It may seem simple, but operators must ensure the equipment is fit for purpose, maintained in accordance with manufacturer's instructions and replaced as and when required by design, regulation, or condition.

Whatever equipment is chosen for use, operators need be aware of its potential for failure and have suitable redundancy and back up.

All equipment should be approved for use on the flag of the vessel.

POSITIONING OF EQUIPMENT

All equipment shall be positioned ready for immediate use, in such a condition so to require the least amount of preparation.

READINESS OF EQUIPMENT

SOLAS, Chapter III, Regulation 20 - Operational Readiness, Maintenance, and Inspections, which applies to all vessel's states that all life-saving appliances shall be in working order and ready for immediate use.

DAVITS & CRANES

Depending on the device intended to be attached to the davit, operators should ensure the height and length are sufficient for the device to work effectively. Short davits will restrict the opening of a cradle, or similarly a person in a sling may not be able to be recovered fully to deck level.

Operators can use the main crane of the vessel but need to be aware that may not be always available.

Source: Boluda Towage & Solent Towage

TRANSOM LIFT OR RECOVERY PLATFORM

- Recovery platforms can be an extremely effective and a quick means to recover a casualty from the water.
- The platform can be deployed in around 5 seconds.
- A conscious and able casualty can pull themselves or the casualty can be 'floated' onto the platform with relative ease, particularly in combination with a rescue pole.
- A winch is operated to raise the platform to deck level, whereby the casualty can then be easily moved onto the deck.
- This type of recovery device is often fitted to the stern of pilot boats and high-speed launches.
- Fitting a recovery platform to the side of a vessel may be an option and would best be considered during the design phase of a new build.

Source: Williams Shipping

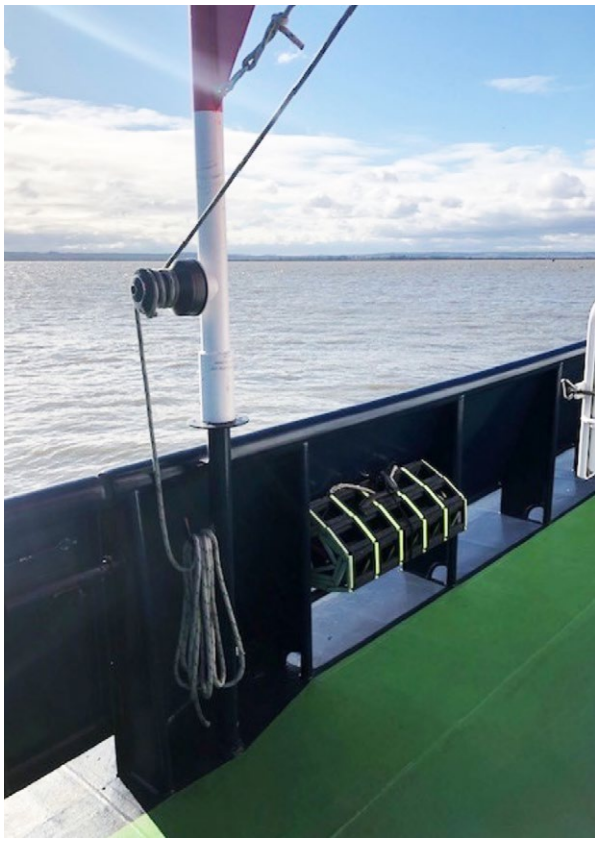
WINCHES

Winches should preferably be a manual self-tailing winch with sufficient mechanical advantage for single person recovery. When a manual winch is used the system should include a clutch to prevent an uncontrolled release of the line should it be let go.

Where an electrical winch has been selected it shall be operable on a primary mains and secondary emergency power and have a clutch to prevent uncontrolled release of the line.

Any winch should allow manual operation by hand and be designed for the marine environment.

To permit the interchanging of cradle and recovery strop that may be attached to a pole or sling on the davit, the cordage or wire used should terminate with a snap hook.



Source: Solent Towage & Boluda Towage

SAFETY AND SECURITY OF THE RESCUER(S)

The International Convention on Load Lines (1966), Regulation 25 [Protection of the Crew] stipulates that all exposed parts of the freeboard deck and of every superstructure deck shall be fitted at their perimeter with efficient guard rails or guard wires and stanchions or with bulwarks.

Rescuers should be mindful of the change in risk when an opening is made, compromising the completeness of the protection offered. In doing so, especially during inclement weather and sea conditions where vessel motion may well pose a significant risk, crew must consider additional barriers to prevent injury or further persons in water.

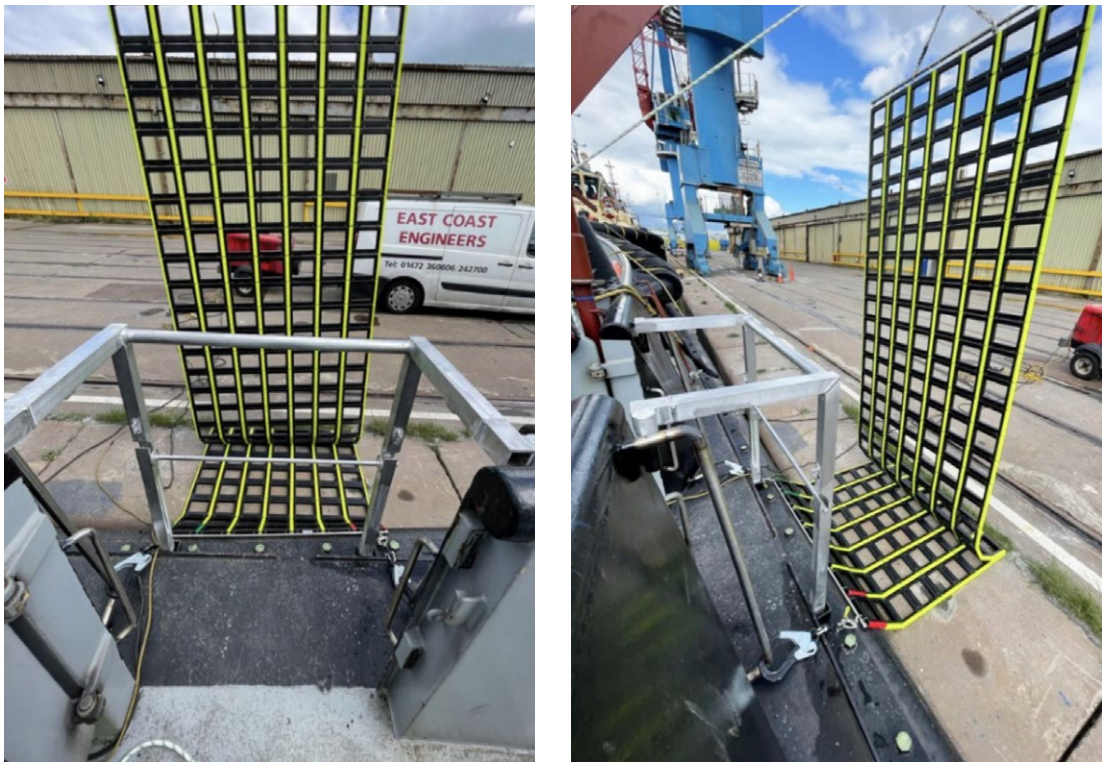
WAIST-BELT & TETHER

Where crew are required to work in or beside an open bulwark gate to effect a rescue they should be attached to the vessel by a waist-belt tether or similar, to a suitable tested anchor point.

Source: Solent Towage

JULIET BALCONIES

Where fendering and/or belting hinder the visibility of the casualty from the rescuer on deck, portable fittings that allow the rescuer to safely move outside the bulwark provide one solution to issue of vessel design.



Source: Svitzer

TESTING & MAINTENANCE OF RECOVERY EQUIPMENT, DAVITS, AND ASSOCIATED EQUIPMENT

Testing and maintenance of equipment should be in accordance with the Original Equipment Manufacturer (OEM) requirements. Items for specific, periodic replacement should be included in the vessel planned maintenance system.

USE OF CAMERAS & COMMUNICATIONS EQUIPMENT

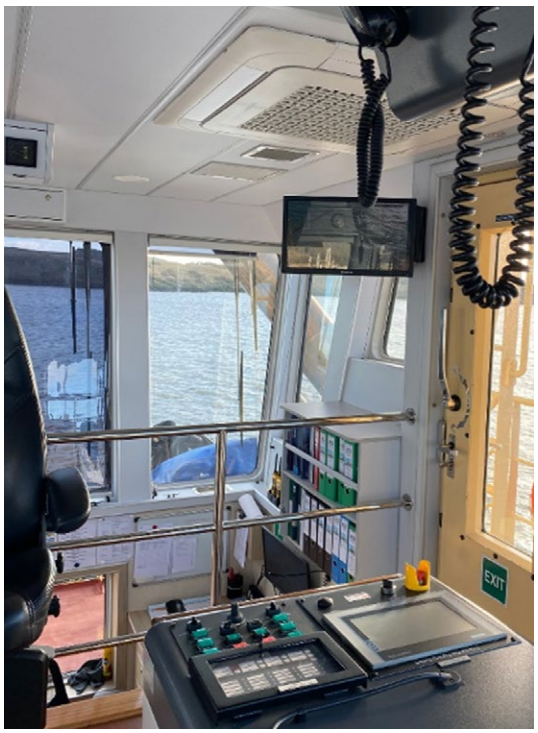
CLOSED CIRCUIT TELEVISION (CCTV)

Operators should consider the visibility of the vessels' external decks, and particularly the casualty recovery area from the bridge/conning position.

For a three-person crew, the individual at the controls will be the only person on the bridge. They will be dealing with manoeuvring the vessel and dealing with communications with third parties/emergency services.

The fitting of CCTV to include the casualty recovery area can greatly improve the efficiency of the recovery.

CCTV can also be effective for the Master to monitor crew movement when conducting self-mooring operations, where crew are required to move from / to an unmoored vessel.



Source: Targe Towing

THERMAL AND INFRA RED (IR) CAMERAS

Thermal / IR cameras are intended to highlight a heat source in the water to aide search and rescue. Operators should consider if the fitting of thermal / IR cameras would be reasonably practicable, i.e., is the reduction in risk justified.

Source: Williams Shipping

Whilst it could be considered unnecessary for general harbour towage vessels, it may be reasonable for crew transfer or pilot vessels considering the increased risk of a person overboard situation.

PERSONAL LOCATOR BEACONS (PLBS)

Personal Locator Beacons (PLBs) are devices which, when activated, send a signal to the relevant authorities alerting them that an individual needs assistance.

Like the use of thermal / IR cameras, operators should consider the reasonably practicality of fitting PLBs to crew members lifejackets. They may not be relevant in all settings but may offer an additional safety measure for crew who work in offshore areas where weather conditions are particularly poor, or where crew may work alone in remote parts of the vessel, or vessels of limited manning.

Where these are identified as a control measure, it is advantageous to ensure they are automatically activated.

RADIOS

Radios should be selected that are of good robust quality and designed to work in the marine environment.

The procurement of handsets of poor quality or not fit for purpose has the potential to disengage any crew, and lead to them not being used.

An efficient means of communication between the deck and bridge is a vital control in ensuring safe operations. It should be considered how radios will be used by a person attempting to recover a casualty alone, the market offers remote microphones and systems which can be combined with a safety helmet.

Radios should be equipped with a suitable means of securing to the person by, for example a waist belt and case.

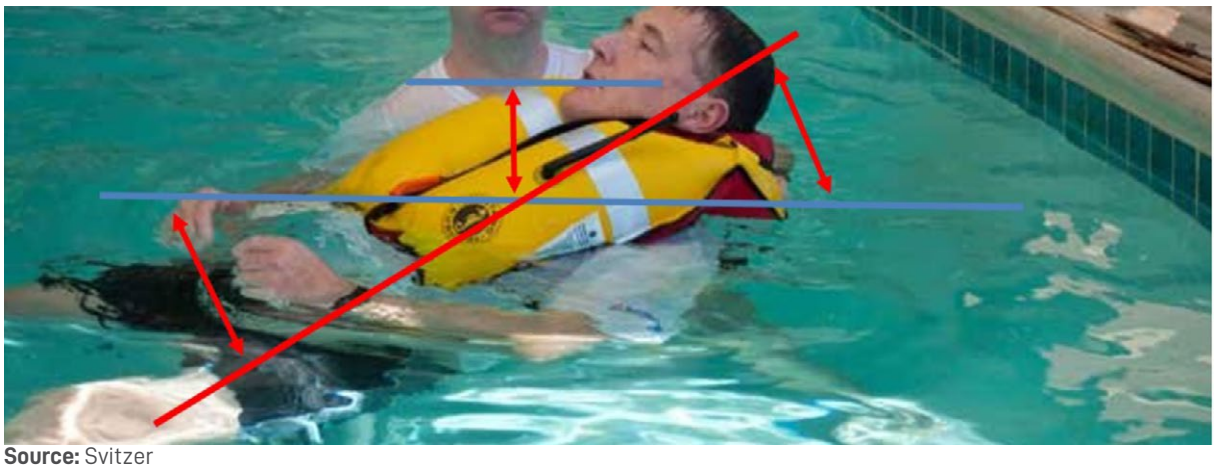
Operators should, through consultation with their work force, identify which system works best for the prevailing circumstances and conditions.

Operators should also consider back up arrangements such as talk back systems or agreed hand signals.

PERSONAL PROTECTIVE EQUIPMENT

LIFEJACKETS

The single most important piece of equipment to keep an individual alive is a correctly fitted lifejacket.



Source: Svitzer

Wearing a crotch strap on a correctly fitted lifejacket will further improve lifejacket performance. Crotch straps have various benefits:

- maximise the vertical distance between the water and airway
- keep casualty floating at an angle to reduce water inhalation
- prevents lifejacket from lifting over the casualty's head
- extends the time taken to inhale the lethal dose of water

SPRAY HOODS & LIGHTS

Lifejacket spray hoods greatly protect the wearer from water aspiration, and it is recommended spray hoods are fitted to every lifejacket, especially where the likelihood of immersion in rough seas is great. Properly designed spray hoods do not pose a health risk to the wearer and improve the chances of survival.

Spray hoods will not protect the wearer significantly during the initial stages of water immersion but are increasingly beneficial the longer the casualty is in the water. Spray hoods are manually donned which in cold water can be challenging where a casualty's ability may be diminished so they should be deployed early before any physical incapacitation.

A lifejacket light correctly fitted will greatly aid detection of the casualty and assist any rescuer in maintaining sight of the casualty, especially in the hours of darkness or in daylight

during periods of restricted visibility. Lifejacket lights normally activate automatically on contact with water and will remain operational for many hours. The effectiveness of even such a small light should not be underestimated when set against the backdrop of night and could be the only reference point to spot a person in the water.

CONSTANT WEAR, EXPOSURE, FLOTATION SUITS

A range of constant wear, exposure and flotation suits are available, that will provide a degree of thermal protection, and in some cases limited buoyancy. All suits should be worn in conjunction with a lifejacket.

The benefits of wearing a suit of these types are:

- to reduce the risk of cold shock and to delay the onset of hypothermia
- to make the user sufficiently conspicuous in the water to aid their recovery

Equipment & Crew considerations

The following section runs through the various considerations and limitations that operations should consider when determining a suitable recovery system for persons in the water.

FACTOR	EFFECT
Wind **Waves** **Swell** **Tide** **Wind Over Tide**	• Reduced visibility of the casualty due to wave/swell height • Movement of vessel affecting its precise positioning • Difficulty in launching rescue boat (where carried)/off-load release hook activation • Difficulty in holding position when using a /recovery cradle/scoop • Ideally de-clutching the propulsion unit on the PIW side. - Consider how in poor conditions this will affect holding position and change risk of making contact with casualty in water. • Casualty will be taken with wind/tide, causing the casualty to be lost from sight faster if direct line of sight is lost. • Waves interacting with the vessel's side, deflecting casualty away from rescue area • Damage to cradle from snatching weight on/off fittings whilst trying to recover casualty • Lee side approach to the casualty to shield them from prevailing conditions
Tide/Speed through water (STW)	• Vessel manoeuvring ability in tidal conditions. Nature of design makes some vessel types easier to position and keep station • Excessive STW hazards for rescue boat launch/recovery • Excessive STW affects performance of cradles and scoop causing them to float or skim across the surface rather than submerging • Excessive STW affects ability of rescuer manoeuvre the strop around the casualty
Propulsion & Thrusters	• Depending on type of propulsion, can you de-clutch/shutdown and restart with ease? • Possible dangers of position of crane/davit/cradle in relation to position of propulsion units • Difficulty in station keeping depending on vessel type • Visibility and noise level on working deck dependant on location of propulsion units • Ability to precisely control vessel with one unit failure or declutched
Poor Maintenance	• If the Planned Maintenance System (PMS) is poor then recovery systems could fail when needed • Failure of equipment due to rust/corrosion/seizing etc. • Failure of a mechanical part (e.g., hydraulic hose) • Equipment incorrectly stowed post maintenance, not ready for immediate use • Poor maintenance of associated fittings such as lugs, steps, or handholds

Sunlight/UV	• UV light can affect quality of rope/line used in rescue equipment possibly causing failure. • UV light can damage reflectiveness of lifebuoys and similar if left exposed without maintenance • Sunlight/glare/night light backscatter could blind master/person manoeuvring the vessel and hinder vision for lookouts trying to maintain a line of vision with casualty • Are sunglasses readily available on the bridge? • Do the bridge windows have blinds fitted?
Hull Form **Freeboard** **Reach**	• How to get PIW from waterline to the deck if there is considerable freeboard or fendering • Casualty lost under fendering consequently out of sight and at risk of contact or being run over • Consider the casualty may be in shock and having a large high sided vessel coming very close may be extremely traumatic • Large reach on recovery equipment prevents the need to manoeuvre the vessel in close proximity of the casualty. • Min/max freeboard – equipment must be designed to cope with full range of the vessel's hull form • Can crew reach recovered casualty without stepping outside bulwark? – Best Practice if so • Non-slip deck coating in recovery area • If recovering stern-to the prevailing weather, what are the risks if aft deck awash? • Does the bridge window design give full view of deck?
Davit System **& positioning** **on Bulwark or Bulkhead**	• Dependant on vessel size / design • Aim to position for optimal access and view when deployed • Bulkhead typically offers permanent mounting, bulwark typically means portable due to obstruction • Portable provides greater flexibility but means longer time / more personnel to rig • Potential for some parts of system not being found if portable and stowed elsewhere
Asymmetrical **Design/Davit** **System/Positioning**	• If the davit system is one sided, the vessel may not be able to conduct casualty rescue alongside berth or quay. • If the side of the vessel which has all PIW recovery capabilities is the same side used for a side-by-side tow or combined operations, then a recovery would be severely hindered

Line of sight **Cameras** **Communications**	• Consider use of infra-red cameras? • Cameras must be correctly located and directionally facing • Bridge monitor(s) should be correctly located so master/person manoeuvring the vessel can see without diverting eyes from the overall operation underway • Over reliance on cameras in drills could result in difficulty when in real world scenario of heavy rain and reduced visibility. • Cameras may be dirty and not usable in a real scenario. Is there sufficient light in hours of darkness? • Radios can run out of battery – back up communications needed in PIW recovery areas. Radio microphone can get wet and cause muffled communications • Designated radios waterproof, kept ready and charged • Rescue zone should be visible from bridge • Crew/equipment visible from bridge to monitor safety of operation • Blind sectors – identify and develop solutions • Training – practice approach to a casualty from different angles and in differing weather • Maintain visual of casualty throughout
Lighting	• Ensure sufficient well positioned bright lighting on deck for effective recovery • Loss of night vision due to excessive deck lighting • Backscatter of deck lights could blind master/person manoeuvring the vessel and hinder vision for lookouts trying to maintain a line of vision with casualty • Illumination of sea spray or rain affecting vision • Master/person manoeuvring the vessel ability to operate searchlight from the conning position • Provision of high intensity torches at rescue zone • If casualty is wearing a substandard lifejacket with no or poor light, then they will be much harder to see when in the water at night. • Reliance on retro-tape on jacket or clothing
Crew Numbers & Capabilities	• For a crew of three, with one person in the water, only one crewmember to engage recovery equipment whilst the third person manoeuvres, whilst maintaining line of sight vision of the casualty. • Consider third party assistance, additional assistance may increase likelihood of success but additional time in water increases risk to PIW. • Safe Manning Level may vary according to change in area of operation – is the equipment still suitable? • Challenges may be due to size, height, and fitness of crewmembers
PLBs / EPIRBs	• Are they fitted to lifejackets and PFDs? • Type – (AIS & Frequency). AIS range limit 5nm • 121.5 / 406 visible to shipping? • Incorrectly rigged so not self-activating • Incorrectly set up so no DSC alert to mother station • Poor maintenance

Geographic considerations

The success of a PIW recovery operation may depend on the geographic location of the incident. Operators should consider their location when assessing how to best recover a casualty.

In port, estuary, and other categorised water locations there may be other resources such as pilot vessels, harbour launches, vessels belonging to port operators and contract utility vessels. There may be an inshore lifeboat, or marine police or alternative vessel rescue/recovery operator in the area.

It may be that a smaller vessel or daughter craft, adequately manned and equipped, would be a more suitable and safer platform from which to recover a casualty - weather conditions permitting.

All the above, except for the lifeboat, will be operating on a common working VHF channel for the area. The lifeboat and marine police unit can be raised via the Coastguard on VHF Ch 16 or by dialling 999. Operators of small craft should also keep a note of the phone numbers of any local rescue/recovery company and other local vessel operators.

In a more remote or offshore location the above services may not all be available.

A master facing a person in water situation must alert the Coastguard in the first instance who will in turn initiate a response via lifeboat and, depending on location, SAR helicopter. Subsequent GMDSS transmissions by the vessel and the Coastguard will also alert any other traffic to assist.

Demonstrating competency – Drills, Familiarisation and Training

We live in an imperfect world where things go wrong, whilst operators, their crews and industry should work together to reduce the risk of a person going overboard to as low as reasonably practicable, every crew member shall be capable of recovering a casualty to the deck of their vessel in a safe and efficient manner. A fundamental part of ensuring such is on-board drills, familiarisation, and training. A dark and stormy winter night, with limited visibility is unlikely to lend itself well to the perfect recovery. Realistic drills and preparation are strongly recommended in a variety of climatic and operational scenarios.

Strong value may be found in tabletop exercises and talking through scenarios, although these do not qualify as drills.

The requirements for drills and training are covered in all four International Maritime Organization (IMO) Conventions and in the MCA's Code of Safe Working Practices (COSWP) and should be captured in an operators' Safety Management System. Drills and training are vital in ensuring crew are adequately prepared to respond in an emergency. In high pressure situations it is well recognised people do not rise to expectations but rather fall back on their level of their training.

Training should start as part of the on-board familiarisation process, ensuring new joiners are instructed in their vessel's specific equipment, any differences, and any limitations.

Whenever there is a new joiner, particular effort should be taken to familiarise them with the arrangements of the vessel. This is paramount for all members of the crew, not just deck personnel.

It shouldn't be considered just for new recruits or recent joiners to the company, but also experienced or long-serving crewmembers who haven't been on the vessel before or for an extended period.

Whilst standardisation across vessels may be the intention or assumed, it has often been found that sister vessels have differing arrangements and stow equipment in different locations on board. A misplaced winch-handle can be critical in an emergency.

SOLAS Chapter III Regulation 19 Emergency training and drills requires that drills shall, so far as practicable, be conducted as if there were an actual emergency on-board. This is echoed by the Code of Safe Working Practices. It's important that when operators conducting on-board drills that a clear distinction is kept between drills and maintenance, and they do not become merged.

Rigging and swinging out the equipment is not sufficient.

PIW drills, particularly on small vessels should, as much as possible, include the vessel leaving berth and the use of a rescue manikin. Alongside recovery, as evidenced by the case study in Appendix 3, are equally important to drill.

Operators should consider the scope of the drill; it should be conducted as if one of the vessel's crew are in the water. For harbour towage vessels which are predominantly crewed with three people, this means the drill should be conducted with one person completing the on-deck retrieval, and the other manoeuvring the vessel. The third person should observe and ensure the crew member conducting the rescue remains safe.

It is important to drill across work schedules and rotas so all crew members are involved.

Switch roles between crew members, it is vital all are competent in using the equipment.

Do not let the drill end when the casualty is retrieved back on the deck, consider what first aid should be provided to the individual, and how they will be evacuated ashore, returning to the vessels usual berth may not be the most effective means of evacuating the casualty. Its good practice where possible to involve third parties, for example the RNLI or Coastguard, in vessel drills, particularly where vessels regularly work in the same areas. In some instances, the RNLI have volunteered to provide use of live persons for recovery from water, although this should only be undertaken following a full risk assessment.

Putting crew in the water for live person recovery is not recommended.

DEBRIEFS

The drill process should include a debrief. Any points arising should be noted for future drills and considered for circulation to other company vessels as best practice. If possible and considered of merit, a drill could be recorded for review in the debrief to analyse what may have gone well or could be improved.

TRAINING & INSTRUCTION MANUAL

The SOLAS training and instruction manual should be onboard and updated for the specific lifesaving equipment carried. Operating instructions shall be available for recovery of persons from the water life-saving equipment at the point of use. Vessels over 500gt are required to have a Person in Water (PIW) Recovery Plan.

Appendix 2 shows the joint British Tugowners Association and Workboat Association Person in Water Poster created in 2021 which asks key questions to answer when carrying out drills.

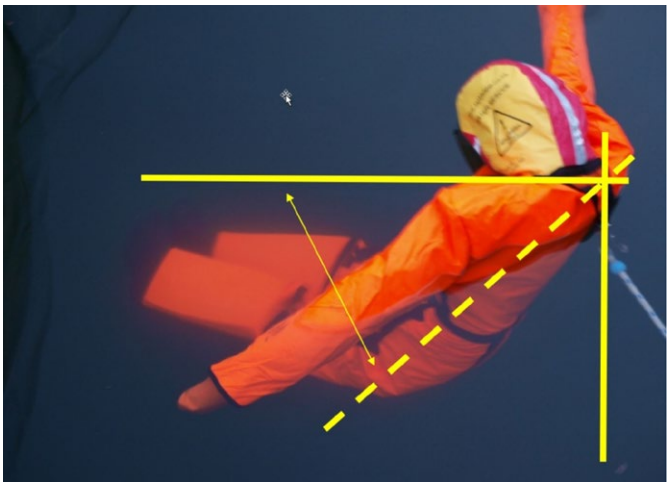
RESCUE MANIKINS

The average dry weight of a rescue manikin is approximately 40kg (Adult). This increases to approximately 65kg in weight when soaked through from water. It is recommended that manikins are left in the water for some time prior to retrieval to allow saturation and weight increase to make more realistic weight. A realistic weight ensures proper decision making but also introduces the possibility of injury. Therefore, there is a need for risk assessment and manual handling training as necessary.

When procuring new rescue manikins, it is important to source a good quality manikin that has been designed and manufactured to allow flexibility in the water but prevent the manikin from bending in half when using recovery devices such as cradles.

Rescue manikins are designed to allow water to ingress during use and should be drained after use for longevity. To aid this process, it is recommended that the manikins are hung up and that the wellington boots are removed. Care and maintenance guidance provided by the supplier and/or manufacturer must be followed.

It is essential that all rescue manikins can float at various angles. Mankins should float horizontally, vertically or at 45 degrees, to simulate a conscious or unconscious casualty. This can be achieved in some cases by redistributing foam pieces within the overalls or by the addition of weights.



Source: Svitzer

LIFEJACKETS ON MANIKINS

Lifejackets can affect the angles at which a manikin lies and affect how they behave in water. Drills should include a combination of scenarios with manikins with or without lifejackets. This exposes crews to the issues and complications that may arise when recovering a casualty. Lifejackets should be inflated during such drills to demonstrate the challenges of retrieval and their potential cumbersome nature.

Appendixes

APPENDIX 1
PERSON IN WATER – MODE OF OPERATION

Prepared / PPE wearer		Unprepared / Non-PPE wearer	
Casualty incapable of assisting themselves	Casualty capable of assisting themselves	Casualty capable of assisting themselves	Casualty incapable of assisting themselves

1 Making a Connection to the casualty

- Lifebuoys with buoy line [SOLAS Ch.III,R7]
- Crook or Recue Sling
- Alternative throwing device

2 Getting the casualty under control

- Lifebuoys with buoy line [SOLAS Ch.III,R7]
- Crook or Rescue Sling
- Ladder / Liferaft
- Recovery Cradle & Net

3 Recovery of the casualty to the deck

- Recovery Cradle and Scoops
- Rescue Sling
- Scramble Net
- Ladder

4 Medical care and post rescue suport on board

APPENDIX 2
BTA / WA PIW SAFETY CAMPAIGN 2021 POSTER

MAN OVERBOARD

ARE YOU READY FOR THE UNEXPECTED?

Are you ready?

Monthly practical MOB drills should be conducted with all crew, don't forget back to backs or relief crew.

Make sure all crew can perform all roles from manoeuvring the vessel to operating the MOB equipment.

Are your drills realistic?

Drills should simulate the actual emergency as close as possible, including the use of a realistic mannequin.

Are you efficient?

Cold water shock can kill, and time is of the essence, ensure your recovery is quick and efficient.

Is the equipment suitable?

MOB equipment should be suitable for the likely conditions and operable by the minimum crew, considering one person overboard.

BTA wa The Workboat Association

APPENDIX 3
INCIDENT & NEAR MISS CASE STUDIES

1) MAIB SAFETY DIGEST 2/2021 CASE 13

Summary

A tug was berthed outboard a sister vessel and the crew had joined by gangway for the evening duty. The tug was required to get underway for a towing task. As the crew were self-unberthing the mate lent over the bulwark to return a standing line to the inboard tug. In leaning outboard, the mate over-extended himself in such a way as to cause him to become unbalanced and fall overboard into the water between the two tugs. The MOB alarm was shouted verbally to the bridge (not heard by the Master). AB 1 deployed a line to the casualty and established verbal communication with them. AB 2 fetched embarkation ladder from deck locker. The ladder was rigged, and the casualty was recovered to deck in 2 minutes and 11 seconds.

Conclusion

The primary root cause was identified as the casualty circumventing a safety barrier and specifically failing to recognise a hazard. Further training was not considered necessary but by sharing the incident with colleagues was deemed to be the best way to achieve the desired learning outcome.

Means of recovery

The tug carries a rescue boat which secures/launches on the port side. As the tug was secured port side to it could not be launched. Matesaver type poles/equipment were not carried, and no scramble nets were presently carried onboard. The perceived assumption is that MOB incidents 'usually' occur off berth or underway although recent reports have called this into question. This incident occurred during the evening in the dark and there was no nearby craft or jetty support available. The tug carries a liferaft which could have been deployed but this had not been considered during drills. The embarkation ladder recovery worked well but fortunately the casualty was conscious and relatively unharmed.

The company are continuing to examine equipment for recovery of persons from water.

2) MOB NEAR MISS REPORT

The vessel hand completed the berthing/line running of the assisted vessel at the terminal. The vessel had returned to her berth and was securely moored at 0130. The AB was climbing the access ladder, when approximately halfway up the ladder, they slipped and fell. They fell between the launch and barge and completely entered the water.

The AB's lifejacket automatically inflated and PLB automatically activated. The AB was recovered to the deck of the vessel by the Launch Coxswain uninjured.

The individual was wearing the following PPE, consisting of:

- hard hat
- clear safety glasses
- deck boilersuit (without coat)
- gloves
- safety boots (approximately 1 month old).

Possible cause(s):

- The incident occurred at 0135. Surfaces were wet from rain earlier in the evening
- Steaming of safety glasses may have limited visibility
- Gloves were wet from line handling operation
- Rung on ladder may have been slippery
- Movement of vessel from passing wash
- Insufficient lighting of access point?

Key notes to the recovery:

- Donning of the lifejacket could have been better, loose crotch strap caused the lifejacket to be pulled above the head of the individual, while also becoming a hindrance in the 'confined space' between vessel and barge.
- At one point during the rescue the use of a knife was evaluated for deflating the lifejacket to get it quickly to reduce in size and bulkiness. This action was not taken, and the individual was recovered successfully.
- The importance of being observed. During the hours of darkness, it is crucial that two persons work together, when there are limited surrounding activities ongoing.

3) CREW TRANSFER PIW RECOVERY

The fast launch/pilot vessel was doing a crew transfer to the Nab Tower outside the Solent. Freeboard of around 8m. Three on-signers. One off. The PIW was the captain of the tanker. The weather was fine with good visibility. Wind SW 2-3 with approx. 0.5m swell.

The captain was the second man to board. He climbed about three quarters of the way up the pilot ladder and could not go any further. A combination (pilot ladder and accommodation ladder together) boarding arrangement had been rigged. He was a few feet from the accommodation ladder.

The PIW was wearing a self-inflating lifejacket fitted with a PLB given to him by the launch's crew. The lifejacket inflated and the PLB was activated.

The Mate Saver was used to pull the casualty alongside the launch. The PIW equipment was set up (Jason's Cradle, davit with winch). This was used to successfully recover the casualty onto the deck of launch. He was recovered in 10-15 minutes of falling into the water.

The PIW had no injuries and displayed signs of shock nor required further treatment.

Key notes to the recovery:

- Lifejacket with PLB used
- PLB activated allowing vessel master to easily locate casualty
- Required two personnel to use winch to recover to deck edge
- May require an adjustment to the ship's boarding arrangement which can be discussed via VHF radio.
- Risk assessment for crew transfer at sea needs close communication with vessel being attended

NOTES