ACCIDENT REPORT

Report on the investigation of

the collision between

Osprey and *Osprey II*

resulting in serious injuries to one passenger

Firth of Forth, Scotland

19 July 2016

SERIOUS MARINE CASUALTY REPORT NO 10/2017 MAY 2017

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

Extract from

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.

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CONTENTS

FIGURES

ANNEXES

GLOSSARY OF ABBREVIATIONS, ACRONYMS AND TERMS

CA	-	Certifying Authority
GRP	-	Glass reinforced plastic
Kill cord	-	A device for stopping a boat's engine if the driver moves away from the controls
Knots	-	A measure of speed in nautical miles per hour
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
PBA	-	Passenger Boat Association
PLA	-	Port of London Authority
RCD	-	Recreational Craft Directive
RIB	-	Rigid Inflatable Boat
RYA	-	Royal Yachting Association
SCV	-	Small Commercial Vessel
UTC	-	Universal Co-ordinated Time
VHF	-	Very high frequency

TIMES: all times used in this report are local (UTC+1) unless otherwise stated

SYNOPSIS

At 1252 on 19 July 2016, two passenger carrying rigid inflatable boats, *Osprey* and *Osprey II*, collided in the Firth of Forth. A passenger who was sitting on an inflatable tube of *Osprey II* was crushed between *Osprey*'s bow and *Osprey II*'s helm console, resulting in her sustaining serious injuries.

Both RIBs had departed from Anstruther Harbour and were bound for the Isle of May. While proceeding in parallel at a speed of around 6 knots, the skipper of each RIB increased speed and commenced a power turn away from each other with the intention of passing each other in the course of completing a round turn. However, as the RIBs turned towards each other, it became apparent to both skippers that the RIBs were in danger of colliding. Although they both acted quickly to reduce the speed of their respective vessels and so lessen the impact, they were unable to prevent the collision.

The manoeuvre had previously been carried out successfully on several occasions but it had not been formally risk assessed and no thought had been given to what to do if a collision situation developed.

There are currently no regulations preventing persons on RIBs from sitting on the inflatable tubes. However, passengers not sitting on suitable inboard seating have an increased risk of falling overboard, are at significant risk of musculoskeletal injuries and, as identified in this accident, are more likely to be seriously injured in the event of a collision.

The operating company, Isle of May Boat Trips Ltd, has since banned similar manoeuvres in future and has prohibited crew and passengers from sitting on the RIB inflatable tubes.

A recommendation has been made to the Maritime and Coastguard Agency to include in its forthcoming Recreational Craft Code requirements for suitable seating in respect of commercially operated passenger carrying RIBs.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *OSPREY*, *OSPREY II* AND ACCIDENT

SHIP PARTICULARS		
Vessel's name	*Osprey*	*Osprey II*
Flag	UK	UK
Certifying Authority	Royal Yachting Association	Royal Yachting Association
Type	Humber Quinquari Rigid Inflatable Boat	Humber Quinquari Rigid Inflatable Boat
Registered owner	Isle of May Boat Trips Ltd	Isle of May Boat Trips Ltd
Manager(s)	Isle of May Boat Trips Ltd	Isle of May Boat Trips Ltd
Construction	GRP hull with hypalon inflatable tubes	GRP hull with hypalon inflatable tubes
Year of build	2004	2010
Length overall	10m	8.0m
Registered length	Not applicable	Not applicable
Gross tonnage	Not applicable	Not applicable
Coded capacity	12 passengers + 2 crew	12 passengers +2 crew
Authorised cargo	Passengers	Passengers
VOYAGE PARTICULARS		
Port of departure	Anstruther Harbour	Anstruther Harbour
Port of arrival	Isle of May (intended)	Anstruther Harbour
Type of voyage	Passenger excursion	Passenger excursion
Cargo information	Passengers	Passengers
Manning	13 (skipper +12 passengers)	12 (skipper +11 passengers)
MARINE CASUALTY INFORMATION		
Date and time	19 July 2016, 1252	
Type of marine casualty or incident	Serious Marine Casualty	
Location of incident	Firth of Forth, Scotland	
Place on board	Not applicable	
Injuries/fatalities	None	Serious injuries to one passenger

MARINE CASUALTY INFORMATION		
Damage/ environmental impact	Damage to GRP on bow of boat/none	One section of tube punctured, minor structural damage/none
Ship operation	On passage	On passage
Voyage segment	Mid-water	Mid-water
External & internal environment	Wind: light airs. Sea State: slight. Visibility: good.	
Persons on board	13	12

Osprey and *Osprey II*

1.2 BACKGROUND

Isle of May Boat Trips Ltd owned and operated two rigid inflatable boats (RIBs), *Osprey* and *Osprey II*, from Anstruther Harbour, Firth of Forth, Scotland. The company offered passenger trips from April to September to the Isle of May **(Figure 1)**, a small island in the outer Firth of Forth. The island is a haven for sea birds and has a large puffin colony. It was a popular destination for tourists and *Osprey* was permitted to land 12 passengers daily.

The company, which was owned by *Osprey*'s skipper, advertised three different RIB tours:

- *''May Experience' – a trip to the Isle of May with passengers disembarking onto the island for several hours before returning to Anstruther.*
- *'Taste of May' – a trip around the Isle of May, not landing on the Island and returning to Anstruther.*
- *'Coastal Dash' – a joyride along the coast to enjoy the thrill of the boat ride and experience coastline from the sea.'* [sic]

Isle of May Boat Trips Ltd operated in partnership, and shared offices, with Anstruther Pleasure Cruises Limited, which operated the Isle of May ferry, *May Princess*. *May Princess* carried up to 100 passengers from Anstruther Harbour to the Isle of May each day from April to September.

A scheduled departure timetable was published in advance. As Anstruther Harbour was tidal, departure times varied depending on the tide. *Osprey* operated every day throughout the season, *Osprey II* did not operate on Tuesdays, Wednesdays or Fridays.

1.3 NARRATIVE

1.3.1 Events prior to departure

On Tuesday 19 July 2016, *Osprey* was fully booked with 12 passengers for its scheduled 1230 'May Experience' tour departure. Fine weather was forecast and several other potential customers had expressed an interest in a trip. *Osprey II* was not scheduled to operate that day but, owing to the fine weather and high passenger demand, the decision was taken to run a 'Taste of May' tour.

At 0800, *Osprey*'s skipper contacted *Osprey II*'s skipper, who confirmed he was available to run the additional tour provided he could bring his 8-year old son with him. This was agreed, and throughout the morning 10 *Osprey II* spaces were sold to passengers for a 1230 departure time.

At 0930, *Osprey*'s skipper arrived at Anstruther Harbour with fuel in jerry cans for both RIBs. He then opened the booking office, and began to process bookings and paperwork for the day's trips. Soon after, *Osprey II*'s skipper arrived, accompanied by his son. Both RIBs were fuelled and then *Osprey II* was moved from its berth in the marina to the passenger boarding embarkation steps.

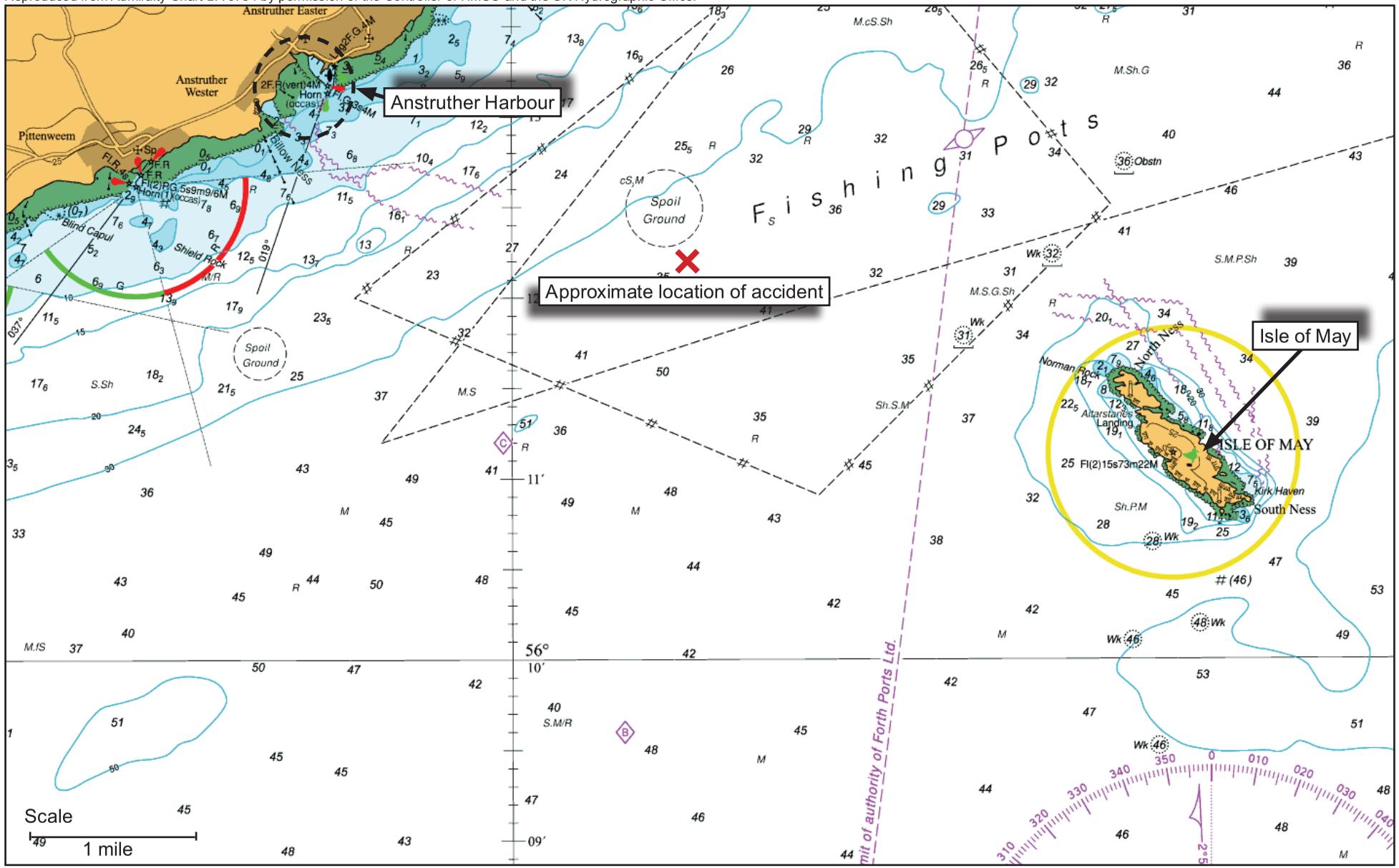

Figure 1: Chart showing Anstruther Harbour and Isle of May with accident location highlighted

At 1215, the skippers distributed and fitted lifejackets to both *Osprey* and *Osprey II*'s passengers on the quayside. There were 12 passengers for *Osprey*, 11 adults and 1 child, and 11 passengers for *Osprey II*, 7 adults and 4 children, 1 being the skipper's son.

A safety briefing was given to all of the passengers by *Osprey*'s skipper. Each skipper then led his respective passengers to the boarding area and assisted with their boarding. *Osprey'*s passengers sat on bench seats configured in five rows. Eight of *Osprey II'*s passengers sat on bench seats configured in four rows, two passengers each sat in a position on an inflatable tube indicated to them by the skipper, one on each side. On *Osprey II* the skipper's son sat on the starboard inflatable tube, in a position aft of the helm console.

At 1225 *May Princess* sailed from Anstruther Harbour, bound for the Isle of May.

1.3.2 Departure from Anstruther

At 1236, *Osprey II* departed Anstruther Harbour and was joined shortly afterwards by *Osprey*. Both vessels then stopped briefly to allow photographs to be taken **(Figure 2)**.

Both skippers then increased speed and proceeded towards *May Princess*, which was now 2.5 miles ahead of them. *May Princess* was travelling at around 6 knots. *Osprey II* ran parallel with and on the port side of *Osprey* at an estimated speed of 17 knots.

Osprey II then crossed behind and onto *Osprey*'s starboard side, a manoeuvre that resulted in the passenger sitting on *Osprey II*'s starboard inflatable tube being splashed.

As the RIBs approached *May Princess*'s stern, they slowed down to match its speed **(Figure 3)**.

1.3.3 The collision

At 1251, both skippers glanced at each other and nodded. This was the pre-determined signal to start a turn manoeuvre. *Osprey*'s skipper increased speed and put his helm hard to port, commencing a power turn to port. *Osprey II'*s skipper increased speed and put his helm to starboard, commencing a power turn to starboard **(Figure 4)**.

As the RIBs turned towards each other, it became apparent to both skippers that the RIBs were in danger of colliding. *Osprey II*'s skipper tried to avoid collision by turning to port, reducing engine speed and engaging astern gear as soon as the engine would allow. As the RIB rapidly slowed down, a child who was sitting on one of the bench seats slid off her seat and onto the floor. *Osprey*'s skipper also tried to avoid collision by turning to starboard and then to port and by engaging astern gear on both engines, which rapidly slowed the RIB **(Figure 5)**.

At 1252, the passenger sitting on *Osprey II*'s starboard inflatable tube turned away from *Osprey*'s approaching bow, which then pinned her to *Osprey II*'s helm console. The starboard aft section of *Osprey II*'s inflatable tube was punctured and rapidly deflated.

Figure 2: *Osprey II* passengers shortly after departing Anstruther, showing two passengers and the skipper's son seated on the tubes

Osprey II's skipper, realising that the passenger was injured, pushed *Osprey*'s bow away, freeing her. The skipper then made an initial assessment of the injured passenger, who was in obvious pain but able to communicate. He tried to relocate her onto one of the bench seats, but she was in too much pain to move **(Figure 6)**.

1.3.4 Post-collision events

At 1255, *Osprey*'s skipper reported the collision to the coastguard on very high frequency (VHF) radio Channel 16, advising that both RIBs would be returning to Anstruther Harbour with one injured passenger, and requesting the coastguard to arrange for an ambulance to meet them in Anstruther.

May Princess initially stopped following the accident, but then resumed passage towards the Isle of May once it was established that no additional assistance was required.

Image courtesy of Teresa Wong-Hui

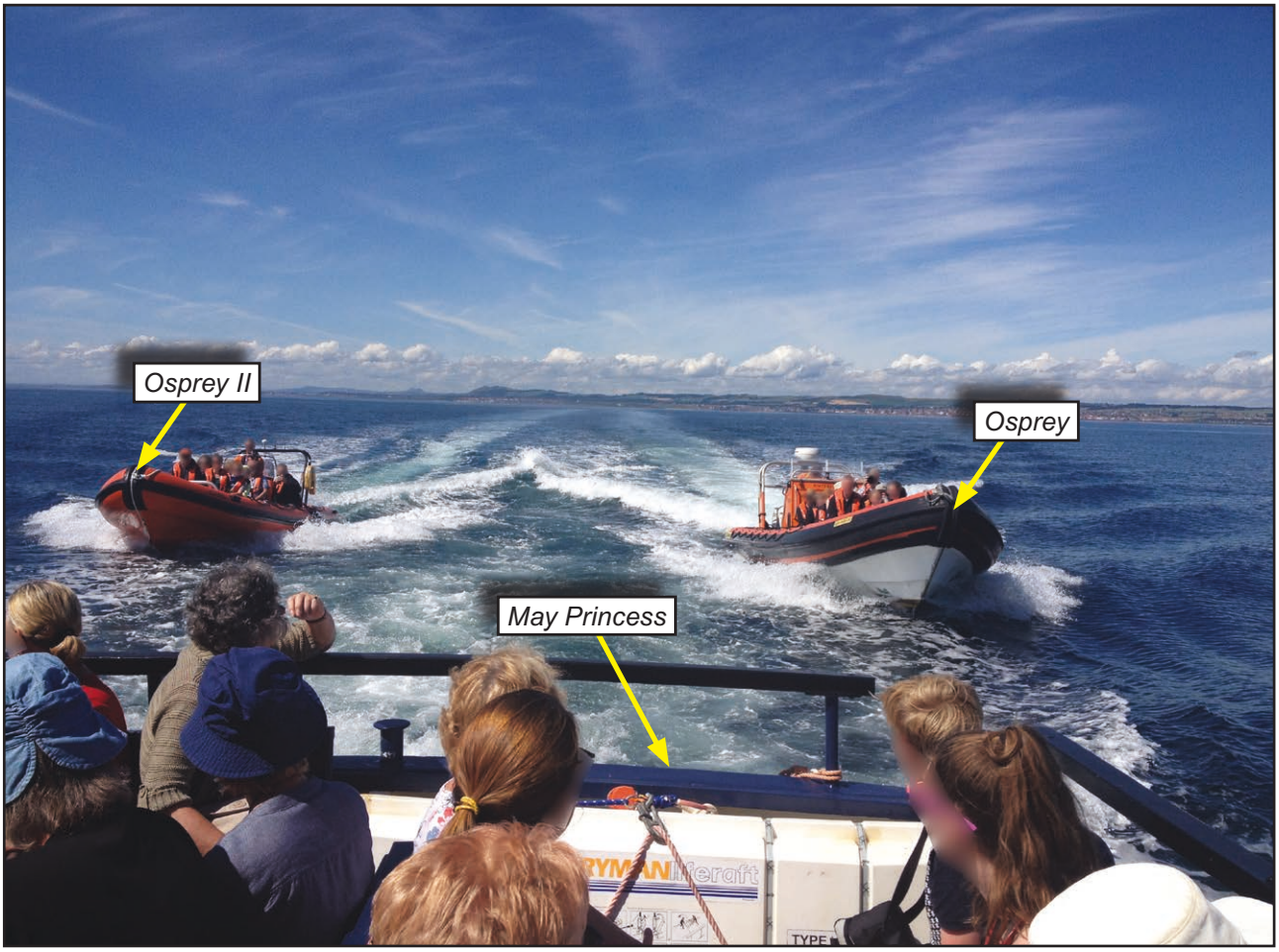

Figure 3: Both RIBs approaching the stern of *May Princess*

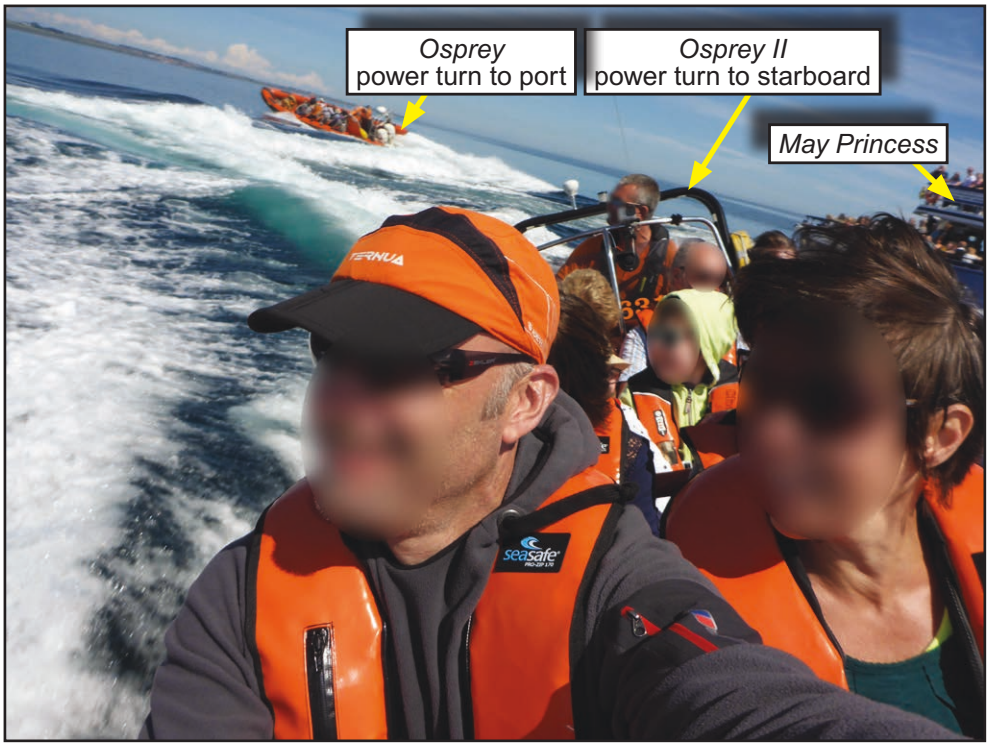

Figure 4: Both RIBs commencing power turn

Image courtesy of Teresa Wong-Hui

Figure 5: *Osprey* about to collide with *Osprey II*

Image courtesy of Teresa Wong-Hui

Figure 6: Injured passenger in slumped position following accident

Osprey and *Osprey II* returned towards Anstruther Harbour at slow speed as a consequence of *Osprey II*'s deflated section of tube and the injured passenger's discomfort.

The injured passenger remained in a slumped position, sitting on the tube and leaning on the helm console. Her husband and one other passenger sat on either side of her to provide support and comfort during the return passage.

At approximately 1320, *Osprey II* arrived in Anstruther Harbour and was met by a coastguard team. By 1333, paramedics had begun treating the injured passenger, who was subsequently transferred to hospital.

1.4 ISLE OF MAY BOAT TRIPS LTD

1.4.1 General

Isle of May Boat Trips Ltd, which was already operating *Osprey*, was purchased by the current owner in 2013. A partnership was formed with Anstruther Pleasure Cruises Limited, which owned and operated *May Princess*. The company's primary business was to offer scheduled passenger tours to and around the Isle of May during the summer season.

1.4.2 Twin RIB operation

Osprey II was purchased by Isle of May Boat Trips Ltd for the 2016 season. *Osprey* and *Osprey II* were scheduled to depart from Anstruther Harbour at the same time on particular days, and this had provided an opportunity for their skippers to interact while following *May Princess* on passage to the Isle of May. Consequently, the skippers had developed a manoeuvre that was intended to incorporate a level of excitement into the trip, and which had been completed successfully on about 20 occasions prior to the accident.

The manoeuvre involved both RIBs proceeding towards *May Princess* with *Osprey II* parallel with and on the port side of *Osprey*. The RIBs then crossed each other's path twice before approaching *May Princess*'s stern and then slowing down to match its speed. After nodding to each other, both skippers increased speed and commenced a power turn away from each other, resulting in the RIBs passing each other starboard side to starboard side on reciprocal headings.

1.4.3 Passenger spaces

Isle of May Boat Trips Ltd operated an online booking system. Bookings could also be made in person at the harbour office. While 12 passenger spaces were available for tours on *Osprey* **(Figure 7),** passenger spaces on *Osprey II* were normally limited to the eight spaces available on its four bench seats **(Figure 8)**. However, in good weather, two additional spaces for *Osprey II* were sold, allowing 10 passengers to be carried, the additional 2 sitting in designated positions on its inflatable tubes. Each of the designated positions on the inflatable tube had a handhold on the tube on either side of the seating position.

Figure 7: *Osprey*

Figure 8: *Osprey II*

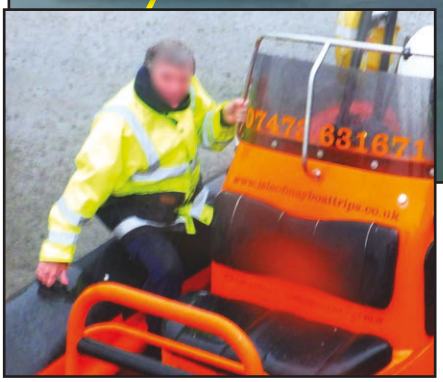

Figure 8 inset: actual seating position on tube of *Osprey II*

On the day of the accident the additional passengers on *Osprey II* were directed to sit on the tubes in a position aft of the two designated positions. This allowed them a handhold on the tube, and a handhold on the stainless steel frame around the helm console **(Figure 8 inset)**.

1.4.4 Safety management

Isle of May Boat Trips Ltd had a safety management plan, which set out its policies on risk assessment and maintenance, and delegated overall authority for the safety of a vessel and persons on board to the vessel's skipper.

The company neither provided instructions on twin RIB operation nor specified the limiting weather conditions when allowing passengers to sit on *Osprey II*'s inflatable tubes.

1.5 VESSELS' DETAILS – *OSPREY* AND *OSPREY II*

1.5.1 Particulars

Osprey and *Osprey II* were Humber Ocean Pro RIBs, with a glass reinforced plastic (GRP) hull and hypalon inflatable tubes, built by Humber Inflatables. *Osprey* was built in 2004 and was powered by two Evinrude 175hp E-Tec outboard engines. *Osprey II* was built in 2010 and was powered by a single Evinrude 200hp E-Tec outboard engine.

The installation of the engines, steering, passenger seats and final fit out was completed by Quinquari Marine, Pembrokeshire.

There was a standing helm console towards each RIB's stern. This console housed the engine monitoring equipment, steering controls, engine throttle, navigation plotter, VHF radio and magnetic compass.

On *Osprey* there were five rows of bench seating forward of the helm console providing seating for 12 passengers. On *Osprey II* there were four rows of bench seats forward of the helm console providing seating for eight passengers. There were also two designated seating positions, with handholds on the inflatable tube on each side of the RIB.

1.5.2 The skippers

Osprey's skipper was 53 years old. He had been a director and shareholder of Isle of May Boat Trips Ltd since 2013, and had worked full-time at Isle of May Boat Trips Ltd since retiring from his previous job in 2014. He held a commercially endorsed Royal Yachting Association (RYA) Yachtmaster Offshore (Power) Certificate of Competence and had previously been an RYA powerboat instructor.

Osprey II's skipper was 50 years old and had worked on *May Princess* as a crew member since retiring from the Royal Marines. He had been skipper of *Osprey II* since it had been purchased by Isle of May Boat Trips Ltd prior to the start of the 2016 season. He held a commercially endorsed RYA Powerboat Advanced Certificate.

Osprey II's skipper did not have his engine cut-out kill cord attached when the RIB departed Anstruther Harbour on the day of the accident.

1.6 DAMAGE TO THE RIBS

Osprey sustained minor damage to the gel coat on its bow **(Figure 9)**.

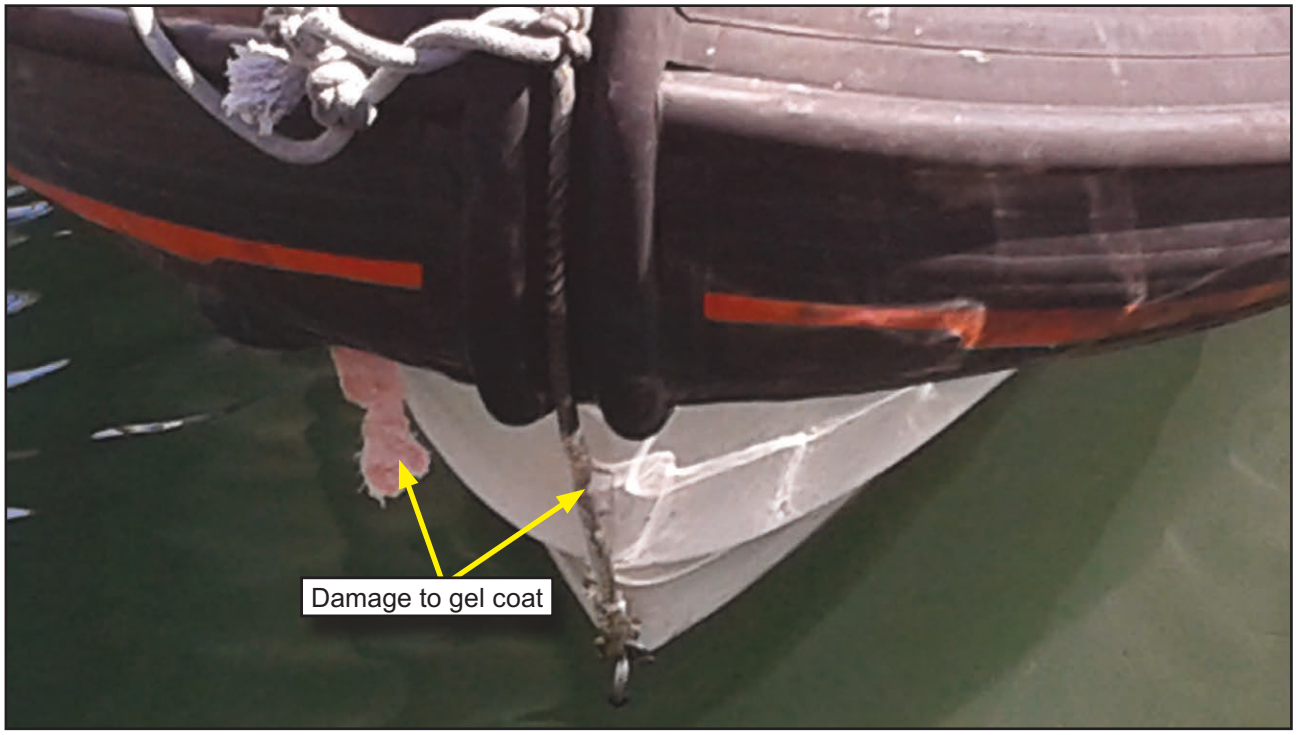

Figure 9: *Osprey*

In addition to *Osprey II* sustaining a puncture and tear to the aft starboard section of its inflatable tube, there was damage to the helm console, starboard navigation light and stainless steel grab rail **(Figure 10)**.

1.7 INJURIES SUSTAINED

The injured passenger was 45 years old. She was travelling on *Osprey II* with her husband, who was seated on the opposite inflatable tube, and her two children aged 8 and 12 years, who were sitting on bench seats. The family were on holiday in the area.

The severity of the passenger's injuries did not become apparent until she was passed to the care of the ambulance crew. On arrival at hospital she was put into an induced coma, and returned home 3 weeks later to continue her recuperation. She had suffered two broken collar bones, five broken ribs, a punctured lung, and lacerations and bruising to her back and torso. The internal injuries she sustained in the accident also resulted in permanent damage to her sight in both eyes.

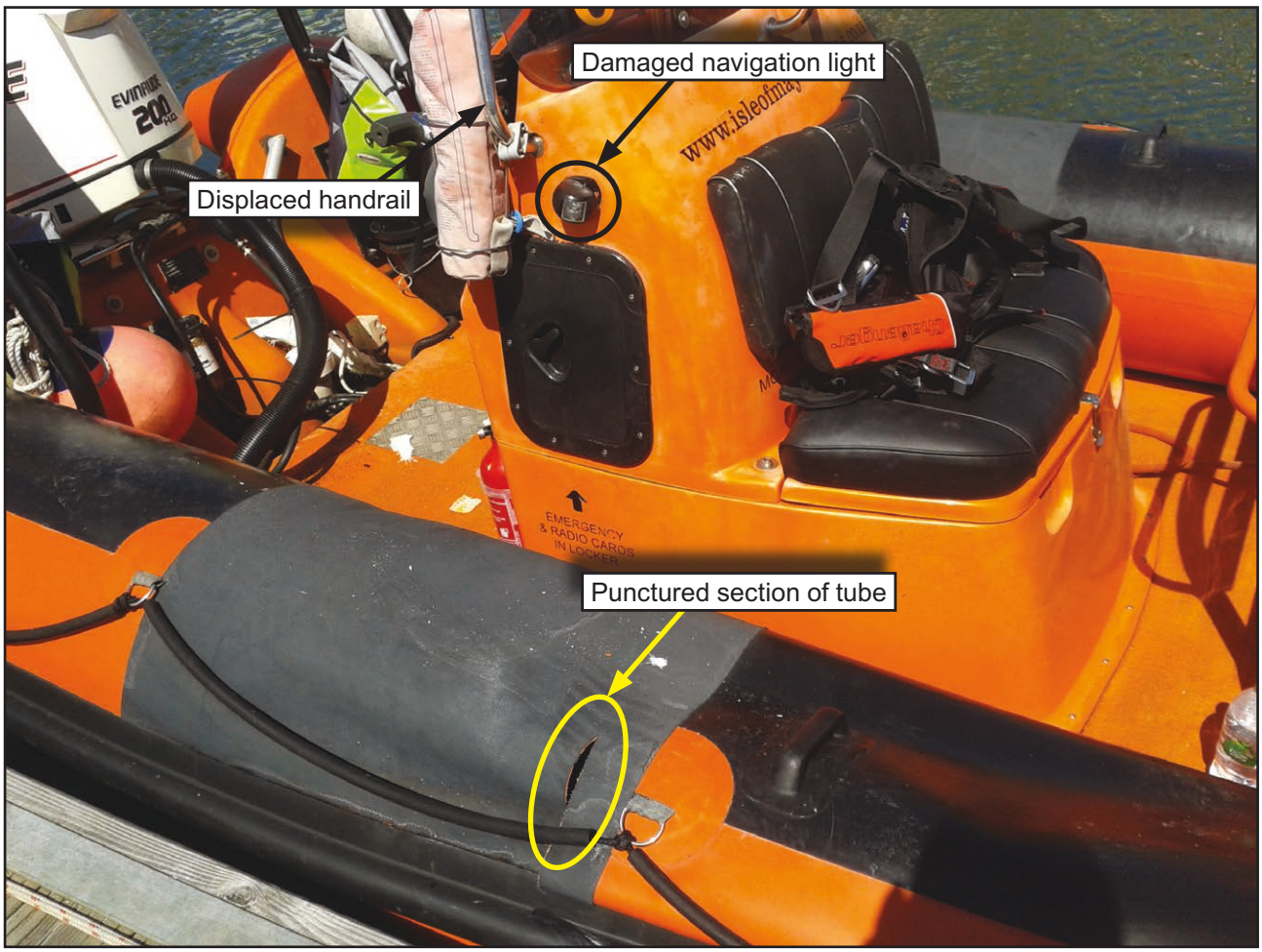

Figure 10: Damage to *Osprey II*

1.8 SMALL COMMERCIAL VESSEL CODE

1.8.1 Background

The Merchant Shipping (Vessels in Commercial Use for Sport or Pleasure) Regulations 1998 apply to UK vessels wherever they may be and other vessels operating from UK ports while in UK waters, except pleasure vessels and vessels carrying more than 12 passengers. Regulation 6 enables alternative standards contained in the Maritime and Coastguard Agency (MCA) Small Commercial Vessel (SCV) Code to be used to fulfil the requirements of the Regulations. The SCV Code, which is intended to be replaced by a Recreational Craft Code and a Workboat Code, is annexed to the MCA's Marine Guidance Note (MGN) 280 (M)[1].

The MCA delegates its responsibility to examine vessels, issue and sign declarations and certificates to a number of approved Certifying Authorities (CAs). The RYA was the CA for *Osprey* and *Osprey II*, which were each certified to carry 12 passengers and 2 crew, allowing operation within 20 miles from a safe haven in favourable weather and in daylight.

[1] MGN 280 – Small vessels in commercial use for sport or pleasure, workboats and pilot boats – alternative construction standards.

1.8.2 Seating arrangements

In section 22.2 of the SCV Code, dealing with Bulwarks, Guard Rails and Handrails; section 22.2.6 states:

> *'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 worst weather conditions likely to be encountered in the intended area of operation.'*

The SCV Code makes no reference to the number of seats required on a RIB.

Section 25.6.3 of the SCV Code states:

> *'For seagoing pilot boats, individual shock absorbent seating with headrests, footrests and moveable armrests should be provided for all members of the crew and the pilots to be carried. Seat belts should be provided for the safety of seated passengers and crew. For non-seagoing pilot boats, seating commensurate with the vessels expected operating conditions, should be provided for all passengers and crew.'*

The SCV Code makes no reference to what constitutes suitable seating on a RIB that is not a dedicated pilot boat.

1.8.3 Passenger numbers

The certified number of passengers that are permitted to be carried on a RIB is determined by stability requirements as documented in the SCV Code, and not by the number of available seats.

Osprey and *Osprey II* were both certified for 12 passengers and 2 crew, 12 being the maximum number of passengers permitted to be carried on vessels certified under the SCV Code.

1.8.4 Risk assessment

Section 2.10.1 of Annex 3 to the SCV Code states:

> *'The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 (SI1997/2962) apply wherever 'workers' are employed on ships. Under these regulations all employers have a duty to ensure the health and safety of workers and others, so far as is reasonably practicable. To fulfil this duty, employers are required to carry out "a suitable and sufficient assessment of the risks of the health and safety of workers arising in the normal course of their activities or duties"..*

Section 2.10.2 states:

> *'Applying the principles of health and safety requirements to Code Vessels means that the operator or skipper should take a proactive approach to safety and consider what particular hazards are likely to arise in the context of work activities on board. They should then take appropriate measures to remove the risks so far as possible…'*

1.9 PUBLISHED GUIDANCE FOR RIB OPERATIONS

1.9.1 Passenger Safety on Small Commercial High Speed Craft

In response to a growing number of passenger RIB tours, RIB thrill rides and Sea Safari type RIB trips, and an increase in the number of accidents on these trips, the RYA has published guidance entitled 'Passenger Safety on Small Commercial High Speed Craft' (issued 1 March 2010).

The publication contains advice on the importance of passengers using correct handholds and adopting good posture, and offers advice to skippers and operators on safety during passage:

'8. Passenger Boarding and Departure

8.2 During the boarding process passengers should be allocated to the most appropriate seating.

8.3 They should be assisted aboard, shown to their seats and advised how to sit, how to prevent vertical shock and how to use the handholds.'

'9. Safety During Passage

9.1 The guiding principle of ensuring a safe ride is to keep the craft in contact with the water. Launching a boat off a wave, or even the wash of another boat, may generate excitement but the forces encountered on landing can be extreme and can cause serious injury. Therefore seeking rough conditions to enhance the thrill of the trip should be considered less than best practice. Even in relatively benign conditions, the shock and vibration experienced can be surprisingly high.

9.2 Even in relatively calm conditions, high speed craft have been shown to experience impacts of 20g perpendicular to the deck, and in excess of 10g parallel to the deck.

9.3 High speed U and S turns should be carried out gently and at a safe speed. As each vessel will have specific ride characteristics, operators should ensure that their operating procedures clearly state maximum operating parameters to this effect. Again, it is important to remember that a boat travelling at speed and heeling to 15-20º may be exciting to the majority of passengers while frightening the less confident ones. Maintaining a safe speed and correct trim is critical. What can be considered safe on a calm day may become reckless in less favourable conditions. However, this does not mean that reducing speed and/or power is always the correct approach to challenging sea conditions.

9.5 Passengers must be seated in the seats provided. Some small commercial vessel certificates allow for passengers to be seated on the inflatable collar of a RIB, but those passengers may be exposed to an increased risk of back injury due to the rotated posture they will have to adopt. If passengers are to sit on the inflatable collar, operators

and skippers should be aware of the additional risks and consider adapting their operating procedures, passage plans and itineraries, especially if sea conditions are less than favourable.'

1.9.2 Small Passenger Craft High Speed Experience Rides

The Passenger Boat Association (PBA), in conjunction with the RYA, has produced additional guidance concerning The management of Small Passenger Craft High Speed Experience Rides' (issued March 2010). The following is an extract:

'5. Structural Considerations

…Seating arrangements should allow passengers to effectively brace themselves against repeated shock loadings and violent movements of the boat. Bench seats, particularly without lateral support, should be avoided on vessels operating in any sea state beyond calm. Jockey seats are generally acceptable with effective foam cushioning, as are wrap-around stand-in bolsters. If boat operations are planned to operate in, or actively seek out rough water, the use of suspension seats is recommended along with an appropriate level of lateral support…

…Handholds – all seats should have hand-holds located in front of the passenger allowing them to hold on with both hands, these should be roughly at chest height and shoulder width apart. Consideration should be given to the potential loss of firm hand grip during cold conditions...'

1.9.3 Shocks and Impacts on Small Vessels

In 2011, following a series of accidents and injuries to passengers on small vessels at a wide range of speeds, the MCA published MGN 436 (M+F) Guidance on Mitigating Against the Effects of Shocks and Impacts on Small Vessels. The following are extracts:

'3.Posture

3.3 An upright posture, with the spine in neutral alignment (natural 'S' shape) should be maintained whilst facing in the direction of travel, i.e. sitting or standing sideways generally results in the occupant adopting a twisted spine thus increasing the stress on the spine and increasing the risk of injury.'

'5.4 Pre-departure briefing

5.4.1 Operators and owners of all vessels should brief those onboard prior to departure on the inherent risk and the correct posture to reduce the likelihood of injury and where handholds and foot-straps are.'

'5.6 Speed perception

5.6.1 It should be noted by operators that are providing "experience rides" that those onboard are likely to perceive that they going considerably faster than they are. Therefore operators should consider travelling at slower speeds than they themselves may perceive as fast. This will reduce the likelihood of injury to those onboard.' [sic]

1.10 PORT AUTHORITIES

The accident occurred in waters under the authority of Forth Ports Ltd.

Forth Ports Ltd Byelaw 25 states:

'The master of a vessel which has been in collision or on fire, or has sustained damage or which has caused damage to other vessels or property shall give immediate notice of the incident to the harbourmaster...'

The Forth Ports harbourmaster was not notified of this collision.

Under the Port Marine Safety Code, port authorities are obligated to conduct risk assessments to ensure that marine risks are formally assessed and are eliminated or reduced to the lowest possible level, so far as is reasonably practicable, in accordance with good practice.

Harbour authorities, and in some cases local authorities, normally have powers to issue local licences to operate from their land and within their harbour limits. Some harbour authorities in the UK, for example the Port of London Authority (PLA), impose additional requirements on the operators of small commercial high speed craft. One such requirement, imposed on all high speed craft operating on the River Thames, is that suitable seating must be provided for all passengers and crew and that seating on a RIB's inflatable tubes is not permitted:

'Thames Byelaw 16, Technical requirements for the issue of a certificate of compliance:

1.8 Seating – appropriate seating must be provided for all passengers and crew on the vessel. Sitting or riding on the side tubes or on parts of the vessel not designated as approved seats, is not permitted.'

1.11 RECREATIONAL CRAFT DIRECTIVE

The Recreational Craft Directive (RCD) applies to all new boats of between 2.5m and 24m length, regardless of their means of propulsion, intended for sports and leisure purposes. A craft built to comply with the RCD must meet essential requirements of construction and equipment. If intended to be used for commercial purposes in the UK, it must also meet the requirements of the SCV Code.

Osprey and *Osprey II* were not built to comply with the RCD.

The RCD ensures boats are built to International Organization for Standardization (ISO) standards.

BS EN ISO 6185 – 4: 2011 Inflatable Boats Part 4: Boats with a hull length of between 8m and 24m with a motor power rating of 15kW and greater, is a harmonised standard referred to by the RCD and includes:

'6.8 Seating and attachment systems (where offered as standard or optional equipment)

Seating and handholds shall provide support for spinal neutral alignment and postural stability for each person up to the crew limit and also to prevent them falling or being thrown on deck or overboard.

Buoyancy tubes shall not be used for seating areas.

7.1 Maximum permissible number of persons (crew limit)

The crew limit…shall not exceed the number of persons for which seating has been assigned…'.

Inflatable boats of over 8m in length, built to comply with the RCD after 2011 should have sufficient seating for the defined maximum permissible number of persons.

1.12 PREVIOUS/SIMILAR ACCIDENTS

Two Cardiff Bay Yacht Club RIBs (MAIB Report No 19/2011)

Two club RIBs belonging to Cardiff Bay Yacht Club collided at night while transporting a number of children across Cardiff Bay. The RIBs were proceeding at about 20 knots in the dark and carried no navigation lights or torches. One RIB had one seat and six occupants, the other, two seats and seven occupants. Those without designated seats sat on the inflatable tubes. As a result of the accident, three children, who were sitting on the inflatable tubes, were thrown into the water. One of the children sustained a traumatic brain injury, two others required subsequent extended medical treatment and several of the children from both boats suffered bruising and soreness following the collision.

Delta 8.5m RIB (MAIB Report No 1/2011)

A male passenger suffered lower back compression fractures while a RIB was transporting him and fellow workers to a jack-up barge on the River Thames. The injury occurred as the passenger landed heavily on a locker lid, where he had been sitting, after he had been momentarily lifted off the lid due to the RIB's motion. The RIB was travelling at a speed of approximately 30 knots. There were no handholds, or foot straps in the vicinity of the locker lid. The boat had four seats and there were nine persons on board.

Celtic Pioneer (MAIB Report No 11/2009)

A female passenger on board a 9m RIB suffered a lower back wedge compression fracture. She was on a 1-hour boat trip in the Bristol Channel with 10 colleagues as part of a team building exercise. The injury occurred as the passenger was momentarily lifted into the air due to the RIB's motion.

The MAIB report stated that the operation of boats conducting thrill rides and similar activities was not specifically included in the current MCA Code of Practice, and there was no industry approved code of practice. Consequently, the standards of safety management among UK operators of such boats varied considerably.

Milly (MAIB Report No 5/2014)

Six people were ejected from a RIB in the Camel Estuary. The ejection occurred as the vessel hooked during a high speed turn. The RIB continued to circle, striking several persons in the water resulting in two fatalities and seriously injuring two others. The driver was not wearing an engine kill cord, and not all of the occupants were sitting on designated seats.

E.R.Athina (MAIB Report No 3/2013)

The bosun on board the Liberian registered platform supply ship *E.R.Athina* was crushed between the ship's hull and the lifting frame of the ship's fast rescue craft (FRC). The bosun was standing at the stern of the FRC, and was trying to push the boat away from the ship's hull as a repair was being made to a small area of damaged paintwork on the hull.

Following the accident the bosun was examined on board the ship. However, because his injuries were internal and he was conscious and responsive, the potential severity of his condition was not immediately apparent. The bosun suffered severe internal chest injuries and was evacuated ashore for medical treatment. He died soon after arriving at hospital.

Kinghorn Inshore Lifeboat (MAIB Preliminary Examination July 2007)

Kinghorn ILB, a 7.3m RIB, was conducting a routine exercise in fine, calm weather, and at the time of the accident it was carrying out a series of turns at speeds of between 20 and 25 knots.

A crew member, seated on the port side inflatable tube, fell overboard during a turn to starboard. He was struck on the head by the RIB's engine propeller. Despite wearing a helmet, the crewmember suffered severe head injuries.

The RNLI's own internal investigation concluded that all crew must be properly seated and secure when practising high speed turns.

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 ACCIDENT OVERVIEW

This accident occurred when two passenger tour RIBs collided during a manoeuvre designed to make the trip more exciting. The passengers on board each RIB were not expecting such a manoeuvre as neither trip was advertised or sold as a thrill ride. The analysis focuses on the power turn manoeuvre and the vulnerability of passengers to injury.

2.3 THE POWER TURN MANOEUVRE

Osprey and *Osprey II* collided as a result of turning towards each other at close range **(Figure 11)**. The power turn manoeuvre had previously been carried out successfully on several occasions but it had not been formally risk assessed and no thought had been given to what to do if a potential collision situation developed.

This was the first time that the power turn manoeuvre had been carried out with *Osprey II* initially positioned on the starboard side of *Osprey*. On all previous occasions, the turn had been started with *Osprey II* on the port side of *Osprey*, the RIBs having crossed each other's path twice prior to the manoeuvre. On this occasion, the RIBs had crossed only once on account of the passenger sitting on *Osprey II*'s starboard inflatable tube getting splashed during the first crossing. The power turn therefore commenced with the RIBs in a different orientation and being turned in the opposite direction to normal.

Both RIBs were travelling at approximately 6 knots when they increased speed and executed the power turn. When it became apparent to both skippers that the power turn had resulted in the potential for a collision, both acted quickly to reduce the speed of their respective vessels and so lessen the impact. However, due to the closing speed and the lack of sea room, the skipper had insufficient time in which to prevent a collision.

The fact that the power turn had previously resulted in the RIBs passing each other starboard side to starboard side may explain why *Osprey II*'s skipper instinctively turned to port. Had more consideration been given to the manoeuvre when it was first conceived, it would have been possible to agree how the RIBs were to pass each other in any of the possible starting configurations.

2.4 SEATING ARRANGEMENTS

Driving RIBs at speed through waves and across the wake of other craft, commonly referred to as 'thrill rides', can be carried out safely providing all of the risks are properly identified and mitigated. Interacting with other vessels brings additional risks.

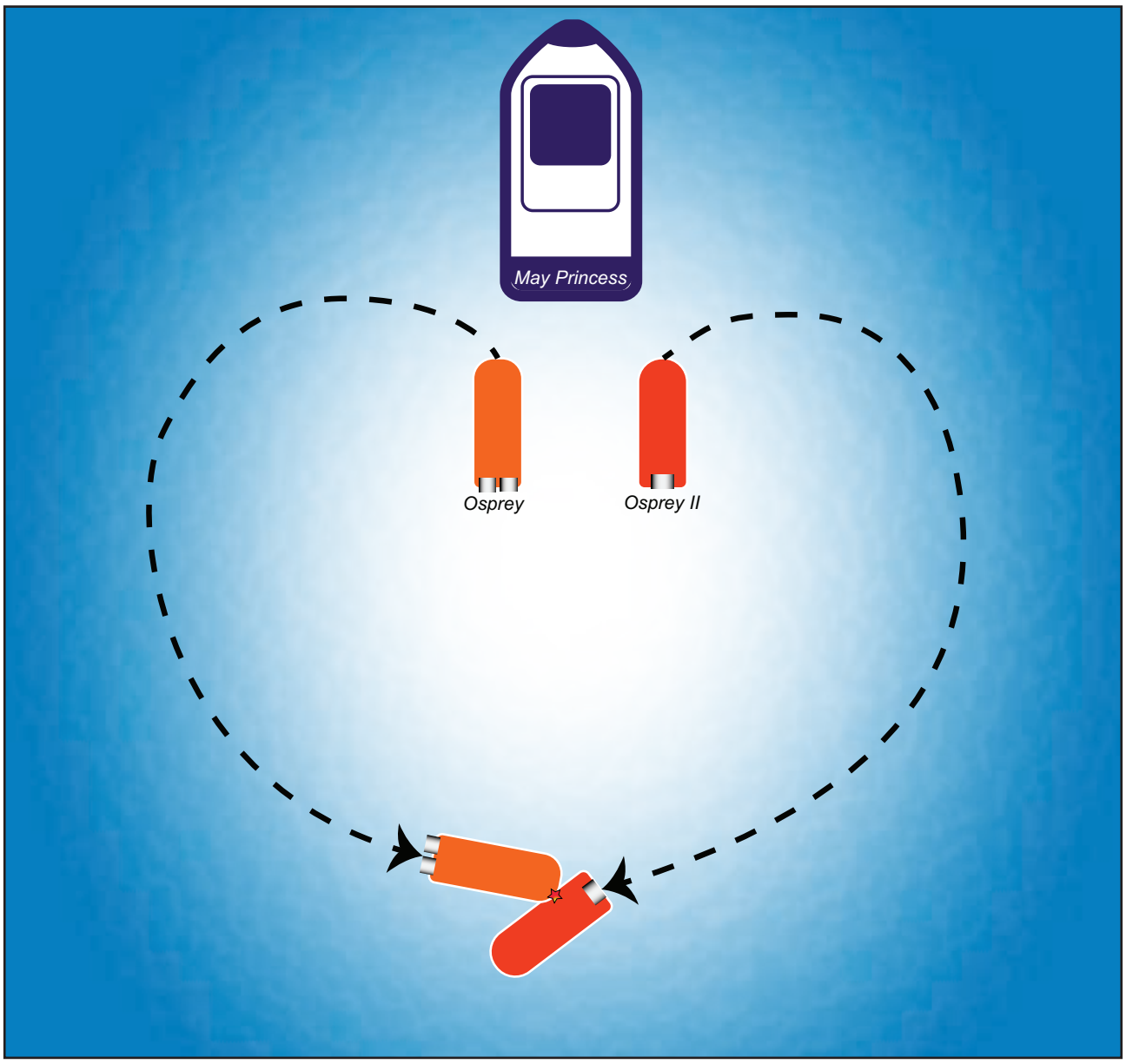

Figure 11: Power turn manoeuvre

Isle of May Boat Trips Ltd had not advertised the 'May Experience' and Taste of May' tours as 'thrill rides'. However, the skippers had decided to incorporate a level of excitement into the trips when *Osprey* and *Osprey II* were operating together. The additional risks associated with these manoeuvres had not been recognised and so the guidance contained in MGN 436 (M+F) with respect to passenger posture and speed perception was not implemented.

This investigation and many of the MAIB reports listed in section 1.12 concern accidents where passengers were not provided with an appropriate seat. The safety issues arising from these investigations highlight the need for effective risk assessment to determine suitable passenger seating for the intended activity.

Although *Osprey II* was certified to carry 12 passengers, including 4 passengers in designated positions on the inflatable tubes, Isle of May Boat Trips Ltd had limited passenger numbers in other than good weather to 8, the maximum number that could be accommodated on the RIB's bench seating. In good weather, as on the day of the accident, it allowed only 2 additional passengers to be carried on the inflatable

tubes. The decision to additionally carry the skipper's son was still within the maximum permitted passenger number. Nevertheless, it resulted in the company's self-imposed passenger number limit being exceeded and both the additional passengers and the skipper's son sat in undesignated seats.

The injured passenger's injuries would no doubt have been less severe had she not been crushed between *Osprey*'s bow and *Osprey II*'s helm console. Nevertheless, she was struck by the bow and could have suffered even more severe injuries had *Osprey*'s speed not been substantially reduced before impact.

There are currently no regulations preventing persons on RIBs from sitting on the inflatable tubes. However, passengers not sitting on suitable inboard seating have an increased risk of falling overboard, are at significant risk of musculoskeletal injuries, and are more exposed to serious injury in the event of a collision.

2.5 CURRENT REGULATION AND GUIDANCE

In the absence of specific regulation covering the design of seating fitted to passenger tour RIBs, operators are required to determine what constitutes suitable seating for their particular activity through risk assessment in accordance with section 2.10.1 and 2.10.2 of Annex 3 to the SCV Code. Current regulation and guidance can provide some assistance. However, responsibility for ensuring that the associated risks to passengers and employees are effectively managed and mitigated rests solely with the operator and skipper.

The SCV Code requires RIBs to be provided with handgrips, toeholds and handrails as necessary to ensure the safety of all persons during the worst weather conditions likely to be encountered. The only reference to seating applies to dedicated pilot boats, which are required to have seating commensurate with the vessel's operating conditions. For seagoing pilot boats, individual shock absorbent seating must be provided.

The RYA publication entitled *Passenger Safety on Small Commercial High Speed Craft* identifies that some small commercial vessel certificates allow for passengers to be seated on a RIB's inflatable tubes but warns that they may be exposed to an increased risk of back injury due to the rotated posture they will have to adopt. It implies that speed may need to be reduced and passage plans adapted, particularly in unfavourable weather conditions, to mitigate the additional risks to passengers when sitting on the inflatable tubes.

The PBA publication entitled *Management of Small Passenger Craft High Speed Experience Rides* states that bench seating should be avoided in any sea state beyond calm, and recommends the use of suspension seats if operating in rough water. It also recommends the use of handholds located in front of the passenger at chest height and shoulder width apart, and makes no reference to the possibility of passengers sitting on a RIB's inflatable tubes.

MGN 436 (M+F) recommends that passengers maintain an upright posture and face the direction of travel. It also advises that sitting or standing sideways to the direction of travel increases the risk of injury, and that operators should consider travelling at slower speeds than they themselves may perceive as "fast".

While built before 2011 and not constructed to comply with the RCD, both *Osprey* and *Osprey II* were more than 8m in length. Had they been subject to BS EN ISO 6185-4: 2011 (see section 1.11), it would have been clear that the inflatable tubes should not have been used for seating areas.

In summary, current regulation and guidance endorse the need for vessel speed and expected weather conditions to be taken into account when determining suitable passenger seating. Particular focus is given to reducing the risk of musculoskeletal injuries or falling overboard. However, they provide no metrics in terms of speed or weather with respect to what constitutes suitable seating, and make no specific reference to other factors that may need to be taken into account, such as traffic density and movement, to reduce the risk of serious injury in the event of a collision.

Research carried out during this investigation has identified that there is a wide range of RIBs certified under the SCV Code with a variety of different passenger seating arrangements. In many cases, an inboard seat is provided for each passenger but, at the other extreme, no inboard seats are provided, necessitating all 12 passengers to be seated on the inflatable tubes **(Figure 12)**.

From the findings of this investigation and the MAIB reports listed in section 1.12, it is evident that sole reliance on an operator's risk assessment to determine suitable passenger seating for a particular activity is resulting in widespread unsafe practices. Of particular concern is the absence of a common understanding between operators, the MCA, CAs, passengers and port authorities as to when seating on a RIB's inflatable tubes is considered to be unsuitable.

Given the wide range of vessel characteristics and multiple activities in the small commercial vessel sector, a large number of factors including, but not limited to, vessel speed and weather conditions, would need to be defined to ensure a consistent interpretation by all parties. An alternative and less complicated approach would be to prohibit passenger seating on a RIB's inflatable tubes unless otherwise authorised by the CA and endorsed on the RIB's Small Commercial Vessel Certificate with specified conditions to be met for a particular activity. This approach would follow the implied practice referred to in the RYA's *Passenger Safety on Small Commercial High Speed Craft*, and would support the initiative taken by the PLA to prohibit the sitting or riding on the inflatable tubes of small commercial high speed craft.

2.6 USE OF KILL CORD

Osprey II's skipper did not have his engine kill cord attached when the RIB departed Anstruther Harbour on the day of the accident.

The use of a kill cord is fundamental to the safe operation of small planing craft and it is imperative that skippers of passenger RIBs such as *Osprey II* wear the kill cord at all times. The potential consequence of failing to wear the kill cord was highlighted in the MAIB investigation report *Milly* (MAIB report 5/2014) with a subsequent safety flyer issued by the MAIB that stressed the importance of fitting a kill cord securely before starting the engine.

Figure 12: Examples of inappropriate seating on RIBs operating around the UK

2.7 CARE OF THE INJURED PASSENGER

The skippers interpreted that the passenger was probably seriously injured, and decided that the quickest means to get her to hospital was to return to Anstruther. *Osprey*'s skipper alerted the coastguard to the collision and requested that an ambulance meet the vessel on its arrival. No request was made to the coastguard for external help at the scene.

Owing to the injured passenger's discomfort caused by *Osprey II*'s movement and the deflated section of its inflatable tube, the RIB could only proceed at slow speed.

As this and the *E.R. Athina* (MAIB Report 3/2013) accidents demonstrate, even slow speed crush injuries can have devastating effects. Both skippers were first-aid trained. However, internal injuries are hard to diagnose without specialist medical expertise. Unless the extent of an injury is clear and can be competently addressed by those present, appropriate medical assistance should be sought immediately.

A Royal National Lifeboat Institution lifeboat was based at Anstruther and a coastguard helicopter was based at Prestwick. Either of these services could have been tasked at any time following the accident. However, transfer to shore on *Osprey II*, accompanied by *Osprey*, proved to be the most expedient option on this occasion.

SECTION 3 - CONCLUSIONS

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

1. The power turn manoeuvre had previously been carried out successfully on several occasions but it had not been formally risk assessed and no thought had been given to what to do if a potential collision situation developed. [2.3]

2. The power turn commenced with the RIBs in a different orientation and being turned in the opposite direction to normal. Had more consideration been given to the manoeuvre when it was first conceived, it would have been possible to agree how the RIBs were to pass each other in any of the possible starting configurations. [2.3]

3. Due to the closing speed and the lack of sea room, the skippers had insufficient time in which to react and prevent a collision. [2.3]

4. There are currently no regulations preventing persons on RIBs from sitting on the inflatable tubes. [2.4]

5. Passengers not sitting on suitable inboard seating have an increased risk of falling overboard, are at significant risk of musculoskeletal injuries and, as demonstrated by this accident, are exposed to serious injury in the event of a collision. [2.4]

6. Current regulation and guidance provide no metrics in terms of vessel speed or weather conditions in relation to what constitutes suitable seating, and make no specific reference to other factors that may need to be taken into account to reduce the risk of serious injury in the event of a collision. [2.5]

7. Of particular concern is the absence of a common understanding between operators, the MCA, CAs, passengers and port authorities as to when seating on a RIB's inflatable tubes is considered to be unsuitable. [2.5]

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

1. The decision to additionally carry *Osprey II*'s skipper's son resulted in the company's self-imposed passenger number limit being exceeded and in the skipper's son sitting in an undesignated seat. [2.4]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT[2]

1. The additional risk associated with the thrill seeking activity had not been recognised and so current published guidance with respect to passenger posture and speed perception was not implemented. [2.4]

[2] These safety issues identify lessons to be learned. They do not merit a safety recommendation based on this investigation alone. However, they may be used for analysing trends in marine accidents or in support of a future safety recommendation.

2. *Osprey II*'s skipper did not have his engine cut-out kill cord attached when the RIB departed Anstruther Harbour on the day of the accident. [2.6]

3. Internal injuries are hard to diagnose without specialist medical expertise. Unless the extent of an injury is clear and can be competently addressed by those present, appropriate medical assistance should be sought immediately. [2.7]

SECTION 4 - ACTION TAKEN

4.1 MAIB ACTIONS

The MAIB has issued a Flyer to the Small Commercial Vessel Industry **(Annex A)**.

4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

Isle of May Boat Trips Ltd has:

- Issued an instruction to the effect that no passengers or crew are to sit on the inflatable tubes of *Osprey* and *Osprey II*, in all circumstances limiting passenger numbers to 12 and 8 respectively.

- Issued an instruction to the effect that twin RIB operations are not to take place except in an emergency.

- Reviewed its risk assessments to ensure that they incorporate all activities undertaken by *Osprey* and *Osprey II*.

SECTION 5 - RECOMMENDATIONS

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

2017/115 Include in its forthcoming Recreational Craft Code with respect to commercially operated passenger carrying RIBs:

- A requirement for the certificated maximum number of passengers to be limited to the number of suitable seats designated for passengers.
- Guidance on its interpretation of "suitable" with respect to passenger seating.
- A requirement for passengers not to be seated on a RIB's inflatable tubes unless otherwise authorised by the Certifying Authority and endorsed on the RIB's compliance certificate with specified conditions to be met for a particular activity.

The **Royal Yachting Association**, in conjunction with the **Passenger Boat Association**, is recommended to:

2017/116 Review the content of the two documents '*Passenger Safety on Small Commercial High Speed Craft'* and '*Small Passenger Craft High Speed Experience Rides*'. In particular, any ambiguity with respect to seating arrangements for high speed craft should be removed and measures taken to ensure that these documents are updated and remain in line with current thinking and good practice.

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

Annex A

MAIB flyer to the small commercial vessel industry

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

FLYER TO THE SMALL COMMERCIAL VESSEL INDUSTRY

Collision between RIBs *Osprey* and *Osprey II* resulting in serious injuries to one passenger, 19 July 2016

Image courtesy of Teresa Wong-Hui

Figure 1: *Osprey* and *Osprey II*

Narrative

At 1252 on 19 July 2016, two passenger carrying rigid inflatable boats (RIBs), *Osprey* and *Osprey II*, collided in the Firth of Forth. A passenger who was sitting on an inflatable tube of *Osprey II* was crushed between *Osprey*'s bow and *Osprey II*'s helm console, resulting in her sustaining serious injuries. *Osprey II* was certified to carry 12 passengers, but only had inboard seating provided for 8. On the day of the accident the RIB was carrying 11 passengers, 3 of whom were sitting on the inflatable tubes.

Both RIBs had departed from Anstruther Harbour and were bound for the Isle of May. While proceeding in parallel, the skipper of each RIB increased speed and commenced a power turn away from each other with the intention of passing each other in the course of completing a round turn. However, as the RIBs turned towards each other, it became apparent to both skippers that the RIBs were in danger of colliding. Although they both acted quickly to reduce the speed of their respective vessels and so lessen the impact, they were unable to prevent the collision.

Image courtesy of Teresa Wong-Hui

Figure 2: Injured passenger in slumped position following accident

Safety Lessons

1. As the RIBs exited their respective turns at close range, the skippers had insufficient time in which to react and prevent a collision.

   The power turn manoeuvre had previously been carried out successfully on several occasions, but it had not been formally risk assessed and no thought had been given to what to do if a potential collision situation developed.

2. Research has identified a wide variety of seating arrangements on passenger tour RIBs. A number of tours, as in this accident, had passengers seated on the inflatable tubes, and a number of examples were found where no inboard seats were provided, necessitating all passengers to be seated on the inflatable tubes.

   Passengers seated on the inflatable tubes of passenger tour RIBs have an increased risk of falling overboard, are at significant risk of musculoskeletal injuries and are more exposed to serious injury in the event of a collision.

This flyer and the MAIB's investigation report are posted on our website: www.gov.uk/maib

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Marine Accident Report

INVESTORS IN PEOPLE