ACCIDENT REPORT

Report on the investigation of

a serious injury to a passenger on the sea safari rigid inflatable boat

Lundy Explorer

at Ilfracombe, England

on 7 June 2023

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SERIOUS MARINE CASUALTY REPORT NO 11/2025 AUGUST 2025

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

All MAIB publications can be found on our website: www.gov.uk/maib

For all enquiries:

Marine Accident Investigation Branch
First Floor, Spring Place
105 Commercial Road
Southampton
SO15 1GH
United Kingdom

Email: maib@dft.gov.uk
Telephone: +44 (0)23 8039 5500

Press enquiries during office hours: +44 (0)19 3244 0015
Press enquiries out of hours: +44 (0)30 0777 7878

CONTENTS

FIGURES

ANNEXES

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

g	-	gravitational force
hp	-	horsepower
HSPV Voluntary CoP	-	commonly used short form descriptor for the *Passenger Safety on Small Commercial High Speed Craft & Experience Rides – A Voluntary Code of Practice*
kg	-	kilogram
kts	-	knots
kW	-	kilowatt
m	-	metre
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MGN 280 (M)	-	Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards
MGN 436 (M+F)	-	Whole Body Vibration: Guidance on Mitigating Against the Effects of Shocks and Impacts on Small Vessels (Amendment 2)
PBA	-	Passenger Boat Association
RCR	-	The Recreational Craft Regulations 2017
RIB	-	rigid inflatable boat
RNLI	-	Royal National Lifeboat Institution
RS	-	repeated shock
RYA	-	Royal Yachting Association
SCV Code	-	Small Commercial Vessel and Pilot Boat Code, as annexed to MGN 280 (M)
SPV Code	-	The Code of Practice for the Safety of Small Vessels in Commercial Use for Sport or Pleasure (The Sport or Pleasure Vessel Code)
SMS	-	safety management system
UTC	-	universal time coordinated
WBV	-	whole-body vibration
YDSA	-	Yacht Designers and Surveyors Association Limited

TIMES: all times used in this report are UTC +1 unless otherwise stated.

Lundy Explorer

SYNOPSIS

On 7 June 2023, the rigid inflatable boat *Lundy Explorer* departed Ilfracombe Harbour for a sea safari trip. While leaving the harbour the boat encountered a high wave, which caused it to slam into an oncoming wave. A passenger sat in a jockey seat in the front of the boat where the highest shock loads were experienced was dislodged from her seat, resulting in a fracture of her spinal column and permanent paralysis. The investigation found that:

- The local weather conditions had deteriorated quickly and this resulted in choppy seas and increased wave heights that *Lundy Explorer*'s skipper had not expected.

- The position of the jockey seats at the front of the boat were unsuitable for single occupancy as they exposed passengers to high shock load as the boat slammed into the waves.

- The pre-departure safety briefing did not include adequate instruction on the use of the seats and the passengers were unaware of the risks.

The owner of *Lundy Explorer*, Ilfracombe Sea Safari Limited, has restricted the use of the front jockey seats except in benign conditions. The company has been recommended to improve operating procedures and risk assessments through the implementation of a safety management system. The company has also been recommended to install real-time measuring equipment to its RIBs to enable the person at the helm to protect passengers and crew from the effects of vibration and shocks during excursions.

The Maritime and Coastguard Agency has been recommended to: extend the anthropometric study (previously recommended in MAIB's *Seadogz* report) to include the effect of forces experienced in the front section of high-speed boats; and, to include in the forthcoming The Code of Practice for the Safety of Small Vessels in Commercial Use for Sport or Pleasure (The Sport or Pleasure Vessel Code) a requirement for operators to assess and mitigate the risks of seating people in the front third of a high-speed boat.

The Royal Yachting Association, British Marine, and the Professional Charter Association have been recommended to promulgate this report to their members.

SECTION 1 – FACTUAL INFORMATION

1.1 PARTICULARS OF *LUNDY EXPLORER* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Lundy Explorer*
Flag	UK
Certifying authority	Yacht Designers and Surveyors Association Limited
IMO number/fishing numbers	Not applicable
Type	Rigid inflatable boat
Owner and operator	Ilfracombe Sea Safari Limited
Construction	Glass reinforced plastic hull with rubber inflatable tubes
Year of build	2020
Length overall	11m
Gross tonnage	Not applicable
Minimum safe manning	Not applicable
Authorised cargo	Passengers

VOYAGE PARTICULARS	
Port of departure	Ilfracombe, Devon, England
Port of arrival	Ilfracombe, Devon, England
Type of voyage	Commercial
Cargo information	Not applicable
Manning	2

MARINE CASUALTY INFORMATION	
Date and time	7 June 2023 at 1211
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Ilfracombe, Devon, England
Place on board	Forward seats
Injuries/fatalities	3 injuries, 1 serious
Damage/environmental impact	None
Ship operation	On passage
Voyage segment	Departure
External & internal environment	Wind easterly force 4. Clear skies, good visibility. Low swell.
Persons on board	14

1.2 NARRATIVE

At 1201 on 7 June 2023, the 11m rigid inflatable boat (RIB) *Lundy Explorer* berthed alongside the pier at Ilfracombe Harbour, Devon, England to disembark passengers after a 2-hour trip **(Figure 1)**. Waiting at the pier landing stages were the owner of the RIB company and 12 new passengers who had booked a 1-hour trip to see wildlife along the coast.

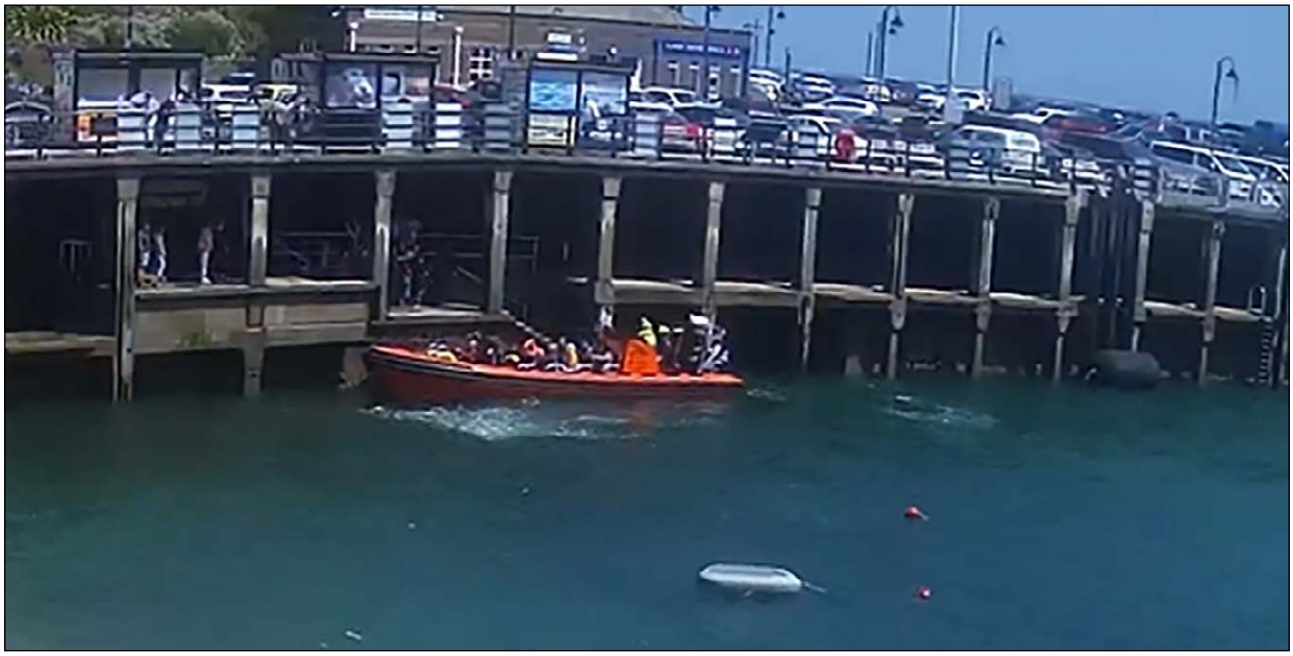


Figure 1: *Lundy Explorer* at pier landing stages about to disembark passengers

Once the passengers had disembarked, one of the company's owners guided the next group of 12 adult passengers and one dog on board. The first two passengers initially sat on a bench seat but were told by the deckhand to fill the RIB's seats from forward. The passengers went forward and sat together on the port jockey seat. The deckhand advised that they could each sit on a jockey seat so one passenger sat on the port side and the other on the starboard side **(Figure 2)**. The remaining passengers sat on the bench seats. Once all were on board, the deckhand gave a safety briefing and instructed the passengers on how to wear the personal flotation devices provided and what actions to take in an emergency. The passengers were also advised to hold on as the conditions would be bumpy in the harbour entrance, but would improve once the RIB was clear of the harbour.

Figure 2: *Lundy Explorer* seating arrangement

At 1205, *Lundy Explorer* departed and met *Voyager*, another of the company's RIBs that had developed an engine fault minutes earlier and was waiting in the harbour. *Lundy Explorer* went alongside *Voyager* and the two skippers swapped RIBs. At 1209, *Lundy Explorer* headed out of the harbour **(Figure 3)** at about 4 knots (kts).

As *Lundy Explorer* rounded the pier to head into open water, the RIB pitched moderately **(Figure 4)**; the skipper considered this to be normal and expected the RIB's movement to ease once it was clear of the harbour. The passengers, some of whom had been on previous trips, were initially unconcerned and considered the movement to be typical in the conditions.

The heights of the waves increased, and the RIB's pitching worsened as *Lundy Explorer* headed north-east **(Figure 5)**. The skipper, who was surprised at the height of the waves, adjusted the RIB's speed to minimise pitching and attempt to keep the passengers dry. Some of the passengers became anxious as *Lundy Explorer* pitched more intensely. Anticipating calmer waters beyond the harbour, the skipper shouted that the passengers should make it known if they wanted to go faster.

At about 1211, *Lundy Explorer* encountered two high waves while still below planing speed[1]. The skipper had been easing the engine's throttles as the bow reached a wave crest, then increasing the throttle as it descended. After a third high wave the bow landed on the water with force, bringing the RIB to a sudden stop. All the passengers were thrown forward and the passenger on the port side jockey seat fell off to the port side. The passenger on the starboard jockey seat struck their face heavily on the handhold in front of them. On the front bench seat, the passenger on the port side was badly jarred and winded and the passenger in the middle was shocked.

Image courtesy of Airbus (2025)

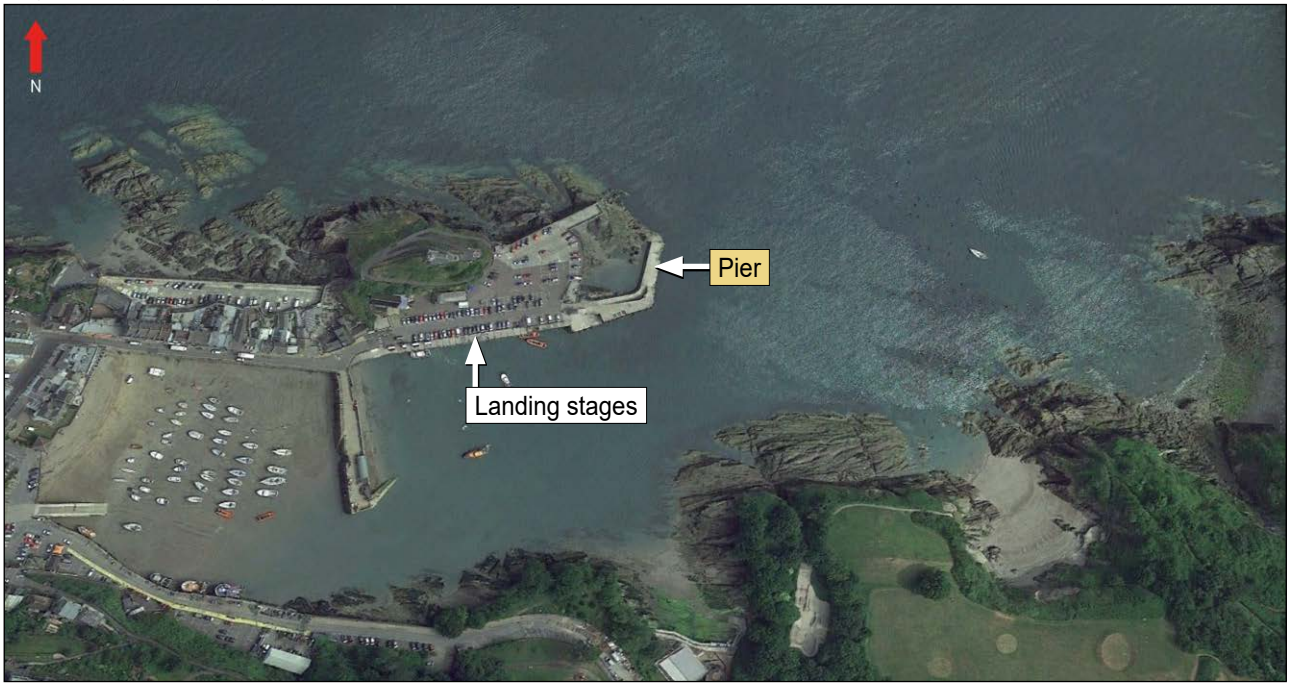


Figure 3: Ilfracombe Harbour

[1] Occurs when hydrodynamic lift takes effect and a boat moves quickly across the water, just touching the surface. *Lundy Explorer*'s planing speed was about 18kts.

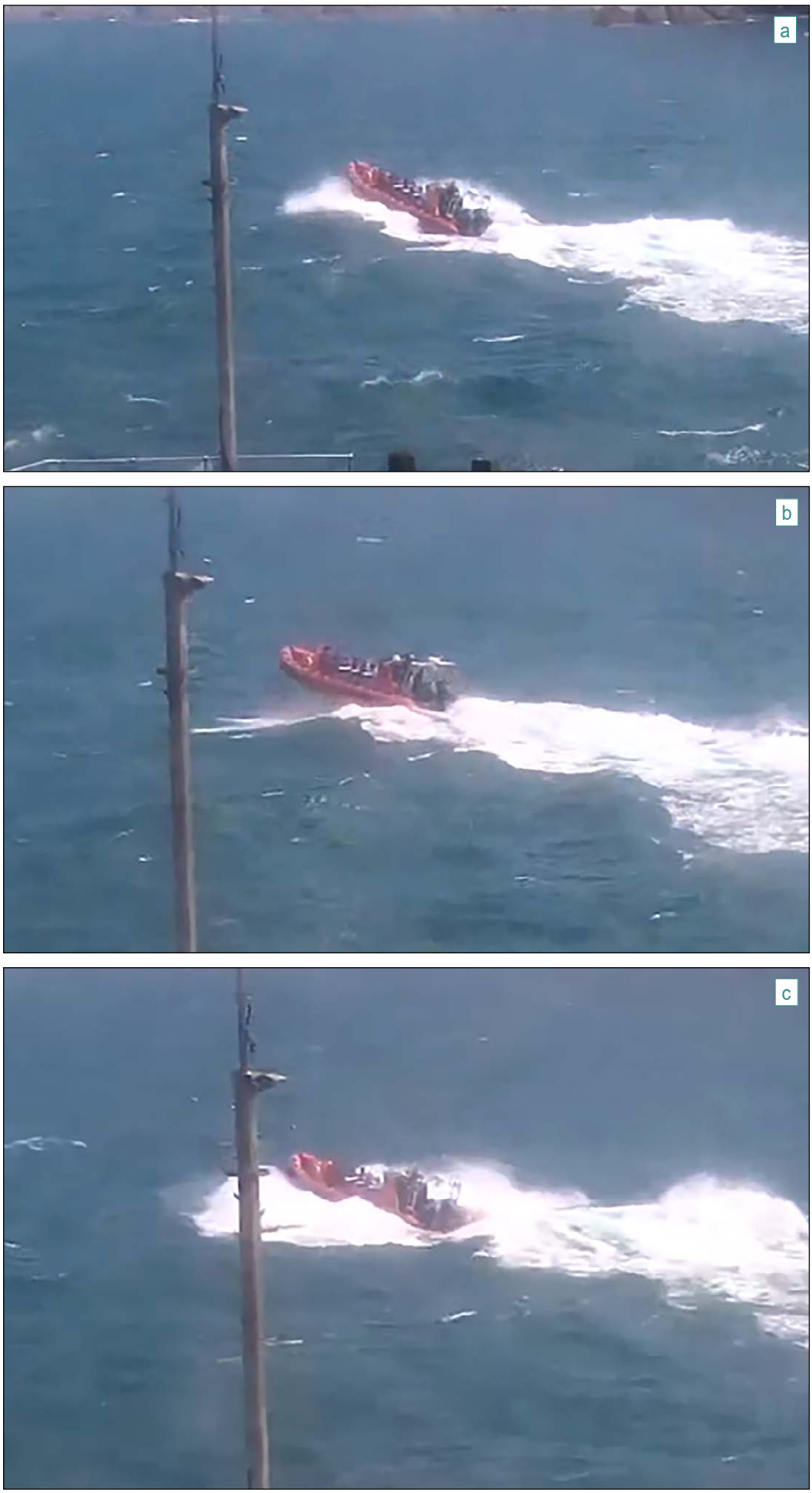


Figure 4: *Lundy Explorer* pitching as it heads out from the harbour

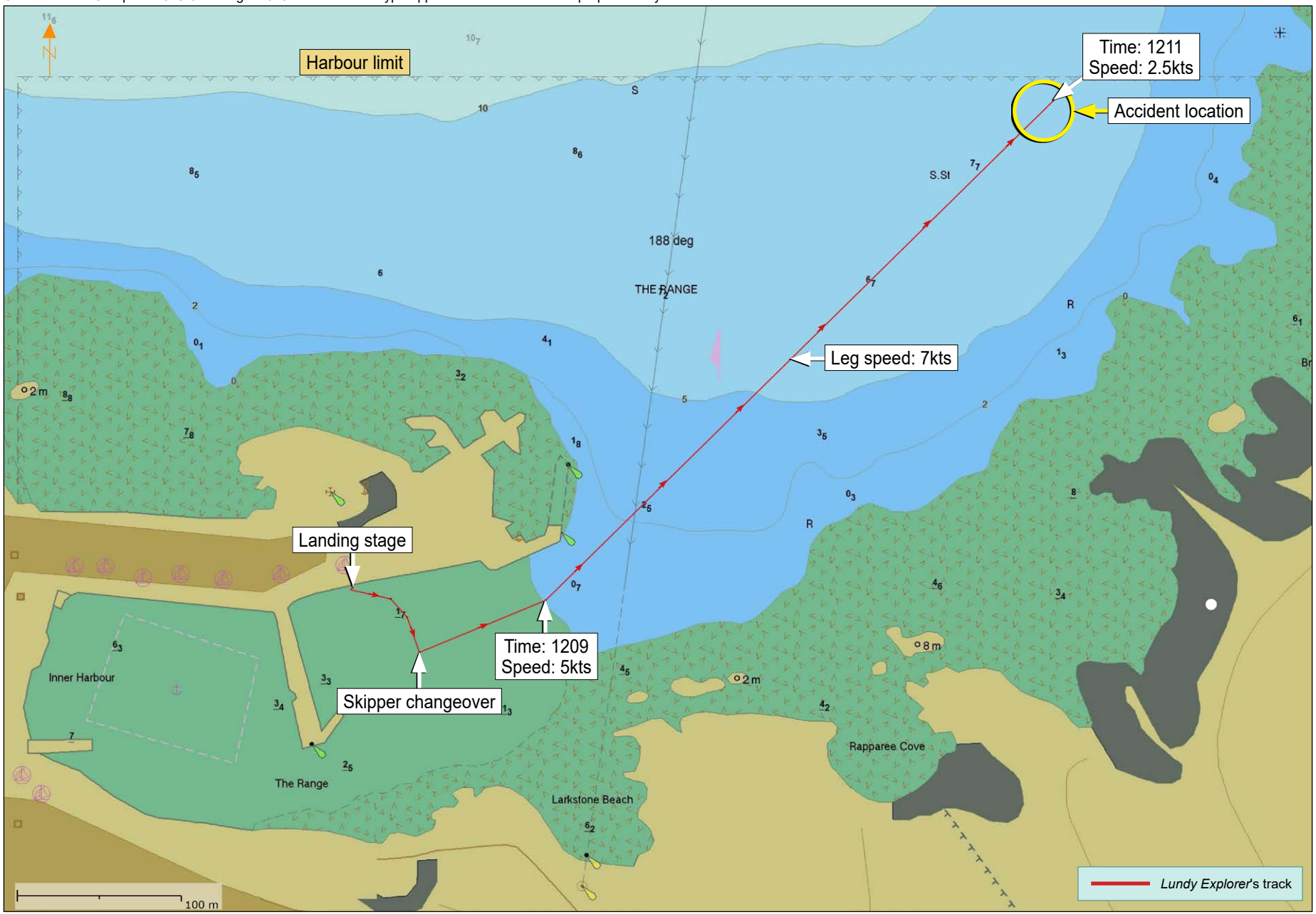


Figure 5: *Lundy Explorer's* position and general track rounding the pier to the accident location

Two passengers immediately raised their arms to notify the skipper that there was a problem. A passenger on the aft bench seat shouted to the skipper that someone had fallen off. The dislodged passenger was wedged between the jockey seat pedestal and the RIB's sponson, in a twisted position with her right leg over the seat **(Figure 6)**. The deckhand attended to the dislodged passenger, who said that she could not feel her legs. The deckhand was concerned that the casualty's position was unsafe and moved her right leg from the seat. The deckhand then attended to the two injured passengers on the bench seat.

Figure 6: Reconstruction of the casualty's position after falling from the jockey seat

The skipper turned the RIB as soon as the wave action allowed and headed back to the pier. The skipper used their mobile phone to call the owner, but received no reply. By 1216, *Lundy Explorer* was moored alongside the pier landing stage. A few seconds later, the owner walked down the steps to the RIB, having seen the boat return and realised there was a problem.

The skipper told the owner what had happened, then the owner helped disembark all the passengers except for the injured passenger on the port side jockey seat, who could not move. The owner was concerned that the RIB's movement in the wave action at the landing stage was detrimental to the situation with the casualty, and that the falling tide would hinder future recovery. The owner and skipper then carried the casualty ashore, and placed her on a stool brought from the pier above. At 1227, the casualty's sister, worried by the situation, called an ambulance.

Someone at the scene had at some point alerted a member of the local Royal National Lifeboat Institution (RNLI), who dispatched a casualty care team. At 1304, the casualty care team alerted the coastguard that it was responding. At 1311, the coastguard tasked the local coast rescue team. Four minutes later, the ambulance service called for more details and advised that an ambulance had not yet been dispatched. At around the same time, the RNLI casualty care team placed the

casualty on a stretcher. At 1342, the team was advised that an air ambulance helicopter was on its way. Eight minutes later, the helicopter landed on the nearby beach. The casualty care team moved the casualty to the main pier for better access. Once the helicopter had landed, its paramedic attended the casualty.

By 1420, an ambulance had arrived, and the casualty was transferred on board. Meanwhile, the helicopter had moved to a safe transfer area at a local rugby club. The casualty was transferred from the ambulance into the helicopter and flown 55 miles to a hospital in Plymouth, Devon, arriving at 1600.

Lundy Explorer's on board equipment recorded that the RIB was making an average speed over the ground of approximately 7kts between 1209 and 1211, just before the accident **(**see **Figure 5)**.

1.3 ENVIRONMENTAL CONDITIONS

The Ilfracombe Harbour Office monitoring station reported that the wind speed was 12kts to 15kts from the east with a significant wave height[2] of 1m from the south-west. The low spring tide was ebbing, with low water at 1501. Tidal stream rates could reach 2kts to 3kts on spring tides.

1.3.1 Ilfracombe Harbour

Ilfracombe Harbour's coastline is bounded by cliffs and headlands that provide shelter from most weather systems except easterly and north-easterly winds, which could cause choppy sea conditions. Those winds could generate wind speeds and wave heights in excess of that reported by local weather stations. The Ilfracombe Harbour Byelaws limited speed to 4kts in the harbour area

Several local boat and RIB operators reported that choppy conditions with unusual and unpredictable waves often arose with easterly winds, but gave differing advice on what route to take out of the harbour to minimise the sea's effect. They described different strategies for addressing the problem; some suggested staying closer to the pier, others proposed moving further from it and closer to the east coastline.

1.4 AMBULANCE RESPONSE TIME

The emergency call handler classified the casualty's injuries as a Category 3 response, which is deemed urgent but not life-threatening. Casualties in this category required treatment to relieve suffering (e.g. pain control) and transport or clinical assessment and management at the scene. The national standard target for ambulance trusts was to respond to 90% of Category 3 calls within 2 hours.

1.5 THE INJURIES

The casualty was a 28-year-old female in good health who was 1.72m tall and weighed 90kg. She sustained a wedge compression fracture to the T12 vertebra **(Figure 7)** and damage to her spinal cord, resulting in paralysis below the fracture. She had no pre-existing conditions, including osteoporosis, that would have

[2] Significant wave height is a term used in oceanography to describe the average height of the highest one-third of waves in each wave record.

contributed to the injury. The injury was permanent. The hospital's consultant neurosurgeon advised that the injury was caused at the moment of impact and no additional damage due to post-accident movement was evident.

The other two passengers were not seriously injured and made a full recovery.

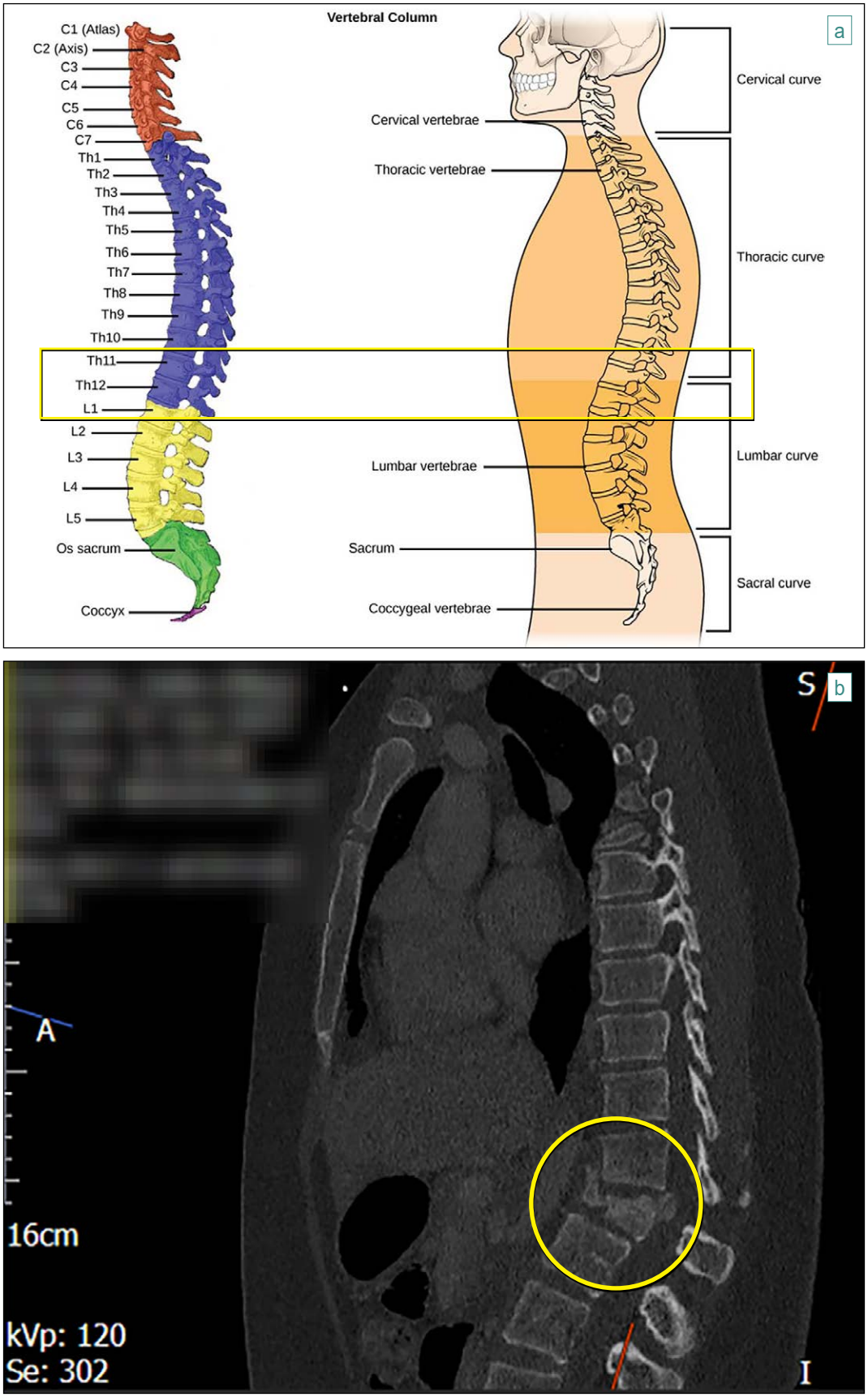


Figure 7: Location of T12 vertebra (a) and X-ray of the injury (b)

1.6 *LUNDY EXPLORER*

1.6.1 Construction

Lundy Explorer was built in 2020 and was one of 49 offshore craft of the same model produced by Humber RIBs. It had a deep V-shaped hull with a stern deadrise[3] of 22°, which allowed a stable ride at high speed and could operate in rough sea conditions offshore. The RIB's recommended maximum engine power was 522 kilowatts (kW), and it was fitted with two outboard engines with a combined output of 478kW or 641 horsepower (hp) and a top speed of over 40kts.

The RIB was operated from an aft steering console equipped with a radar, navigation plotter, and fixed very high frequency radio. The two crew positions had suspension seating[4] **(Figure 8)**, which were reportedly only used on long trips in low wave heights.

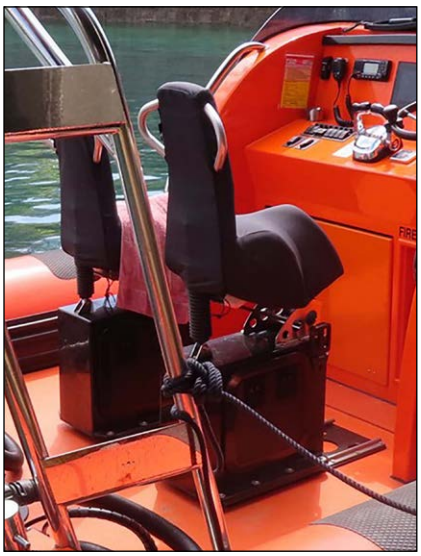


Figure 8: *Lundy Explorer*'s helm position suspension seat

1.6.2 Passenger seating

The manufacturer delivered seating arrangements to the most popular specification for their intended use and boat size, or in line with customer requirements.

Lundy Explorer's passenger seating arrangement comprised four rows of bench seats accommodating three passengers each and two twin occupancy jockey seats. The seats were cushioned with vinyl-covered generic foam. Not all of the 16 available seats needed to be occupied. The jockey seats had shallow moulded contours to indicate the seated positions for two people. There was a cushioned backrest for the rearmost passenger and an extended vertical handhold constructed from stainless steel tube with a round profile for the forwardmost passenger **(Figure 9)**.

Figure 9: Jockey seat dimensions

[3] The transverse inclination of the bottom of a boat. A flat bottom boat had a deadrise of 0° while a deep V-shaped hull typically had a deadrise angle of at least 20°.

[4] Designed to reduce whole-body vibration and repeated shock during high-speed manoeuvres and in rough conditions.

1.6.3 Survey and certification

Lundy Explorer had been approved for commercial use under the Small Commercial Vessel and Pilot Boat (SCV) Code (see section 1.9.2). The RIB had been surveyed by a Yacht Designers and Surveyors Association Limited (YDSA)[5] surveyor at the start of a 5-year survey regime; this cycle allowed for annual owner/operator declarations and required a further survey to be conducted by the nominated surveyor during the mid-term year. The SCV Certificate was issued by YDSA on 3 July 2020. This was valid until 2 July 2025 with the mid-term survey to be completed no later than 3 July 2023. The SCV certificate allowed the RIB to operate in up to and including Category 4[6] areas.

1.6.4 Ilfracombe Sea Safari Limited

Ilfracombe Sea Safari was established in 2012 and offered wildlife and coastal cruises, fishing trips, and 'swimming with seals' trips using its three RIBs and a catamaran. All the vessels were certified to carry up to 12 passengers each.

The company had produced written risk assessments for several scenarios. The stated mitigations in the risk assessment for a medical emergency or injury, which was categorised as *low risk*, were the crews' first aid training and a safety briefing given to passengers before departure. The stated mitigations in the risk assessment for *worsening sea conditions*, also categorised as *low risk*, were a *safe and comfortable speed* or *returning to the harbour*.

The decision to run trips was based on the actual and forecast weather, and one of the two owners would assess the conditions in the morning, before deciding whether to run trips that day. Assessments would also be conducted during the day should conditions change, and skippers could cancel trips if they were concerned. The company's crew members reported that they were never under pressure to run a trip if they decided conditions were unsafe. All the employees consulted confirmed that trips had in the past been cancelled due to weather, but this had never been required while on passage before this accident.

1.6.5 Crew

Lundy Explorer's skipper had grown up around boats and had experience with small craft and jet skis. In 2022, having become interested in RIBs, they gained casual employment with Ilfracombe Sea Safari Limited, intending to become a deckhand then a skipper. In April 2023, after completing several trips as a deckhand and trainee skipper, they obtained their Royal Yachting Association (RYA) Powerboat Advanced Certificate of Competence with commercial endorsement. One of the experienced full-time skippers assessed them for skippering duties over a number of trips and passed them 3 weeks before the accident.

The deckhand had also grown up around boats and had spent many years accompanying crew on commercial rod fishing excursions. They obtained an RYA Powerboat Advanced Certificate of Competence in March 2023. It was their first season with the company, and they had 3 weeks' experience, during which they had completed several trips.

---

[5] YDSA was a certifying authority approved by the Maritime and Coastguard Agency.

[6] Up to 20 miles from a safe haven, in favourable weather and in daylight.

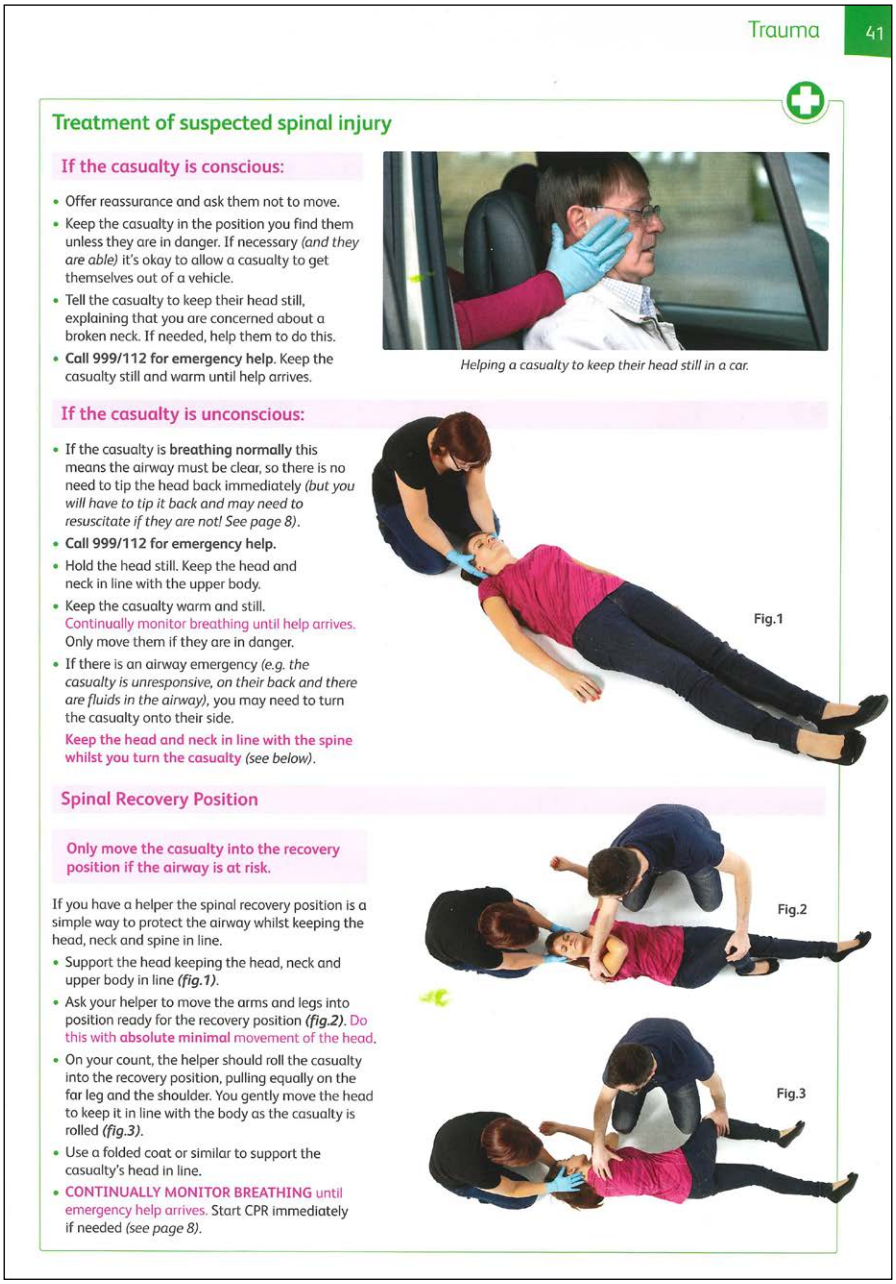
1.7 TRAINING

On operating boats in waves, the RYA Powerboat Advanced Course taught that engine power should be eased off just before reaching the crest and increased again when the bow dropped, to raise it for the next wave. If not correctly timed, this could cause a vessel's bow to hang mid-air until the lack of lift and gravity took over to point the bow down and into the face of the next wave. If the trough was deep enough, or the oncoming wave was steep, it could stop the boat suddenly.

The RYA Powerboat Advanced Course also instructed that driving the boat at an angle to the waves increased the wave's effective wavelength and eased vertical movement. Reducing weight at the front could also improve boat movement.

To gain an RYA Powerboat Advanced Certificate of Competence a 1-day RYA First Aid Course completion certificate was also required. The first aid course covered the treatment of a suspected spinal injury **(Figure 10)**.

Image courtesy of the Royal Yachting Association



Trauma 41

Treatment of suspected spinal injury

If the casualty is conscious:

- Offer reassurance and ask them not to move.
- Keep the casualty in the position you find them unless they are in danger. If necessary *(and they are able)* it's okay to allow a casualty to get themselves out of a vehicle.
- Tell the casualty to keep their head still, explaining that you are concerned about a broken neck. If needed, help them to do this.
- **Call 999/112 for emergency help.** Keep the casualty still and warm until help arrives.

Helping a casualty to keep their head still in a car.

If the casualty is unconscious:

- If the casualty is **breathing normally** this means the airway must be clear, so there is no need to tip the head back immediately *(but you will have to tip it back and may need to resuscitate if they are not! See page 8)*.
- **Call 999/112 for emergency help.**
- Hold the head still. Keep the head and neck in line with the upper body.
- Keep the casualty warm and still. Continually monitor breathing until help arrives. Only move them if they are in danger.
- If there is an airway emergency *(e.g. the casualty is unresponsive, on their back and there are fluids in the airway)*, you may need to turn the casualty onto their side.

Keep the head and neck in line with the spine whilst you turn the casualty *(see below)*.

Fig.1

Spinal Recovery Position

Only move the casualty into the recovery position if the airway is at risk.

If you have a helper the spinal recovery position is a simple way to protect the airway whilst keeping the head, neck and spine in line.

- Support the head keeping the head, neck and upper body in line ***(fig.1)***.
- Ask your helper to move the arms and legs into position ready for the recovery position ***(fig.2)***. Do this with **absolute minimal** movement of the head.
- On your count, the helper should roll the casualty into the recovery position, pulling equally on the far leg and the shoulder. You gently move the head to keep it in line with the body as the casualty is rolled ***(fig.3)***.
- Use a folded coat or similar to support the casualty's head in line.
- **CONTINUALLY MONITOR BREATHING** until emergency help arrives. Start CPR immediately if needed *(see page 8)*.

Fig.2

Fig.3

Figure 10: RYA training manual excerpt on the treatment of suspected spinal injuries

1.8 RIB DESIGN

1.8.1 General

RIBs typically offered excellent performance characteristics, including agility, manoeuvrability, and responsiveness, making them popular for commercial and leisure use. Their rigid hulls and lightweight construction made them suitable for use in choppy seas, high winds and strong currents.

A RIB fitted with outboard engines resulted in a longitudinal centre of gravity approximately two thirds to three quarters of the boat's total length from the bow. Movement at the centre of rotation was greatly reduced compared to that at the bow. When the longitudinal centre of gravity was behind a wave crest the RIB adopted a bow up motion and when it was in front of the wave crest it adopted a bow down motion. Applying low throttle on wave approach then increased throttle as the centre of gravity reached the wave crest could mitigate the motion[7].

The complex interactions of the effects of RIB motion on humans are not fully understood. Military, professional, and search and rescue organisations continue to trial and evaluate the effects of boat motions at high speed to improve design to reduce effects that induce fatigue, chronic musculoskeletal disorders, and injury. Boat hulls are typically designed to withstand a peak impact gravitational force (g) of 5g to 6g. Suspension seats are specified to mitigate peak impacts of up to 4g to 5g[8].

1.8.2 Seat design and selection

The layout and type of seating on commercial RIBs was unregulated and determined by the builder or purchaser. Limitation on exposure to whole-body vibration (WBV) and repeated shock (RS) was addressed in Marine Guidance Note (MGN) 436 (M+F) Amendment 2 (see section 1.9.3), which provided information enabling manufacturers and operators to select seats they considered most effective for their operations and the likely conditions.

RIBs manufactured for the leisure sector were expected to comply with The Recreational Craft Regulations 2017 (RCR), which implemented EU Directive 2013/53/EU – the Recreational Craft Directive. The RCR set out safety requirements for recreational craft, including RIBs, but did not include design standards for seating.

Several operators, manufacturers and skippers were consulted during this investigation, and all acknowledged that the front seats of a RIB could present comfort issues, often referring to them as 'kamikaze' or 'suicide' seats.

---

[7] *What Influences Rigid Inflatable Boat Motions?*, Townsend et al., University of Southampton/RNLI.

[8] *Does Military High-speed Boat Slamming Cause Severe Injuries and Disability?*, Ullman et al, Clinical Orthopaedics and Related Research (2022).

1.9 REGULATIONS AND GUIDANCE

1.9.1 Passenger Safety On Small Commercial High Speed Craft & Experience Rides – A Voluntary Code of Practice

In February 2019, the RYA, British Marine, and the Passenger Boat Association (PBA)[9] published Passenger Safety On Small Commercial High Speed Craft & Experience Rides – A Voluntary Code of Practice, Issue 2[10]. Commonly referred to as the High Speed Passenger Vessel (HSPV) Voluntary Code of Practice (CoP), its foreword stated that:

> *This Voluntary Code of Practice provides skippers and managers with guidance on the safe operation of small commercial high speed craft such as Rigid Inflatable Boats (RIBs), sports boats and other purpose built vessels engaged in carrying passengers on fast sightseeing trips, adventure trips and charters. It should be considered as a guide to good practice to ensure there is a balance struck between passenger enjoyment and ensuring their welfare.*

The HSPV CoP provided general guidance for seating arrangements, noting that:

> *Seating arrangements should allow passengers to effectively brace themselves against repeated shock loadings and violent movements of the boat. For vessels operating at sea, Jockey seats with effective foam cushioning are preferred. When operating vessels at sea with bench seats without lateral support in any sea state beyond calm, the vessel should be driven in such a manner so as to mitigate against the risk of injury or ejection through actions such as lower speeds and wider, slower turns than might otherwise be the case. Irrespective of seating type and operating area, the vessel should always be driven appropriately for the sea conditions.* [sic]
>
> *Passenger seats located near to the bow are likely to experience higher shock loading compared to those located amidships. Seats should also be located away from areas which do not allow the occupants to have their feet flat on the deck, e.g. away from sloping bulwarks.*
>
> *When a boat jumps off a wave, it is usual for the passengers to part company with their seats. When the boat then impacts with the water the passenger can land on the seat with considerable force - increasing their risk of injury. The seats design features, such as the cushioning/padding can reduce this risk of injury. However, while a thick, soft seat pad cushion may be comfortable at rest and in benign sea conditions, when exposed to choppy sea conditions soft cushioning can result in the passenger travelling downwards, compressing the cushion, while the boat has landed and is travelling upwards. This can result in an increased impact force on the passenger as they and the boat seat are travelling in opposite directions. Therefore, it is better to have seats that are not susceptible to extreme compression as a result of the downward force of the passenger impacting them.*

---

[9] A Group Association within British Marine, which is a trade association for the UK leisure, superyacht and small commercial marine industry. The PBA retains its own identity, aims and objectives but contributes to and benefits from the broader resources available within British Marine.

[10] First published in 2010 (see section 1.11.1).

On safety briefings, the HSPV CoP advised that:

> *During the pre-departure brief, skippers should give an overview of the passage with details of any areas of significance, i.e. possible turbulence that may be encountered.*
>
> *It is essential that advice is given on the importance of using correct handholds and adopting a good posture. Explanation of how passengers may 'stand' (subject to the vessels seating being suitable) along with a demonstration of how to use bent knees to mitigate against shock will also be helpful.*
>
> *The magnitude of impact and movement on a small high speed craft is greater at the bow and reduces towards the stern. When deciding on where each passenger will sit, the skipper should take this into account.*
>
> *It is important that a method of communication is established for passengers to indicate if they are in discomfort or wish to speak to a crew member. This is often achieved by the individual passenger raising their hand. A shouted word such as 'stop' may also be suitable.*

On weather limitations, the HSPV CoP stated that:

> *If the conditions are less than favourable, consider reducing passenger numbers, reviewing seating positions and limiting speed. It may even be prudent to consider postponement or cancellation.*

Other sections included safety while on passage and hazard perception, noting that high-speed craft had been shown to experience impacts of 20g perpendicular to the deck.

On the benefits of properly assessed hazards and written procedures, the HSPV CoP stated that:

> *Hazards (or risks) can be identified and mitigated against by applying simple planning based on experience. Many hazards can be recognised and addressed by reviewing the operator's intended business plan and scope of operation throughout the year. These may be considered 'foreseeable' and can be identified through a simple review meeting undertaken by all key management and staff.*
>
> *During the trip hazards may also arise spontaneously and without warning. These could occur during any of the trips undertaken in the company's operating area. Identification of hazards within an operating area is essential to the safety of a vessel, but identification alone will not necessarily remove the danger. Responsibility rests with the skipper to decide, based on prevailing conditions at the time. What can be perceived as an unacceptable risk to one person may be considered safe by another. With this in mind operators should review carefully all actual and potential hazards, and ensure that robust procedures are in place and that all skippers and crew work within the operating parameters. These hazards may be considered 'spontaneous' and will need quick assessment and mitigation on the part of the skipper and crew while the vessel is under way.*

The development of robust and resilient Safe Operating Procedures is the key to recognising and mitigating against hazards.

On auditing of general operational safety, the HSPV CoP recommended that:

… operators implement a Safety Management System (SMS) and arrange and undertake their own audits of their SMS. This may be done in house or be facilitated independently. [sic]

1.9.2 Small Commercial Vessel Code

In 2004, the SCV Code was issued by the Maritime and Coastguard Agency (MCA) as an annex to MGN 280 (M) *Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards*. The purpose of the SCV Code was to set standards for the construction and safe operation of craft of up to 24m Load Line Length being operated to sea commercially. Commonly referred to as the 'harmonised' SCV Code, it was intended to rationalise and harmonise the existing four 'coloured' Codes of Practice for various types of small commercial craft, which included, among others, *The Safety of Small Commercial Motor Vessels – A Code of Practice* (Yellow Code) and *The Safety of Small Workboats and Pilot Boats - A Code of Practice* (Brown Code). Vessels complying with the SCV Code were issued with an SCV Certificate.

The SCV Code did not include requirements for seating and only referred to the protection of people:

In an inflatable boat or a rigid inflatable boat, handgrips, toeholds and handrails should be provided as necessary to ensure safety of all persons on board during transit and the worst weather conditions likely to be encountered in the intended area of operation.

The Code of Practice for the Safety of Small Vessels in Commercial Use for Sport or Pleasure (The Sport or Pleasure Vessel Code) (SPV Code) will replace the SCV Code and is due to be enabled by The Merchant Shipping (Vessels in Commercial Use for Sport or Pleasure) Regulations in 2025. The SPV Code will apply to newly built vessels, and to existing vessels within a yet to be defined period.

1.9.3 Marine Guidance Note 436 (M+F)

Marine Guidance Note 436 (M+F) Amendment 2[11] Whole Body Vibration: Guidance on Mitigating Against the Effects of Shocks and Impacts on Small Vessels provided guidance on mitigating the risk of injury from WBV on small vessels, and in particular severe shock and RS as a result of impacts. The guidance was provided to help improve the design of vessels, to reduce the severity of the impact and to provide a suitable postural position for those on board to enable them to brace effectively. There was also guidance for operators on reducing the risk of injury through training, pre-departure briefing and boat operation considering vessel design, sea conditions and the health and experience of those on board.

[11] Extant at the time of the accident. Updated by Amendment 3 then Amendment 4 (published 7 August 2024).

The introduction to MGN 436 (M+F) stated that:

> *There have been a number of incidents involving small craft, travelling at a wide range of speeds, receiving predominantly vertical shock impact when coming off a wave, resulting in injury to one or more persons on board. The effects of crossing seas and side-on waves can also cause injury. Incidents have occurred on inland waters and estuaries as well as at sea, and to a wide range of people. Injuries sustained include spinal compression injuries, serious damage to joints and fractures in the leg and feet. When such injuries occur, they can be life-changing for those injured.*

On layout of the vessel, section 5.1 noted that the vertical motion experienced on a powered craft was greater at the bow than the stern. This meant that the driver of an aft helm boat was less exposed to vertical impacts and so might drive the boat to their own comfort level rather than that of their passengers. The guidance suggested that a forward driving position was preferable.

Section 5.3 provided guidance on seating, advising that:

- *A wide range of seat designs are available for small craft including jockey or straddle seats where the occupant is in a partially standing posture and seats where the occupant is fully seated. Each type of seating should be suitable for the application for which it was designed and the conditions it will be used in. Seating should be appropriate for the vessel and the size / weight of the user.* [sic]

- *Choosing the correct type of seating for the craft's intended operation may reduce the likelihood of injury to those on board. The greater the exposure to repeated shock and whole body vibration, the greater the requirement for the adoption of shock mitigation equipment and systems specifically designed to cope with the level of exposure experienced.* [sic]

- *Each seat should provide an appropriate amount of postural stability and lateral support.*

Section 6.3 advised on the content for pre-departure safety briefings, which included:

- *Operators of all vessels should consider appropriate weather forecasts, then brief passengers on expected sea conditions including the effects of waves on the vessel and occupants.*

- *As part of the usual pre-departure safety briefing, operators of all vessels should brief those onboard prior to departure on the inherent risk and the correct posture, along with use of handholds and foot-straps, to reduce the likelihood of injury.*

- *The importance of observation should be highlighted to all onboard, encouraging both crew and passengers to take personal responsibility for preparing for shocks (e.g. bracing), and maintaining good posture and stability. However, boat drivers should consider that an inexperienced passenger should not be relied upon to know when to brace, without clear instructions.*

- *Throughout the voyage, boat drivers should maintain communication with all onboard. All people on board should be able to raise concerns and voice discomfort, and the driver should react accordingly.*

Section 8 of MGN 436 (M+F) stated that:

- *Sensors can provide real time vibration data that enables the person driving the vessel understand the impact of their driving, and to slow down or alter course to reduce the effects of repeated shocks and whole-body vibration on crew and passengers.* [sic]

- *Displays showing incremental numbers or lights, for example green -amber -red, can provide warnings that support decisions to protect crew, passengers and vessels against the effects of vibration and shocks. Subject matter expertise should be sought before setting levels. Different pre-set levels may be required to be appropriate to the voyage, for example considering the experience and capabilities of crew and passengers.*

- *Training and/or company policy on the correct use of this information is recommended.*

1.10 REFERENCE INFORMATION

1.10.1 High-speed craft design

The High Speed Craft Human Factors Engineering Design Guide identified that RIBs are often used in rough sea conditions, where occupants could be exposed to high levels of shock and vibration. It provided recommendations for RIB seat designs with built-in shock mitigation features, such as shock-absorbing materials, suspension systems, or energy-absorbing seat mounts, to reduce the risk of spinal injuries during high-speed operations. The guide noted that seating arrangements for varied physiological attributes were complex and that there was no one-size-fits-all solution; seats might require adjustments for each individual.

The guide also identified that sudden vertical shock loads could be high, in that the *risks of acute and chronic injury are manifested in an increase in spinal, knee, arm, or neck injury*, which could be *from a single high-energy event (e.g. a 20g impact)*, and that multi-axis shock loads could exceed 25g.

The guide addressed all the design aspects that affected human performance, and the mitigation that could be provided, noting that:

> *Operator posture is as critical as any design consideration for shock mitigation. The human spine is designed to compress during a fall and can absorb a considerable amount of impact provided that it is aligned with the direction of force. As the human spine becomes misaligned (i.e. more perpendicular) to the force vector, a shearing effect is imparted between vertebras, which can lead to injury.*

The guide also noted that seat restraints were essential for mitigating shocks due to sudden deceleration.

1.10.2 Lower back injuries on high-speed boats

When a boat hits the trough of a wave the occupant continues downward, compressing the seat cushion, while the boat moves upward. This opposing motion increases the impact force on the occupant. The spine is strongest when standing on a stable surface in its natural 'S' shape, supported by evenly distributed intervertebral discs and engaged trunk muscles. In a seated posture, the spine becomes weaker, assuming a slumped position that diminishes muscle support. Human tolerance levels for peak vertical acceleration are between 12g and 14g in the seated position with good postural stability.

The T12 spinal cord segment located in the lower back **(**see **Figure 7)** governs key muscle groups such as the hip flexors, abdominal muscles, inner thighs, and gluteal muscles. A T12 spinal cord injury often results in an inability to voluntarily move the lower parts of the body, impairing motor functions and sensations below the injury level.

1.11 PREVIOUS ACCIDENTS AND STATISTICS

1.11.1 *Celtic Pioneer* – heavy landing

On 26 August 2008, a passenger on board the 9m RIB *Celtic Pioneer* suffered a lower back wedge compression fracture during a 60-minute corporate boat trip in the Bristol Channel (MAIB report 11/2009[12]). The injury occurred when the passenger landed heavily on their seat after being momentarily lifted into the air due to the RIB's motion. They were treated in hospital and fitted with an external spine brace before returning home to begin a 6-month recuperation programme.

The report recommended that the passenger boat industry develop an approved code of practice and raise awareness of shock and vibration. This was achieved by the publication of the HSPV Voluntary CoP in 2010 (see section 1.9.1).

1.11.2 Delta 8.5m RIB – heavy landing

On 6 May 2010, a passenger suffered lower back compression fractures while a RIB was transporting them with fellow workers to a jack-up rig on the River Thames (MAIB report 1/2011[13]). The injury occurred when, due to the RIB's motion, the passenger was momentarily lifted off the locker lid on which they had been sitting and then landed heavily back onto it.

1.11.3 *Seadogz* – high-speed contact

On 22 August 2020, the commercially operated RIB *Seadogz* hit a navigation buoy at high speed in Southampton Water. A 15-year-old passenger, who was sitting in the middle of the bench seat, was propelled forward into a handhold and sustained fatal injuries (MAIB report 10/2023[14]).The skipper and the 11 passengers suffered impact injuries; two passengers were thrown into the water.

---

[12] https://www.gov.uk/maib-reports/heavy-landing-during-boat-trip-on-the-rigid-inflatable-boat-celtic-pioneer-in-the-bristol-channel-near-penath-wales-with-1-person-injured

[13] https://www.gov.uk/maib-reports/heavy-landing-on-a-delta-rigid-inflatable-boat-on-river-thames-england-with-1-person-injured

[14] https://www.gov.uk/maib-reports/heavy-contact-between-the-high-speed-passenger-craft-seadogz-and-a-navigation-buoy-with-loss-of-1-life

The investigation found that:

- The seating and handholds on *Seadogz* afforded little protection to the passengers in the event of a rapid deceleration.

- There were significant limitations in the regulations for small high-speed commercial passenger craft, with no specific requirements for factors such as crash protection, seat design, forward visibility and an SMS. Further, the current regulations did not consider the intended operation or high-speed operations of a small commercial craft.

Recommendations made to the MCA included, to:

> *Conduct an anthropometric assessment of the design and operational requirements for small high-speed passenger craft safety to develop a framework for assuring the protection of passengers and crew provided by the craft with respect to whole-body vibration and sudden decelerations in the event of a horizontal impact. The assessment should consider, among other things, the:*
>
> - *full anthropometric range of passengers and crew;*
>
> - *operational profile of the craft, including the range of speeds;*
>
> - *crash protection and general protection of the seating arrangements, including the design and use of handholds and restraints*

And, to:

> *… expedite the introduction of The Sport & Pleasure Vessel Code and its enabling legislation at the earliest possible opportunity to ensure that additional requirements are introduced for small commercial high-speed passenger craft for:*
>
> - *the operators of such craft to implement a safety management system that includes, but is not limited to:*
>
> - *operational procedures for the craft's full range of intended operations, including navigational and emergency response procedures.*
>
> - *accident reporting and investigation procedures.*

1.11.4 MAIB Safety Bulletin SB3/2023

In September 2023, the MAIB issued a safety warning[15] following the accident on *Lundy Explorer*. The wider context of the bulletin highlighted that:

> *Since 2001, the MAIB has been notified of 54 accidents during RIB rides that have resulted in lower back injuries, 17 of which resulted in spinal fractures. Initial analysis of these previous accidents as part of this investigation indicates that passengers seated in the front third of a RIB's overall length…are exposed to a significantly higher risk of lower back injuries than those seated further back, as the vertical motions experienced are generally greater towards the bow.*

1.11.5 Further accidents

Since the publication of the safety bulletin, the MAIB was notified of two incidents on RIBs that resulted in spinal fractures with recovery. In both cases, the injured person was seated in the front third of the boat. The MAIB visited one of the owners and found that the RIB's skipper was highly experienced, and that the company had a comprehensive set of risk assessments and operating procedures.

In 2025, two further accidents resulting in spinal injury occurred on boat excursions conducted by Ilfracombe Sea Safari Limited.

[15] https://www.gov.uk/maib-reports/safety-warning-issued-following-a-serious-passenger-injury-during-a-rigid-inflatable-boat-ride

SECTION 2 – ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 OVERVIEW

Lundy Explorer encountered a high wave when leaving Ilfracombe Harbour, which resulted in the RIB slamming heavily with the next wave. The passengers at the front of the RIB were injured and shocked to varying degrees, and one suffered a high shock load to the spine that resulted in a fracture to a vertebra, spinal damage and paralysis. This section of the report will consider the injury, the conduct of the trip, operational practices and seating in RIBs, and the medical response.

2.3 INJURY

When *Lundy Explorer* crested a high wave and descended it slammed into an oncoming wave, generating high gravitational forces that acted on the injured passenger. The descending RIB initially caused the passenger to be partially or fully disconnected from the jockey seat, followed by an impactful, skewed reseating as the RIB made heavy contact with the wave. The jockey seat, located at the front of the RIB, was positioned where the highest forces would have been experienced, amplifying the severity of the incident.

The injured passenger had no pre-existing health conditions that would have made her more vulnerable to an injury. It is likely that her displacement from the seat caused the large forces experienced to become misaligned with her spine and resulted in a shearing force, as described in the High Speed Craft Human Factors Engineering Design Guide. The shearing force resulted in a fracture of the T12 vertebra, damage to the spinal cord and permanent paralysis.

2.4 BOAT OPERATION

2.4.1 Seating of the passengers

Lundy Explorer had capacity to seat the trip's 12 passengers on the four bench seats. When the passengers were embarked at the landing stages, two were told to move from a bench seat to the forward jockey seats as filling from the front was the usual method for seating them. The injured passenger's physiology allowed her to sit on the jockey seat with her feet on the deck and use her knees to brace against shock loads **(Figure 11)**. However, the seat was not designed for single occupancy and lumber support could not therefore be provided by the seat's back rest if using the handhold. Consequently, the chances of being displaced from the jockey seats during rough conditions were increased.

Figure 11: Reconstruction of the casualty's approximate position on the jockey seat

2.4.2 Safety briefing

The crew delivered a safety briefing when all passengers were embarked. It included how to wear a personal flotation device, emergency actions and that the conditions were likely to be rough at first.

The safety briefing was a stated mitigation against injury in the company's risk assessment. However, the briefing did not include instructions on the importance of maintaining good posture while seated and the use of handholds, which the HSPV Voluntary CoP and MGN 436 (M+F) deemed essential advice. It is therefore possible that the passengers did not appreciate that single occupancy of the jockey seats was inappropriate or understand how to use the jockey seats to minimise their chance of injury.

It is evident that the safety briefing did not fully follow industry guidelines or the company's risk assessment, increasing the risk of passenger injury.

2.4.3 Conduct of the trip

Lundy Explorer's trip began as normal, and the skipper navigated the sea conditions after rounding the pier. The closed-circuit television images **(**see **Figure 4)** indicated *Lundy Explorer* was not planing and initially handled the wave heights without significant issue. However, the interaction of the easterly winds with the headland meant the conditions to the north of the harbour entrance were probably worse than

the skipper expected. The RIB exceeded the harbour speed limit as it travelled on the ebbing tide, but it is likely this was due to the skipper adjusting the speed in line with their training to ride out across the waves as best they could.

Although the crew were not using the suspension seats, their position, standing near the RIB's centre of the rotation, possibly desensitised them to the extent of the conditions. *Lundy Explorer* was not fitted with sensors that could *provide real time vibration data that enables the person driving the vessel* to *understand the impact of their driving*, as discussed in MGN 436 (M+F). Consequently, the skipper might not have fully realised the discomfort caused by the forces acting on the passengers at the front of the RIB and did not therefore consider returning to harbour. Given the further accidents in 2025 resulting in passenger injuries during Ilfracombe Sea Safari Limited RIB excursions, it is likely that the ability to monitor the real-time conditions experienced at the forward section of the RIB would be beneficial to the person at the helm.

The injuries to the passengers sitting in the jockey seats indicated the severity of the forces experienced as the boat slammed into the waves. *Lundy Explorer*'s skipper underestimated the effect on passengers of navigating through rough conditions, possibly due to their position at the helm and the lack of real-time monitoring equipment. Consequently, the trip was not aborted.

2.4.4 Company procedures

The HSPV Voluntary CoP recommended that commercial boat operators implemented an SMS. Similarly, the MAIB's report into the *Seadogz* accident recommended the MCA to include the requirement for an SMS in the forthcoming SPV Code.

Ilfracombe Sea Safari Limited had some written emergency procedures but only a few risk assessments for its day-to-day operations. The use of jockey seats was not risk assessed. The stated mitigation for the risk of worsening sea conditions was to moderate speed or return to port. While the company had cancelled trips in the past due to poor weather, this had only occurred pre-departure and had neither been considered necessary nor implemented mid-voyage. Since maximum operating parameters, such as sea state, were not formalised, the go/no-go decision to proceed was subjective. Other mitigations suggested in industry guidance, such as limiting passenger numbers when rough conditions were anticipated, had not been considered.

It is apparent that the company's procedures were rudimentary and not strictly followed. It is likely that the adoption of an SMS, as recommended in industry guidance, and including information on the setting of weather limitations would improve operational safety.

2.5 SEATING ARRANGEMENTS ON RIGID INFLATABLE BOATS

The worst injury sustained on *Lundy Explorer* occurred on one of the forward jockey seats, where the highest forces were experienced during the rough sea conditions on the day of the accident.

Industry guidance such as the HSPV Voluntary CoP and MGN 436 (M+F) referenced the potential for high forces in forward areas of RIBs and the risk of spinal damage. This information was reinforced by The High Speed Craft Human

Factors Design Guide and anecdotally by RIB operators. While industry guidance highlights risks, not all forward seating is inherently unsafe. The effectiveness of seating arrangements is shaped by both design and how the vessel is operated.

The incidents involving *Celtic Pioneer* and the Delta 8.5m RIB highlighted the risk of injury due to inappropriate or poorly designed seating and handholds, which proved fatal in the *Seadogz* accident. The publication of MAIB Safety Bulletin SB3/2023 identified a high-risk area for shock exposure on board RIBs, recommending restricted seating in the front third of the boat's total length. High-speed RIB seat design, position and use remains unregulated despite this wealth of information, and is not currently referenced in the SCV Code or the RCR that regulate the pleasure vessel sector.

MAIB's *Seadogz* report recommended that the MCA conduct an anthropometric assessment of small commercial high-speed passenger craft with the goal of improving the safety of passengers and crew. It would be beneficial if this assessment quantified the forces that could be experienced in the forward sections of high-speed RIBs and informed seating design and position standards in the forthcoming SPV Code.

2.6 MEDICAL TREATMENT AND RESPONSE

The skipper's decision to return *Lundy Explorer* to shore after passengers were injured was justified and contacting the owner at the pier made sense to them given the proximity to safe water. However, failing to call the coastguard by radio might have delayed the emergency response and prevented medical advice on handling a suspected spinal injury. The RIB's confined space made it difficult for the injured passenger to be laid flat in line with the RYA first aid training, which the crew had completed. Under stressful conditions, returning the injured passenger to a seat therefore seemed logical to the crew **(**see **Figure 10)**.

Once alongside. the need to limit casualty movement versus the need to recover the passenger to safety ashore presented a dilemma to the owner and skipper. Their decision to move the passenger was influenced by the boat's movement alongside and a falling tide. While first aid training offered limited guidance on managing spinal injuries, such situations are inherently complex and leaving the casualty in place might not always be feasible.

The emergency services responded within national guidelines, with the air ambulance helicopter arriving within the required 120 minutes. Though this timeframe might seem lengthy, the ambulance service prioritises life-threatening cases. The injured passenger, who was conscious and breathing without immediate life-threatening conditions, was appropriately categorised. The hospital's assessment was that their injuries resulted from the accident and no additional damage was induced by their post-accident handling.

SECTION 3 – CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. The injured passenger was dislodged from her seat as *Lundy Explorer* encountered high waves. Her spine was subjected to large misaligned impact forces that resulted in a broken vertebra, damage to the spinal cord and permanent paralysis. [2.3]

2. Single occupancy of the forward jockey seats was inappropriate and did not provide lumber support while using the handhold, thereby increasing the risk of displacement from the seat in rough conditions. [2.4.1]

3. The pre-departure safety briefing did not fully follow industry guidance or the company's risk assessment, placing passengers at increased risk of injury during the trip. [2.4.2]

4. *Lundy Explorer*'s skipper underestimated the effect on passengers of navigating through rough conditions, possibly due to their position at the aft-positioned helm and the lack of real-time monitoring equipment. Consequently, the trip was not aborted. [2.4.3]

5. Current regulations do not reference safety standards for the design, position and use of seats on high-speed RIBs. [2.5]

3.2 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. The company's safety procedures were rudimentary and not strictly followed. The adoption of an SMS, as recommended in industry guidance, would likely improve operational safety. [2.4.4]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. The constraints of the RIB and the urgent need to evacuate the injured passenger ashore made it difficult for the crew to strictly follow their RYA first aid training on the handling of spine injuries. [2.6]

SECTION 4 – ACTION TAKEN

4.1 MAIB ACTIONS

The **MAIB** has issued a safety bulletin **(Annex A)** urging owners and operators of small commercial passenger vessels to review their operations and procedures in line with current safety guidance.

4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

Ilfracombe Sea Safari Limited has introduced an operational procedure that limits the use of the forward jockey seats in all but benign conditions.

SECTION 5 – RECOMMENDATIONS

The **Maritime and Coastguard Agency** is recommended to:

2025/127 Extend the anthropometric assessment recommended in the *Seadogz* report (recommendation 2023/120) to include vertical impacts resulting from operating high-speed commercial vessels in varied sea conditions and speeds.

2025/128 In consideration of MAIB Safety Bulletin SB3/2023, include in the forthcoming The Code of Practice for the Safety of Small Vessels in Commercial Use for Sport or Pleasure (The Sport or Pleasure Vessel Code) a requirement to assess and mitigate the risks of seating people in the front third of a rigid inflatable boat or a high-speed boat.

Ilfracombe Sea Safari Limited is recommended to:

2025/129 Implement a safety management system as recommended in the Passenger Safety On Small Commercial High Speed Craft & Experience Rides – a Voluntary Code of Practice to include:

- operating procedures detailing pre-departure considerations and what actions to take should the conditions change;
- a pre-departure safety brief;
- risk assessments that accurately reflect potential hazards; and
- use of jockey seats.

2025/130 In line with Marine Guidance Note 436 (M+F) Amendment 4 – Whole Body Vibration: Guidance on Mitigating Against the Effects of Shocks and Impacts on Small Vessels, install to all company-owned rigid inflatable boats sensors that provide real-time measurement of the forces experienced in the boat's forward section to better enable the person at the helm to protect passengers and crew against the effects of vibrations and shocks.

The **Royal Yachting Association**, **British Marine**, and the **Professional Charter Association** are recommended to:

2025/131 Promulgate this report to their members.

Safety recommendations shall in no case create a presumption of blame or liability

MAIB Safety Bulletin SB3/2023, issued September 2023

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB3/2023 SEPTEMBER 2023

Extracts from The United Kingdom Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 Regulation 5:
"The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

Regulation 16(1):
"The Chief Inspector may at any time make recommendations as to how future accidents may be prevented."

Press Enquiries:
+44 (0)1932 440015

Out of hours:
+44 (0)300 7777878

Public Enquiries:
+44 (0)300 330 3000

NOTE
This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

All bulletins can be found on our website:
https://www.gov.uk/maib

For all enquiries:
Email: maib@dft.gov.uk
Tel: +44 (0)23 8039 5500

Serious passenger injury on board a sea safari rigid inflatable boat

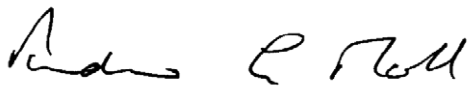
MAIB SAFETY BULLETIN 3/2023

This document, containing safety lessons, has been produced for marine safety purposes only, on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch is carrying out an investigation into a serious passenger injury on board a sea safari rigid inflatable boat.

The MAIB will publish a full report on completion of the investigation.



Captain Andrew Moll OBE
Chief Inspector of Marine Accidents

NOTE

This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall not be admissible in any judicial proceedings whose purpose, or one of whose purposes, is to apportion liability or blame.

This bulletin is also available on our website: www.gov.uk/maib
Press Enquiries: 01932 440015 Out of hours: 0300 7777878
Public Enquiries: 0300 330 3000

BACKGROUND

On 7 June 2023, a passenger on a rigid inflatable boat (RIB) sea safari suffered a spinal injury that left them paralysed from the waist downwards. Twelve passengers had boarded the RIB and, once it was clear of the jetty, the two crew gave them a safety briefing and instruction on the wearing of lifejackets. The RIB then proceeded out to sea and was increasing speed in choppy sea conditions when it encountered a steep-sided wave. The boat fell off the wave and slammed violently into the trough, dislodging a passenger from a forward jockey seat **(Figure 1)**. The passenger immediately lost feeling in their legs.

The boat returned to the harbour and the casualty was removed by emergency services to an air ambulance and flown to hospital. There, diagnosis identified that the casualty had suffered a wedge compression fracture of the spine that left them with permanent paralysis below the waist. The passenger had no pre-existing conditions, was in good health and had normal bone mineral density (BMD).

The RIB was 3 years old, in good condition and certified under the Maritime and Coastguard Agency's (MCA) Small Commercial Vessel (SCV) Code, which was an annex to Marine Guidance Note (MGN) 280 (M)[1].

The RIB's owner had several years' experience operating this type of excursion, and the boat's skipper was appropriately qualified.

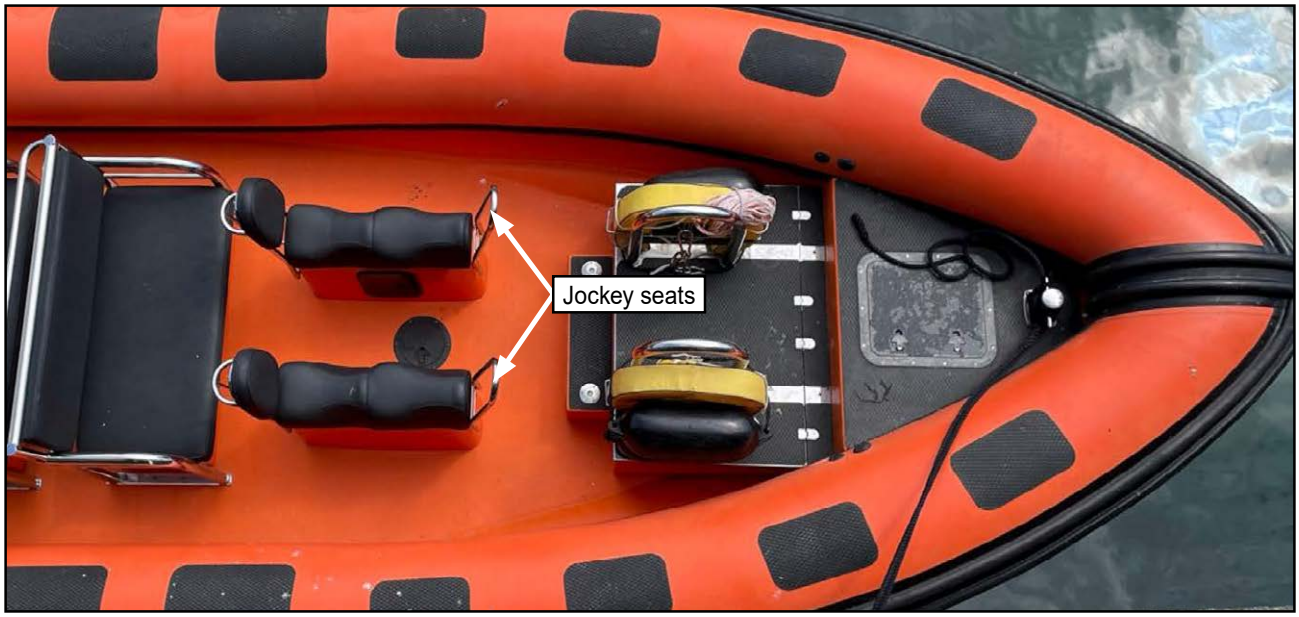


Figure 1: Front of RIB with jockey seats

INITIAL FINDINGS

The accident

The accident happened in weather conditions that the skipper considered favourable for the trip. Although the RIB was not travelling at high speed, as the bow pitched up on encountering waves it restricted the skipper's view ahead. The steep-sided wave caught the skipper unaware and without time to mitigate the impact.

[1] Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards.

When the boat hit the trough, the resulting force applied to the passenger's spine was of sufficient magnitude to fracture a vertebra. With a normal BMD level and no pre-existing conditions to increase their susceptibility to this type of injury, the factors contributing to the fracture related to the activity being undertaken. These included:

- the speed and movement of the RIB in the sea conditions
- the forward location of the seat that the passenger was using
- the passenger's seated posture and their ability to react and compensate for the RIB's motions
- the passenger's awareness of the hazards associated with the RIB's movement.

Wider context

Commercial passenger tours using RIBs, including sea safaris and thrill rides, have experienced a surge in popularity across the UK, with a corresponding increase in the occurrence of accidents. Since 2001, the MAIB has been notified of 54 accidents during RIB rides that have resulted in lower back injuries, 17 of which resulted in spinal fractures. Initial analysis of these previous accidents as part of this investigation indicates that passengers seated in the front third of a RIB's overall length **(Figure 2)** are exposed to a significantly higher risk of lower back injuries than those seated further back, as the vertical motions experienced are generally greater towards the bow.

For illustrative purposes only: not to scale

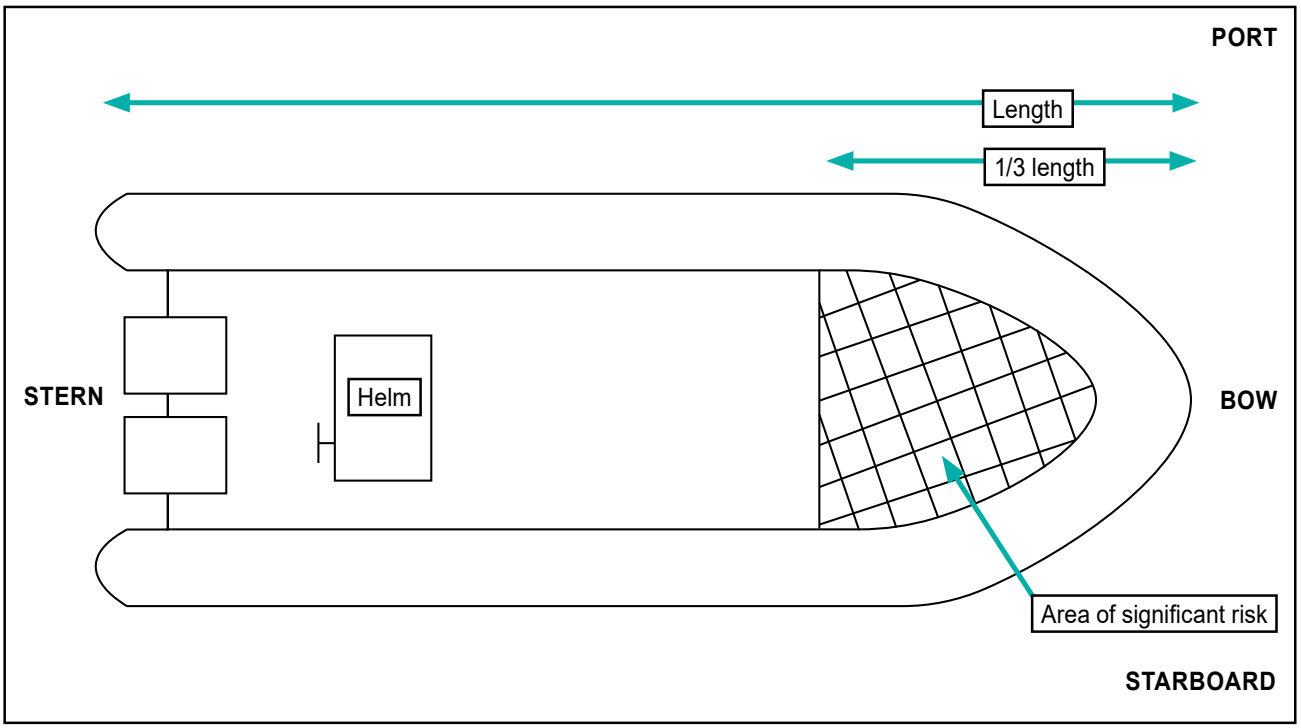


Figure 2: RIB outline highlighting the area of significant risk

The passenger RIB industry has conducted research on shock mitigation and whole body vibration, primarily focused on high-speed operations, which has led to the development of codes of practice and seating designs. This accident, combined with the previous accident data, has highlighted concerns regarding the design, construction and location of seating on RIBs used for passenger operations, particularly when the seated individuals have little or no understanding of boat movement or how to mitigate its effects.

Small commercial high-speed craft guidance

In the UK, commercial RIBs carrying no more than 12 passengers to sea are certified to meet the standards set out in the SCV Code, but the conduct of operations and safety management are currently largely self-regulated.

In 2010, in response to an MAIB investigation report[2], the Passenger Boat Association (PBA) and Royal Yachting Association (RYA) issued guidance on the safety of small high-speed passenger craft. In April 2019, issue 3 of the guidance was issued by the RYA, PBA and British Marine as the *Passenger Safety on Small Commercial High Speed Craft & Experience Rides – A Voluntary Code of Practice* (CoP). Additionally, in September 2021, MGN 436 (M+F)[3] Amendment 2 was issued, which was further updated by Amendment 3 in July 2023.

Both the CoP and the MGN include guidance on seating location, design and shock mitigation. Also included is advice on the design of vessels, the posture and stability of occupants and the content of pre-departure briefings.

SAFETY LESSON

There is a significantly higher risk of spinal fractures to people seated in the front area of RIBs, regardless of speed.

Owners and operators of small commercial passenger vessels are strongly advised to:

- Urgently review their operations and risk assessments, with reference to the CoP and MGN 436 (M+F). This review should assess and mitigate the risks associated with the requirement to seat passengers in the front area of a RIB and ensure that the risk assessment includes and addresses the variability of weather conditions and the ability of passengers.
- Review their passenger pre-departure briefing and ensure that it includes a specific explanation of how to use the seat(s) and their associated handholds, including how to maintain the correct posture and stability to mitigate against injury.

Issued September 2023

[2] https://www.gov.uk/maib-reports/heavy-landing-during-boat-trip-on-the-rigid-inflatable-boat-celtic-pioneer-in-the-bristol-channel-near-penath-wales-with-1-person-injured

[3] MGN 436 (M+F) Whole Body Vibration: Guidance on Mitigating Against the Effects of Shocks and Impacts on Small Vessels.

Marine Accident Report

INVESTORS IN PEOPLE