Report on the investigation of

the capsize of

Atlantic Eagle

off St Justinians, Ramsey Sound

28 September 2000

Marine Accident Investigation Branch
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Carlton House
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United Kingdom
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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the cause with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

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GLOSSARY OF ABBREVIATIONS

AALA	-	Adventure Activities Licensing Authority
BHP	-	Brake Horse Power
DSC	-	Digital Selective Calling
m	-	metres
MCA	-	Maritime Coastguard Agency
MRSC	-	Maritime Rescue Sub-Centre
RIB	-	Rigid Inflatable Boat
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

GLOSSARY OF TERMS

Eddy	-	A circular movement of water, the diameter of which may be anything from a few inches to a few miles.
Tide Rips	-	Caused by a strong stream near the seabed, being deflected upwards by obstructions on the bottom, thus causing a confused sea on the surface.

SYNOPSIS

On 28 September 2000, the RIB *Atlantic Eagle* capsized during a 'white-water' adventure trip in confused water in the vicinity of Horse Rock, between Ramsey Island and the Pembrokeshire coast. Her twelve passengers and two crew were quickly recovered by another RIB in close proximity. Although many of the passengers were shaken and sustained minor injuries, none were seriously injured.

Maritime Rescue Sub-Centre (MRSC) Milford Haven reported the accident to the MAIB by telex at 0041 (UTC+1) on 29 September, and an investigation started later that day.

It is considered the RIB capsized because it was being operated in an area of very turbulent and confused water, which was too severe for the coxswain to maintain control. A recommendation for the area to be avoided during certain tidal conditions has therefore been made. Additional recommendations are aimed at ensuring:

- Certifying authorities check that all boats operating under codes of practice have appropriate risk assessments in place.
- Thousand Island Expeditions, *Atlantic Eagle*'s operator, takes measures to improve the overall safety of its RIB operations.
- The provision of adequate VHF coverage in the vicinity of Ramsey Sound is investigated.

PARTICULARS OF *ATLANTIC EAGLE* AND ACCIDENT

Vessel details	:	***Atlantic Eagle*** **(Figure 1)**
Registered Owner	:	Ocean Dynamics
Flag	:	UK
Type	:	Rigid Inflatable Boat
Built	:	1983 - St Davids, Wales
Classification society	:	N/A
Construction	:	Aluminium hull and rubber tubing
Length overall	:	9 metres
Gross tonnage	:	N/A
Engine power	:	300 BHP
Service speed	:	24 knots
Other relevant info	:	Water jet propulsion

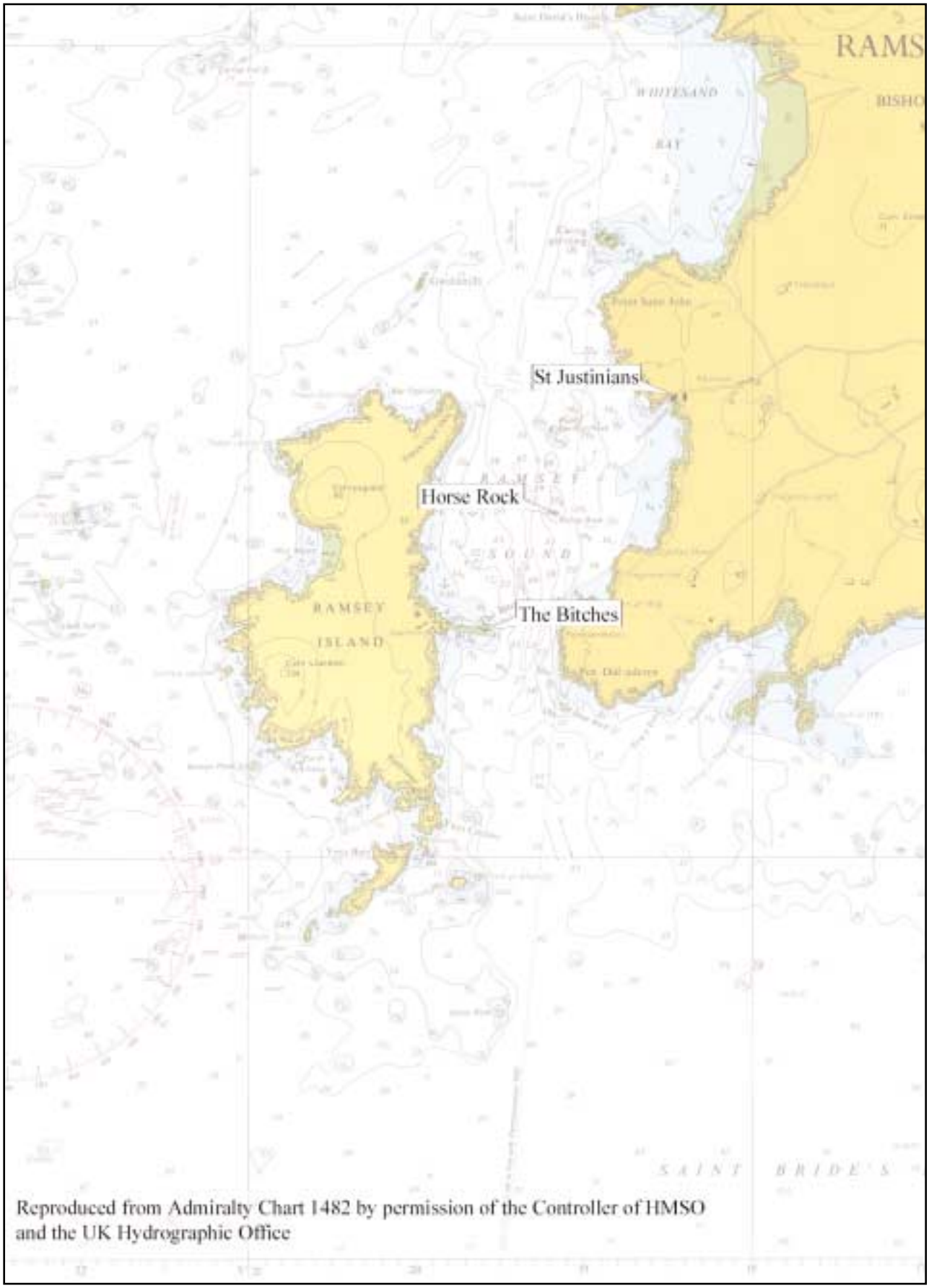
Accident details

Time and date	:	1730 UTC 28 September 2000
Location of incident	:	51° 52.0’N 005° 20.0’W
Persons on board	:	14
Injuries	:	Several people with abrasions, bruising, and shock
Damage	:	Water immersion of engine and electrical equipment. Rubber tube and hull damaged during recovery.

Figure 1

Atlantic Eagle after capsize and recovery

Figure 2



Reproduced from Admiralty Chart 1482 by permission of the Controller of HMSO and the UK Hydrographic Office

SECTION 1 - FACTUAL INFORMATION

All times are UTC (+1). A chart extract of Ramsey Sound can be seen at **Figure 2**.

1.1 THOUSAND ISLAND EXPEDITIONS

Thousand Island Expeditions is a company based in St Davids, Pembrokeshire. It has been operating rigid inflatable boat (RIB) trips to Ramsey Sound since 1975.

The focal point for the activities of Thousand Island Expeditions is Ramsey Island with its wildlife, and a collection of partially submerged rocks through which the tidal stream slices. These rocks, or islets, are known as The Bitches, and it is from these that the expedition derives its name.

Thousand Island Expeditions currently offers two different excursions between April and October:

a A 'Two Hour Spectacular' to view the wildlife around Ramsey Island. During the busiest part of the season in July and August, when the trip runs six times daily, passengers embark and disembark at the beach in Whitesands Bay. For the remainder of the season they run from the lifeboat slip at St Justinians. Although suitable for children, those under 16 years old must be accompanied by an adult. This trip does not require pre-booking.

b. A 'Bitches Adventure', which is a one hour 'white-water' trip to the ledge on the south-east corner of Ramsey Island. These trips run from the lifeboat house at St Justinians during spring tides, which normally limits the number of trips per season to about 20. The trip involves the use of two RIBs operating in company. Children under the age of 16 are not permitted. It must be pre-booked, and passengers are encouraged to view a video of the trip, including dangers, and what to expect from it, in the St Davids office before departure. Other parts of the Sound are visited routinely during this trip, but Horse Rock is not. Unlike several other water sport or water-based activities, this 'white-water' activity is not controlled by a governing body.

In addition to the main office in St Davids, the company operates from a small hut at St Justinians. The hut is situated in a car park immediately above the lifeboat house, and is a good vantage point from which most of the sound is visible. The office is usually manned when the company's boats are operating in Ramsey Sound, or around Ramsey Island. It is equipped with a VHF radio, but no telephone. The company has established operating procedures, but these have not been formalised in written documentation.

Two serious injuries have been previously recorded by the company: one person broke an arm during a 'Bitches Adventure', and a small girl slipped and injured her spine during a trip around Ramsey Island. In addition, two passengers fell overboard 'involuntarily' during previous 'Bitches Adventure' trips, but were safely recovered without injury.

Two other companies, ‘Voyages of Discovery’ and ‘Aquaphobia’ operate RIB tours around Ramsey Island. They do not operate ‘white-water’ trips akin to the ‘Bitches Adventure’.

1.2 THE BOATS

Thousand Island Expeditions operates two RIBs: *Atlantic Eagle* and *Storm Raven*. They were purpose-built by Ocean Dynamic Ltd; a company owned by the same person as Thousand Island Expeditions. Both RIBs are powered by waterjet: *Atlantic Eagle* with 300 BHP has a maximum speed of about 24 knots, whereas *Storm Raven* with 420 BHP has a maximum speed of about 28 knots.

Atlantic Eagle has an aluminium hull with rubber inflatable tubing. The tubing is divided into seven independent compartments, and the hull has four separate watertight chambers, any one of which would keep the boat afloat. The boat is not fitted with an enclosed shelter. *Storm Raven*, though not identical, is of similar construction. Until 28 September, neither boat had capsized.

Certificates were issued in April 2000 by Burness, Corlett and Partners, to enable both boats to operate under the Small Commercial Vessel and Workboat Codes of Practice (Yellow and Brown Codes).

1.3 THE COXSWAINS AND CREW

Each RIB is manned by a coxswain with a valid Boatmaster Licence and a crewman: *Atlantic Eagle*’s coxswain had been driving the boat since 1985 on both the nature and ‘Bitches’ excursions, and *Storm Raven*’s coxswain joined the company in 1977 as a crewman. He has been a coxswain since 1982. Both coxswains have a comprehensive knowledge of the waters and local conditions in Ramsey Sound. Although not required to be certificated, the crewmen are trained to drive the boats in an emergency.

Both coxswains had completed a basic sea survival course, and all crew except *Atlantic Eagle*’s coxswain had completed recognised first-aid training to varying levels.

1.4 NARRATIVE

At about 1700, 12 passengers embarked in *Storm Raven* at the lifeboat slip for the ‘Bitches Adventure’. On completion, the boat left the slip and moved to a mooring about 50 to 100m from it. Soon after, 12 passengers embarked in *Atlantic Eagle* and sat on the rubber tubing, six on each side of the boat. She, too, then secured to a mooring off the lifeboat slip. At the mooring the coxswains stopped the engines, issued lifejackets and protective helmets, and briefed the passengers on the safety aspects of the trip.

Both boats then slipped the moorings. *Atlantic Eagle* remained close to the mainland and headed south at a steady speed to allow the engine time to warm

through. She then crossed Ramsey Sound towards The Bitches, remaining there for about 20 minutes in company with *Storm Raven*. Meanwhile each boat conducted several runs across The Bitches in northerly and southerly directions. The boats then visited small coves on Ramsey Island to view local seal colonies, and ventured to the southern end of the sound to experience the large seas. On the return journey north, several more runs across The Bitches were conducted until between 1820 and 1825, when the boats headed back to St Justinians.

Storm Raven, which was about 400 to 500m ahead of *Atlantic Eagle,* manoeuvred briefly to the west of Horse Rock. Although not visible because of the height of tide, the Rock could be located by an area of turbulent water. She then returned to the lifeboat slip. As tidal constraints prevented both boats from disembarking passengers on the slip simultaneously, *Atlantic Eagle*'s coxswain decided to kill time by manoeuvring in the vicinity of Horse Rock also. Initially passing to the west of it on a northerly heading at about 20 knots, he then turned to starboard about 100m off it to aim directly at the area of turbulent water. As the boat steadied she started to surf on the front of a wave until, suddenly, the bows dipped into an eddy or whirlpool, decelerated rapidly, and sheered sharply 90° to port. At the same time the port quarter of the boat lifted and she overturned.

As a result, initially the crewman and two passengers were trapped under the overturned boat; the remainder were thrown clear. The crewman, who had been snagged by a mooring line secured on a frame on the boat's stern, eventually cleared the hazard and swam to the surface with the two passengers, who had experienced difficulty swimming under the rubber tubing. The coxswain managed to climb on to the overturned boat, while the rest either linked arms in small groups, or, with some difficulty, tried to hold on to the overturned boat. One passenger, however, became separated from the others.

Moments after *Atlantic Eagle*'s capsize, *Storm Raven*'s coxswain spotted the overturned boat, when about 10m from the slip at St Justinians. With 12 passengers still embarked, he turned about immediately and headed back towards *Atlantic Eagle*. At about the same time, one of the company's employees at St Justinians saw the overturned boat with *Storm Raven* proceeding to assist. She drove to a nearby farmhouse, which was known to belong to a member of the St Justinians lifeboat, and raised the alarm. The coastguard was called at 1841, and the St Justinians lifeboat was activated immediately.

Storm Raven arrived at the scene quickly, and began to recover *Atlantic Eagle*'s passengers and crew, starting from the north. All, except the passenger who had become detached, were recovered swiftly over the stern. This task was made easier because *Storm Raven* is propelled by water jet and is not fitted with a stern transom. There was no risk of injury from a rotating propeller, and passengers were able to climb on board at water level. A search for the missing passenger was initiated. *Storm Raven*'s coxswain considered the missing

person might be trapped under *Atlantic Eagle*, and prepared to enter the water to search for him. Less than 5 minutes later, however, the missing person was seen to the south and recovered at 1852. The lifeboat arrived at the scene at 1854.

About 5 minutes later, *Atlantic Eagle*'s passengers and crew were landed at the lifeboat slip, and an ambulance was called at 1901 to provide medical assistance. This arrived at 1945 and paramedics attended to minor injuries. None were serious.

The lifeboat towed *Atlantic Eagle* to moorings off Porthgain where she was secured. After breaking from them during the night, she was found the following day about 4 miles to the north-west of Abercastle, to where she was towed and beached.

1.5 ENVIRONMENTAL CONDITIONS

The wind was south to south-east force 5 to 6, locally force 7. The sea was moderate to rough, and a swell was running at the southern entrance to Ramsey Sound. Visibility was good.

It was spring tides, and high water in Ramsey Sound was at 2006; the height of tide at 1830 was 4.7m. In the centre of Ramsey Sound, the tidal stream was northerly at about 6 knots, but in The Bitches it was accelerating between the rocks to considerably more.

Sunset was at 1906 and civil twilight was at 1939.

1.6 DUTY SKIPPER

The two coxswains shared the role of duty skipper on a rotating three-day basis. The duty involved conducting routine administrative tasks, and deciding whether the conditions were suitable for a planned trip. On 27 September, the day before the incident, *Atlantic Eagle*'s coxswain was the duty skipper. Assessing the conditions from ashore, he decided that the wind and sea conditions were unsuitable for the planned 'Bitches' trip that evening. As a result the trip was cancelled.

The next day, *Storm Raven*'s coxswain was the duty skipper. He had not seen the conditions experienced the previous day. Two trips were planned: the first, a two-hour clockwise trip around Ramsey Island from 1500 - 1700 for 8 adults from Twr Y Felin Outdoor Pursuits Centre. The second, 'Bitches Adventure' was from 1730 until 1830. The duty skipper was aware the 'Bitches Adventure' had been cancelled the day before because of the conditions. Although the conditions were similar, he decided it was safe to conduct the excursion around Ramsey Island, which by its nature was less hazardous. As neither the weather, nor sea conditions, caused any problems during this trip, the duty

skipper decided it would be safe to go ahead with the ‘Bitches Adventure’ at 1730. The coxswain of *Atlantic Eagle* remained concerned about the unpleasantness of the conditions, but was reassured by his colleague they were better than on some of their previous trips.

1.7 SAFETY EQUIPMENT AND CLOTHING

1.7.1 Lifejackets

The passengers were issued with ‘Crewsaver’ lifejackets, compliant with BS EN 396, with in-built buoyancy provided by foam padding. An orally-inflated chamber could be used for additional buoyancy. They were secured by chest straps; no crotch straps were fitted. The lifejackets were checked visually for damage at the end of each day, and were fully inflated, and the lights and whistles were tested weekly. The only significant problem highlighted during routine inspections concerned the lights; batteries that should last five years were lasting less than one week. The problem with the lights was found on both ACR and McMurdo models. The lifejackets were issued to, and donned by, the passengers in the mooring area immediately off St Justinians. Under the codes of practice, the lifejackets had to be carried in the vessel, but not worn.

After *Atlantic Eagle* capsized, the passengers reported five problems with the lifejackets:

- the buoyancy provided by the foam padding hindered the efforts of those trying to free themselves from under the boat;
- oral inflation was extremely difficult, and was not fully achieved by several passengers;
- even when buoyancy was increased by oral inflation, it was barely sufficient to keep a person afloat;
- the chest straps became tighter following inflation, making breathing more difficult; and
- the lifejacket tended to ‘ride up’ the wearer in the water.

Atlantic Eagle’s coxswain was not wearing the same type of lifejacket as those issued to the passengers; he was wearing a foam buoyancy aid beneath a waterproof jacket.

1.7.2 Protective helmets

Each passenger was issued with a ‘Prijon’ protective helmet designed for use in canoeing and white-water activities.

1.7.3 Clothing and footwear

Advice regarding clothing and footwear is given by Thousand Island Expeditions on its booking confirmation sheet which states:

> *You should be wearing: shoes that you do not mind getting wet, with a good grip on the sole and plenty of warm layers all over with hats where possible. Waterproof jackets are necessary and can be borrowed from us if you do not have your own. Waterproof trousers are a good idea if you have them (we do not provide these). Wetsuits are fine but must be worn under warm waterproof, windproof layers….*

Most of the passengers heeded this advice and wore several layers of clothing. Various types of footwear were worn, including walking boots. Passengers report that when in the water, the weight of the layers of clothing considerably reduced their buoyancy, and that walking boots were heavy and difficult to remove.

1.7.4 Liferafts

Atlantic Eagle carried two liferafts: an eight-person and a six-person. They were stowed in a fixed container with a lid secured by clips at the forward end of the boat's central console. Although fitted in accordance with the relevant codes of practice, they did not deploy when the boat capsized.

1.7.5 Portable VHF radio and flares

These were kept in a 'grab bag' stowed in a locker close to the coxswain's console.

1.7.6 Passenger seating in the boat

The passengers were seated on the rubber tubing, six on each side. A steel handrail fitted to the boat's central console, and a rope line on the top of the rubber tubing provided the means by which to hold on. The boat was not fitted with foot-straps.

1.8 SAFETY BRIEFING

The safety briefing was conducted in *Atlantic Eagle* while secured to a mooring just off St Justinians. The coxswain states that the subjects covered included: the operation of the lifejackets, how to hold on, and what to expect such as sudden sideways movement.

The opinion of the passengers regarding the brief given by *Atlantic Eagle*'s coxswain on the day of the incident was that it was short, light-hearted, and concentrated mainly on the operation of the lifejackets. The brief was also concurrent with the fitting of the lifejackets, and one passenger reports that she did not hear the instructions on how to inflate them. No advice regarding what to do in the event of falling overboard or capsize was given.

1.9 HORSE ROCK, THE BITCHES, AND TIDAL STREAMS

Horse Rock is a 21m high vertical column, rising from the seabed. It has a drying height of 0.9m above chart datum. The predicted depth of water over the rock at the time *Atlantic Eagle* capsized was 3.8m. When it is submerged and the tidal stream is strong, the water in its vicinity is extremely turbulent and its position is usually marked by tide rips. Also, when the tidal stream is northerly, in addition to the tide rips, a back eddy with a southerly flow forms to the north of the rock. Passengers from *Atlantic Eagle* have described the water in the vicinity of the rock on 28 September as being similar to a witch's cauldron, with whirlpools and extremely aerated water.

For most of the time however, when the tidal stream is not near its maximum spring rate, the conditions in the vicinity of the rock do not present a hazard. Consequently, local boats frequently pass close to Horse Rock. *Atlantic Eagle*'s accident is the only capsize known to the St Justinians lifeboat's skipper, to have occurred in its vicinity.

The Bitches is a ledge of rocks extending 2 cables from the middle of the eastern side of Ramsey Island. A picture of The Bitches can be seen in **(Figure 3)**.

Figure 3

The Bitches

The following information is given in Admiralty Sailing Directions (West Coast of England and Wales Pilot):

a) Horse Rock, with a dangerous wreck close W, lies 6 cables N of Pen Dal-aderyn, its position being generally marked by tide rips.

b) Tidal streams. In the narrowest part of Ramsey Sound the streams begin as follows:

Interval from HW Milford Haven	*Direction*
+0300	*South*
-0325	*North*

The maximum spring rate in each direction is 6 kn. The rate of the stream decreases N and S of the narrowest part but a spring rate of 5kn may be encountered on the N-going stream as far N as Gwahan.

c) On the N-going stream eddies run S on both sides of Ramsey Sound, those on the W side between The Bitches and Gwahan, and those on the E side between the narrows and Point St John.

d) The best time for making passage through Ramsey Sound is at slack water, but it should not be attempted without local knowledge…..Pay particular attention to the helm on account of the strong tidal streams and eddies.

Based on this information, the tidal stream in Ramsey Sound on the day of the incident was northerly from 1611 until 2236.

1.10 VHF RADIO

VHF radios are fitted to the control consoles in both RIBs which also carry portable handsets. None of these radios were used to raise the alarm: *Atlantic Eagle*'s fixed radio was under water, and the portable set was in the 'grab bag' and inaccessible. *Storm Raven*'s coxswain did not attempt to raise the alarm via VHF. As difficulties are experienced with VHF radio coverage in Ramsey Sound, he believed that he would not be able to contact the coastguard from his position close by the lifeboat slip. He therefore opted to proceed directly to *Atlantic Eagle*, and not waste time trying to raise the alarm on VHF radio. Gaps in VHF radio coverage are also reported to exist to the west of Ramsey Island.

1.11 CODES OF PRACTICE

1.11.1 The Safety of Small Commercial Motor Vessels (Yellow Code)

This code of practice is:

For the construction, machinery, equipment, stability, operation and examination of motor vessels, of up to 24 metres load line length, in commercial use and which do not carry cargo or more than 12 passengers.

With regard to sport diving, sea angling, and other water-based activities it states:

1. *The Code deals with safety of the vessel and its occupants but the sport or pleasure activities of those on board are not considered from the particular safety needs which may be relevant to the activities.*

2. *The Government's objectives for sport were set out in the document "Sport and Active Recreation".....The principle of self-determination for sports bodies has been encouraged to the extent that when it has been necessary to impose some form of control on such bodies…the policy has usually been to encourage the bodies to accept voluntary codes or procedures which would have the same effect as regulation.*

3. *In 1990, the Minister for Sport commissioned a review into safety in water sports. The review concluded that the current system of self-regulation developed by the governing bodies of sport is sufficient to meet their responsibility for the safety of sport participants.*

1.11.2 The Safety of Small Workboats and Pilot Boats (Brown Code)

This code of practice is:

For the construction, machinery, equipment, stability, operation, manning, examination, certification and maintenance of vessels of up to 24 metres load line length which are in commercial use for the carriage of cargo and/or not more than 12 passengers or neither cargo nor passengers; and Pilot boats.

The code does not apply to commercial vessels engaged in sport or leisure activities.

1.11.3 Category

Atlantic Eagle has Category 3 Certificates under both codes of practice, allowing her to operate up to 20 miles from a safe haven.

The Yellow Code, with reference to rigid inflatable boats, states:

4.5.1.3 A boat should be of strength to withstand the sea and weather conditions likely to be encountered in the area of operation.

4.5.1.4 An approved boat may be accepted for area categories 4 (up to 20 miles from a safe haven in favourable weather and in daylight)

4.5.1.5 A rigid inflatable boat with a substantial enclosure for the protection of persons on board and purpose designed may be considered for operations in area categories 2 or 3 subject to approval of the Certifying Authority.

The Brown Code contains similar provisos.

1.11.4 Definitions:

1. The Brown Code:

a. "Daylight" means one hour before sunrise until one hour after sunset.

b. "Favourable weather"…means conditions existing throughout a voyage or excursion in which the effects either individually or in combination of swell, height of waves, strength of wind and visibility cause no hazard to the safety of the vessel, including handling ability. (In making a judgement of favourable weather the skipper should have due regard to official weather forecasts for the service area of the vessel or to weather information for the area which may be available from the coastguard or similar coastal safety organisation).

2. The definitions of "daylight" and "favourable conditions" are not contained in the Yellow Code.

1.11.5 Merchant Shipping Health and Safety Regulations

The Merchant Shipping and Fishing Vessels (Health and Safety) Regulations 1997 came into force on 31 March 1998 and is applicable to all United Kingdom ships, including vessels operating under codes of practice. Guidance on the application of these regulations is provided by the MCA in MGN 20 (M + F) which states:

…..it is the duty of employers to protect the health and safety of workers and others affected by their activities so far as is reasonably practicable.

Among the principles for ensuring health and safety highlighted in the MGN are:

a. The avoidance of risks, which among other things includes the combating of risks at source and the replacement of dangerous practices, substances or equipment by non-dangerous or less dangerous practices, substances or equipment;

b. The evaluation of unavoidable risks and the taking of action to reduce them;

c. Giving collective protective measures priority over individual protective measures; and

d. The provision of appropriate and relevant information and instruction for workers.

The Yellow Code contains no reference to the health and safety regulations, and guidance on this subject in the Brown Code is limited to:

The owner/skipper of a vessel is responsible for the health and safety of anyone working on the vessel. When the owner/skipper employs crew, the Merchant Shipping Health and Safety Regulations apply.

At the time of the accident, the owner of Thousand Island Expeditions was not aware of the requirements of the Merchant Shipping Health and Safety Regulations, particularly the need to conduct a risk assessment of his vessels' water-borne activities. As the conduct of a risk assessment was not a requirement for certification, the boat's certifying authority did not check its completion.

1.12 INTENDED ACTIONS BY THE COMPANY

Following the capsize of *Atlantic Eagle*, Thousand Island Expeditions informed the MAIB of its intention to:

a) Prohibit its boats from navigating in the vicinity of Horse Rock during periods of strong tidal streams, or when tide rips are observed.

b) Contact the coastguard at the start and completion of each day's boat activity.

c) Keep the hut at St Justinians manned when its boats are conducting 'white-water' trips.

d) Fit DSC VHF radios to its RIBs, and investigate a more suitable stowage for portable VHF radio sets.

e) Investigate the provision of more suitable lifejackets, clothing and footwear for passengers on the 'Bitches Adventure'.

f) Establish written operating procedures for its personnel.

g) Review the content, conduct, and location of its safety briefs.

h) Ensure that all snagging hazards, such as mooring lines, are secured in lockers when not in use.

i) Decrease the duration of ‘Bitches Adventure’ trips from one hour to forty-five minutes.

SECTION 2 - ANALYSIS

2.1 THE DECISION TO PROCEED WITH THE TRIP

The company's duty skipper on 27 September cancelled the planned evening 'Bitches Adventure' because of the adverse wind and sea conditions. As these had not changed appreciably on the following day, it would have been consistent for the 'Bitches Adventure' planned for that evening to also have been cancelled. This was not the case. However, although similar conditions existed, the decisions were made by different people and based upon different criteria; one based his decision on observations from ashore, the other from the conditions experienced first hand during a circumnavigation of Ramsey Island.

Each coxswain is responsible for the safety of his boat and passengers, and must ultimately make the final decision whether or not he is prepared to put to sea; he should be aware of his own competency and use judgment accordingly. This was the case in this instant. Although *Atlantic Eagle*'s coxswain remained apprehensive about the unpleasantness of conditions, he discussed the matter with the duty skipper, and the decision to proceed was agreed by both.

2.2 THE SAFETY BRIEFING

It is apparent from the observations of the passengers that the safety brief was inadequate and did not prepare them for the situation in which they found themselves. Briefing and issuing lifejackets to passengers while at a mooring with the engine switched off has advantages: it is quiet, the passengers are a captive audience, and there are few distractions. A major disadvantage is that passengers transit from the slip to the mooring without a buoyancy aid or brief on how to hold on. While the distance from the slip to the mooring is short and made at slow speed, such a practice is not prudent. In this case, it is apparent that briefing the passengers on the operation of the lifejackets, at the same time as they were putting them on, meant that several passengers missed important information.

Had passengers been fitted with lifejackets and given the safety briefing before getting into the boat, not only would they have been better prepared from the outset, this would also have provided an opportunity to appraise them of the marginal conditions and allow them the option of withdrawing from the trip if they wished. Uncertain or nervous passengers may find it easier to withdraw from a trip when it can be done discreetly and without affecting others. This is not possible once in the boat and clear of the lifeboat slip.

Conducting briefs in a light-hearted manner is not necessarily wrong, and can be effective in certain circumstances, if done well. There is a danger, however, that when conducting briefs in this manner, important information can be trivialised and the impact of the brief significantly reduced.

Given the conditions, along with the nature of the ‘Bitches Adventure’, the inclusion in the briefing of actions to be taken in the event of capsize would have been a wise precaution.

2.3 THE CAPSIZE

Atlantic Eagle’s coxswain was experienced, and had a good knowledge of the local conditions in Ramsey Sound. He knew that it was spring tides and that the tidal stream was about 6 knots; he was also aware of the turbulent waters that can be experienced in the vicinity of Horse Rock. Yet, faced with the prospect of a several-minute wait while *Storm Raven* cleared the slip, *Atlantic Eagle*’s coxswain opted to manoeuvre in its vicinity. Although this was not usual practice for a RIB on a ‘Bitches Adventure’ trip, his decision was intended to maximise the enjoyment of his passengers.

Initially making good about 20 knots through the water when transiting to the west of the rock, the boat’s speed would have been considerably reduced following the turn to starboard. Once out of the turn, and in the back eddy to the north of Horse Rock, it is feasible that she began to surf on the front of a southerly-moving wave. When the bows entered the tide rip or whirlpool, the boat would have been influenced by two opposing forces: the wave, and the whirlpool. Under such conditions, severe and unexpected movement is likely. In this case *Atlantic Eagle* sheered to port, decelerated rapidly and her port quarter was lifted to an irrecoverable angle, causing capsize.

Phenomena such as tide rips, whirlpools, back eddies and standing waves in the vicinity of Horse Rock, are primarily the result of interaction between tidal stream and the rock itself. Other factors however, including wind speed and direction, precipitation, swell, and barometric pressure are also influential. Consequently, other than predicting that water turbulence will be at its greatest when tidal stream is at its maximum, it is almost impossible to determine the exact nature of the turbulence in specific locations around the rock at any given time. With a strong southerly wind, it is possible the hydrodynamic forces in the vicinity of the rock might have been exacerbated. It is, therefore, most unlikely the coxswain could have foreseen the effects of the conditions experienced. Given the strength of the hydrodynamic forces, along with the speed of capsize, it is also assessed that the coxswain could not have taken actions to have prevented it. It must be concluded, therefore, that when the tidal stream is strong, the waters in the vicinity of Horse Rock are unpredictable and are unsuitable for a ‘white-water’ leisure trip of this type, even when undertaken with robust boats and experienced coxswains.

At other times, particularly slack water, the water around the rock may be no more dangerous than any other part of Ramsey Sound. However, as the exact rate of tidal stream at which the dangerous water turbulence begins is not known, the area is best avoided whenever evidence of water turbulence, such as tide rips or overfalls, are seen.

2.4 SAFETY EQUIPMENT AND CLOTHING

The difficulties experienced by passengers in the water appear to be a function of the turbulent, aerated nature of the water, and the inadequacies of the safety equipment and clothing worn:

a. The lifejackets provided may be suitable under normal circumstances, but not necessarily for a 'white-water' trip, where the dangers of capsize or falling overboard in turbulent water are far greater. In this incident, although the lifejackets' in-built buoyancy initially caused difficulties for those passengers trapped under the boat, the buoyancy proved insufficient for the remainder, who struggled to keep afloat in the aerated water. In turbulent and aerated water buoyancy is reduced, and it is easy for a passenger to become disorientated. In such conditions, a lifejacket requiring oral inflation is inappropriate. Other types of lifejacket, which are also fitted with crotch rather than chest straps are available, and are more suitable for use on boat trips of this nature.

b. The issue of the 'canoeing' style protective helmets is prudent.

c. Buoyancy was further reduced by the weight of the many layers of clothing and footwear the passengers were advised to wear. The advice given by the company was probably well intended and aimed at ensuring its passengers remained warm and comfortable throughout the trip. In giving this advice, however, the company failed to appreciate the possible reduction in buoyancy that may result. Had the passengers been wearing clothing such as wet or dry suits that retain heat and maintain buoyancy, along with light shoes (such as plimsolls) that can be easily discarded, they would have experienced less difficulty in staying afloat.

d. The boat was required to carry liferafts under its codes of practice. The fact that the liferafts were not deployed following the capsize was expected, given that they were sited in a secure stowage, and capsize occurred extremely quickly. Had they been secured via hydrostatic releases, this would not have made any difference, as the boat remained afloat, albeit upside-down.

e. Although the passengers were seated on the rubber tubing, the means with which to hold on were satisfactory. The lack of foot-straps on *Atlantic Eagle* (foot-straps normally reduce the chances of a passenger falling out of a boat) did not in fact affect passenger safety in this instance. Indeed, if foot-straps had been fitted, more passengers might have been trapped briefly as the boat overturned.

f. The life-line attached to the rubber tubing was not visible when the boat was upside-down. The passengers trying to remain with the boat would have found this task easier had they been briefed on how to use the life-line following capsize, or had a second line been fitted closer to the aluminium hull.

2.5 THE USE OF VHF RADIO

The reported gaps in the VHF radio coverage is cause for concern, especially in an area where several operators offer boat trips to the public. After seeing that *Atlantic Eagle* had capsized, the coxswain of *Storm Raven* should have alerted the coastguard by VHF radio, but did not do so because he lacked confidence in the VHF coverage in his immediate area. Fortunately, on this occasion he was able to render immediate assistance, and the employee ashore quickly alerted the coastguard. On another day, for a boat in difficulty, operating alone, and without the comfort of somebody watching from ashore, the consequences of being unable to notify the coastguard via VHF radio could be serious.

The use of VHF radio in fast open boats, such as RIBs, can be extremely difficult; the noise of the engine and wind can make it extremely difficult to communicate via this means. This is possibly why, with a radio already fitted to *Atlantic Eagle*'s console, the seldom-used portable set had been placed in a 'grab bag' and secured in the boat. Consequently, as the 'grab bag' remained in the overturned boat, the portable VHF radio could not be used. If the portable set had been carried in a waterproof cover by either of the crew, it would have been available for use, and might have been invaluable in raising the alarm had others not noticed the capsize.

2.6 BOAT CERTIFICATION AND OPERATIONS

Atlantic Eagle is certified to operate under Brown and Yellow Codes of Practice. As the Brown Code does not apply to vessels in commercial use for sport or pleasure, when conducting excursions in and around Ramsey Sound and the 'Bitches Adventure' trips, she operates under the latter. Accordingly, with a Category 3 endorsement, she is authorised to carry up to 12 passengers, 20 miles from a safe haven at any time. However, while a boat may be materially sound, manned and equipped in compliance with a particular code, this does not mean it is suited to conduct any water-based activity within the geographical, meteorological, or time limits imposed. A boat must be assessed to ensure it is fit for purpose. A 'white-water' trip over a ledge in strong tidal streams is, by intent, more hazardous than a nature trip around Ramsey Island. The safety equipment requirements of the relevant code of practice may, therefore, be appropriate for one, but not necessarily, both trips.

The MCA appears content to allow governing bodies of water sports and water-based activities to regulate the sports and activities via voluntary codes of safety and procedures. Unlike many sports and activities, however, the 'white-water' activity undertaken by Thousand Island Expeditions is not regulated by a governing body. Under these circumstances, the responsibility of ensuring the safe operation of the activity, falls to the operator.

In this case, the company has a good safety record spanning 25 years, its boats are sturdy, and its coxswains experienced. Additionally, at the time of the

accident, several precautions and risk control measures beyond the requirements of the Yellow Code, were in place: the 'Bitches Adventure' trips were conducted with two RIBs; an employee was in place to oversee the boats from a vantage point at St Justinians; and the trips only operated in daylight, between April and October. These measures were prudent: the mutual support and assistance provided by *Storm Raven* resulted in the rapid recovery of passengers and crew; the presence of an employee at St Justinians enabled the coastguard to be quickly alerted; there was adequate daylight remaining in which to complete the rescue. Consequently, a prolonged search and rescue, more serious injuries, or even loss of life were possibly prevented. Additional safety measures taken by the company include the provision of safety helmets, the minimum age requirement, and the wearing of lifejackets, none of which are required by the code. Although the owner was not aware of the requirement to conduct a risk assessment of his water-borne activities, the precautions taken above indicate he had identified many of the risks involved and had taken appropriate measures to minimise them. A process of risk assessment had occurred, but had not been formalised.

Despite the precautions taken, the accident and difficulties experienced by passengers in the water, indicate that the safety aspects of such 'white-water' trips can be improved further by introducing more appropriate lifejackets, clothing, and footwear, along with implementing written operating procedures and giving comprehensive safety briefs. The intended actions of Thousand Island Expeditions are, therefore, supported. However, as 'white-water' trips of this kind are a specialist activity and lack a governing body, it may be beneficial for the company to draw upon the experience and knowledge of bodies such as the AALA when deciding on the detailed improvements to be made.

It is noted that as *Atlantic Eagle* is not fitted with a shelter, her operation under both codes of practice should be limited to Category 4 (up to 20 miles from a safe haven, in favourable weather, and in daylight).

2.7 INTENDED ACTIONS BY THE COMPANY

The intended actions noted in paragraph **1.12** are considered prudent, and should improve the safety aspects of all Thousand Island Expeditions' boat operations.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

1. The coxswain was qualified to drive *Atlantic Eagle*. [1.3]

2. The coxswain has driven *Atlantic Eagle* since 1985. [1.3]

3. The coxswain has a good knowledge of the local waters and conditions. [1.3]

4. *Atlantic Eagle* is certified to operate under the Brown and Yellow Codes of Practice with an area of operation of up to 20 miles from a safe haven (Category 3). As it is not fitted with a shelter, its area of operation should have been limited to Category 4 (20 miles from a safe haven, in favourable weather and in daylight). [1.2,1.4,1.11]

5. Definitions of 'favourable weather ' and 'daylight' are not contained in the Yellow Code. [1.11]

6. The 'white-water' activity undertaken during the 'Bitches Adventure' is not controlled by a governing body. [1.1]

7. This was the first occasion the boat had capsized. [1.2]

8. The passengers were evenly distributed in the boat. [1.4]

9. Tidal stream was northerly at about six knots; it was spring tides. [1.5]

10 The wind was south-south-easterly, force 5 to 6, locally force 7. [1.5]

11. The decision to proceed with the 'Bitches Adventure' was based on the experiences of *Storm Raven*'s coxswain during an earlier trip. [1.6]

12. The decision to proceed with the 'Bitches Adventure' was agreed by both coxswains. [1.6,2.1]

13. Passengers were not issued with lifejackets, nor given a safety briefing, until the boat was secured to a mooring. [1.4,1.8]

14. The safety brief was conducted in a light-hearted manner. [1.8,2.2]

15. The safety brief was given at the same time as the fitting of lifejackets; some of the passengers did not hear the entire brief. [1.8,2.2]

16. The safety brief did not include action to be taken in the event of capsize or falling overboard. [1.8,2.2]

17. It was prudent to issue protective helmets. [1.7.2,2.4]

18. The crewman was snagged by a mooring line after capsize. [1.4]

19. The buoyancy provided by the foam padding fitted to the lifejackets, hampered the attempts of two passengers trying to free themselves from under the boat. [1.7.1,2.4]

20. Passengers experienced difficulty in orally inflating their lifejackets in the turbulent water. [1.7.1,2.4]

21. The buoyancy provided by the lifejacket was not sufficient to keep the passengers afloat without considerable effort. [1.7.1,2.4]

22. The lifejackets tended to 'ride-up' in the water. [1.7.1,2.4]

23. When inflated, the lifejackets became tight around the chest, causing difficulty in breathing. [1.7.1]

24. Many layers of wet clothing reduced buoyancy. [1.7.3,2.4]

25. Heavy footwear (such as walking boots) reduced buoyancy, and was difficult to remove. [1.7.3,2.4]

26. The liferafts were stowed in a locker and did not deploy. [1.7.4,2.4]

27. *Storm Raven*'s coxswain did not call the coastguard on VHF radio because he believed he would not be able to establish contact due to his position. [1.10,2.5]

28. VHF coverage in Ramsey Sound and to the west of Ramsey Island is incomplete. [1.10,2.5]

29. *Atlantic Eagle*'s fixed and portable VHF radios were under water, and were either unusable or inaccessible. [1.10,2.5]

30. The coastguard was alerted by a telephone call instigated by a company employee observing from St Justinians. [1.4]

31. Passengers had difficulty in holding on to the overturned RIB. [1.4,2.4]

32. The waters in the vicinity of Horse Rock are extremely turbulent and unpredictable when the tidal stream is strong, making them unsuitable for white-water leisure trips of this type. [1.9,2.3]

33. Measures beyond the requirements of the codes of practice were taken by the company to ensure the safe operation of the 'Bitches Adventure' trip and reduce the risks to personnel, but a formal risk assessment had not been conducted. [1.11.5,2.6]

34. No enquiry had been made by the boat's certifying authority to ascertain if a risk assessment had been conducted. [1.11.5]

35. RIBs operating on the ‘Bitches Adventure’ do not usually manoeuvre in the vicinity of Horse Rock. [1.1,2.3]

36. Operating the ‘Bitches Adventure’ with two RIBs enabled *Storm Raven* to recover the passengers and crew quickly. [2.6]

37. Conducting the ‘Bitches Adventure’ in daylight aided the rapid recovery of the passengers and crew. [2.6]

38. The intended actions by Thousand Island Expeditions are considered prudent. [2.6,2.7]

3.2 CAUSES

1. The immediate cause

Capsize was caused by hydrodynamic forces lifting the boat’s port quarter to an irrecoverable angle. [2.3]

2. Other causes and underlying factors

1. The tidal stream was at its maximum rate. [1.5, 2.3]

2. Hydrodynamic forces in the vicinity of Horse Rock were strong and unpredictable. [2.3]

3. The boat does not normally operate in the vicinity of Horse Rock when the tidal stream is at its maximum. [1.1, 2.3]

SECTION 4 - RECOMMENDATIONS

The Maritime and Coastguard Agency is recommended to:

1. Consider revising relevant codes of practice to highlight the requirement for owners to comply with the Merchant Shipping (Health and Safety) Regulations, in particular the need to conduct risk assessment.

2. Consider issuing guidance to certifying authorities surveying vessels under codes of practice, to check that risk assessments, as required by the Merchant Shipping (Health and Safety) Regulations 1997, have been conducted.

3. Investigate the possibility of improving VHF radio coverage in Ramsey Sound and to the west of Ramsey Island.

Thousand Island Expeditions is recommended to:

4. Progress and formalise the risk assessment of its water-borne activities.

5. Complete the intended actions, detailed in paragraph 1.12, before ‘Bitches Adventure’ trips recommence.

Marine Accident Investigation Branch
May 2001