ACCIDENT REPORT

Report on the investigations of two fatal accidents

on board the UK registered yacht

CV21

122nm west of Porto, Portugal

on 4 September 2015

and

mid-Pacific Ocean (39° 05.3N, 160° 21.5E)

on 1 April 2016

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 7/2017 APRIL 2017

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.

Front cover image courtesy of Clipper Ventures plc

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GLOSSARY OF ABBREVIATIONS, ACRONYMS AND TERMS

AIS	-	Automatic Identification System
Boom	-	A spar supporting the foot of a mainsail attached at one end to the mast
British Marine	-	Formerly the British Marine Federation
ºC	-	Degrees Celsius
Clipper	-	Clipper Ventures plc
cm	-	centimetre
CoC	-	Certificate of Competency
COG	-	Course over the Ground
CPR	-	Cardio-pulmonary resuscitation
DSC	-	Digital Selective Calling
Foot	-	The bottom edge of a sail
GPS	-	Global Positioning System
Grinder	-	A type of manual winch
Gybing	-	When under sail, to alter course so that the stern of the vessel goes through the wind resulting in the mainsail setting on the opposite side
Halyard	-	A rope used to hoist a sail
HART	-	Hazardous Area Response Team
HF	-	High Frequency
HMPE	-	High modulus polyethylene
IAMSAR	-	International Aeronautical and Maritime Search and Rescue
IIMS	-	International Institute of Marine Surveying
ISAF	-	Formerly the International Sailing Federation, now World Sailing
kg	-	kilogram
kts	-	knots, a measure of speed. It measures nautical miles per hour
kW	-	kilowatt
Leech	-	The aft edge of a sail
Luff	-	The leading edge of a sail
m	-	metre
Mainsheet	-	A line that is attached to the boom and controls the angle of the boom to the centreline

Marlow	-	Marlow Ropes Ltd
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MNA	-	(ISAF) Member National Authority
MOB	-	Man Overboard
MTech	-	Materials Technology Ltd
nm	-	Nautical miles, 1 nautical mile = 1852 metres
Preventer	-	A line that runs from the boom to the foredeck that limits the boom's ability to swing unexpectedly across the yacht
Race	-	Clipper Round the World Race
Reefing	-	An evolution that reduces the area of a mainsail by lowering and securing a section of the sail
RRS	-	(World Sailing) Racing Rules for Sailing
RYA	-	Royal Yachting Association
SCV	-	Small Commercial Vessel (and Pilot Boat Code)
Sheet	-	A rope used to control the power of a sail by determining its angle to the wind and its shape
SI	-	Sailing Instruction
SOG	-	Speed over the ground
SOLAS	-	International Convention for the Safety of Life at Sea 1974, as amended
STCW	-	The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended
t	-	tonne, 1000 kilograms = 1 tonne
Tacking	-	When under sail, to alter course so that the bow of the vessel goes through the wind, resulting in the sails setting on the opposite side
Traveller	-	A device, usually a rail, which allows for changing the position where the mainsheet tackle connects to the boat
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency
Yankee	-	A high cut foresail
Zygrib	-	Software for weather data visualisation

CHIEF INSPECTOR'S FOREWORD

Since 1996, over 4,000 people have taken part in the Clipper Round the World Yacht Race. The event has progressively grown in size and the yachts, their equipment and associated safety procedures have evolved significantly. The Clipper Round the World Yacht Race is an adventurous activity with particular risks that need to be controlled in order to provide an acceptable level of safety. The two fatal accidents featured in this report have identified a need for Clipper Ventures plc to re-assess those risks and to improve their associated controls with the aim of preventing similar accidents occurring in the future.

A mature safety management system monitors and challenges itself. It challenges the sufficiency and suitability of its risk controls, not just to ensure compliance with regulations but also to ensure they are fit for purpose. It then monitors their implementation and effectively identifies and challenges any non-conformities.

The investigations have identified deviations from the company's existing procedures that contributed to both accidents. The effectiveness of some risk controls, such as pre-race training, can be monitored effectively ashore. However, shore-based company oversight is limited and difficult once the race has started and is largely reliant on the expertise and supervision provided by the professional skipper, who is the sole company representative on board.

While a single employee on board a commercial yacht may provide sufficient company oversight in many circumstances, the special nature of the Clipper Round the World Yacht Race places a huge responsibility on one person to ensure the safety of the yacht and its crew at all times.

Therefore, in addition to acknowledging the completed and ongoing actions taken following the two accidents featured in this report, I am recommending Clipper Ventures plc review and modify its onboard manning policy and shore-based management procedures so that Clipper yacht skippers are effectively supported and, where appropriate, challenged to ensure that safe working practices are maintained continuously on board. In particular, consideration should be given to the merits of manning each yacht with a second employee or contracted 'seafarer' with appropriate competence and a duty to take reasonable care for the health and safety of other persons on board.

Steve Clinch
Chief Inspector of Marine Accidents

Image courtesy of Clipper Ventures plc

CV21

SYNOPSES

Accident to Andrew Ashman

At 2356 on 4 September 2015 (UTC+1), Andrew Ashman, a watch leader on the UK registered yacht *CV21*, was fatally injured when the yacht experienced two successive uncontrolled gybes while 122 nautical miles west of Porto, Portugal. *CV21* was one of 12 identical yachts participating in the 2015-2016 Clipper Round the World Race with a complement of a professional skipper and 21 fee-paying crew.

Before the accident, *CV21* had been sailing under its yankee 1 headsail and full mainsail on a broad starboard reach when, due to increasing winds Andrew decided that it was necessary to reef the mainsail. He had stepped forward of the mainsheet traveller to brief the crew when the yacht altered course. This caused the wind to catch the leech of the mainsail putting the sail aback, causing tension on the preventer line. The forward strop securing the preventer line to the bow broke, releasing the boom, which then moved swiftly to starboard across the cockpit in an accidental and uncontrolled gybe. The yacht then performed a second uncontrolled gybe with the boom swinging back onto the port side before the helmsman was able to regain control. During the uncontrolled gybes, Andrew sustained a fatal neck injury and, despite the efforts of his crew mates, could not be resuscitated.

The cause of the unexpected and sudden movement of the yacht was the accidental gybes, during which the preventer securing strop failed. This strop had been constructed using high modulus polyethylene rope. An assessment of the preventer arrangement by Clipper had concluded that it was fit for purpose. The strengths of the preventer line, strop and pad-eye were estimated but not documented and no estimate of their expected in service loading had been recorded.

Following the accident, actions taken by Clipper were aimed at improving crew safety on board the Clipper 70s, and included: the introduction of a second preventer line; the marking of the area to be avoided while running downwind, when an accidental gybe was possible; and, debriefing the crew with the lessons learned from the preventer strop failure.

A recommendation has been made to Marlow Ropes Ltd, the rope manufacturer, aimed at improving the information provided to users on the loss of strength caused by splices, hitches or knots when using high modulus polyethylene rope. A recommendation has also been made to the Royal Yachting Association, World Sailing and British Marine, which is intended to encourage recreational and professional yachtsmen to consider carefully the type of rope used for specific tasks on board their vessels.

Accident to Sarah Young

At 2324 on 1 April 2016 (UTC+12), Sarah Young, a crew member on board *CV21*, was washed overboard mid-Pacific while the yacht was on passage from Qingdao, China to Seattle, USA. At 0044 on 2 April, she was recovered unconscious back on board *CV21*, having been located by her personal AIS beacon, but she never regained consciousness. Sarah was buried at sea 2 days later and *CV21* continued to Seattle.

CV21 had been sailing downwind in 20-25 knots when the starboard watch took over at 2200. Shortly afterwards, the wind increased in strength and backed and the crew started to reduce sail by reefing the mainsail, the skipper taking the wheel. Once the mainsail had been reefed, with some difficulty the skipper tacked the yacht onto a more easterly

direction. Sarah then went below to ask some of the off-watch crew to help with taking down the headsails. On returning to the cockpit she became involved assisting another crew member without first clipping on her tether. The combination of the yacht's motion and a wave breaking over the deck caused her to lose her footing and she fell down to the starboard guardrail. Another wave washed her overboard. An MOB recovery operation began immediately, but in atrocious wind and sea conditions the crew took about 32 minutes to drop the headsails to enable them to head towards Sarah's AIS beacon. On arrival, Sarah was still conscious with her lifejacket inflated. It took several attempts to rescue Sarah, during which time she lost consciousness. Sadly, all efforts to revive her once on board were unsuccessful.

It is unknown why Sarah did not attach her tether, but it could have been for one or more reasons, including: fatigue, forgetfulness or distraction. The investigation established that the tethering practice on board *CV21* was inconsistent. To prevent this there needed to be a robust safety culture built on strong leadership, discipline and effective oversight.

Clipper's MOB recovery procedure was well established. However, two main factors delayed the recovery of Sarah: the difficulty of lowering the headsails and the time taken to recover Sarah once on scene. Although MOB drills had been briefed on board *CV21*, no practical MOB drills were completed with the crew for the Race leg together, an omission in common with other Clipper yachts.

Following this accident Clipper Ventures plc has taken a number of actions, including lacing the guardrails, ensuring MOB drills have been conducted downwind with AIS and scramble net deployment, re-emphasising the use of lifejacket spray-hoods, and imposing a wind speed limit above which all crew must be clipped on. A recommendation has been made to Clipper Ventures plc to complete its review of the risks associated with MOB and recovery, and its development of appropriate control measures to reduce those risks to as low as reasonably practicable.

More generally, the ability of the company's shore-based management to monitor the onboard working practices during the Race was limited and difficult, placing significant responsibility on the skipper as the only employed person on board. Greater supervision could have prevented both of these accidents and could have been provided had a second employee or contracted 'seafarer', with appropriate competence and a duty to take reasonable care of other persons on board, been carried. Accordingly, Clipper Ventures plc has also been recommended to review and modify its onboard manning policy and shore-based management procedures so that Clipper yacht skippers are effectively supported, and where appropriate, challenged to ensure safe working practices are maintained continuously on board.

SECTION 1 - BACKGROUND INFORMATION

1.1 CLIPPER ROUND THE WORLD YACHT RACE

The first Round the World Clipper Yacht Race (Race) took place in 1996. The event was devised to enable sailors of varying backgrounds and competence to gain experience of ocean racing. Participants chose to complete either a circumnavigation of the World or a selection of one or more individual legs. No prior sailing experience was required and a compulsory training programme was provided.

Clipper Ventures plc (Clipper) based in Gosport, England, owned and managed the Clipper racing fleet. Originally completed in 60-foot (18.3m) yachts, by 2013 the Race fleet had evolved to comprise 12 identical 70-foot (21.3m) yachts known as the Clipper 70s. Each of the yachts had a qualified skipper on board who was employed by Clipper. The rest of the crew comprised fee-paying participants. Different legs of the Race attracted varying numbers of participants and, with individual injuries and retirements during the Race, the number of crew on board a yacht ranged from 22 to 12.

1.2 DETAILS OF THE 2015-2016 RACE

The 2015-2016 Race was divided into 8 legs and 14 races, one of which included the Sydney to Hobart race **(Table 1)**. After departing London, UK on 30 August 2015, the fleet was due to return to London on 30 July 2016.

Leg	Race	Estimated Start date	Departure Port	Arrival Port
1	1	30 August 2015	London, United Kingdom	Rio De Janerio, Brazil
2	2	7 October 2015	Rio De Janerio, Brazil	Cape Town, South Africa
3	3	31 October 2015	Cape Town, South Africa	Albany, Australia
4	4	1 December 2015	Albany, Australia	Sydney, Australia
	5	26 December 2015	Sydney, Australia	Hobart, Tasmania
	6	2 January 2016	Hobart, Tasmania	Whitsundays, Australia
5	7	18 January 2016	Whitsundays, Australia	Da Nang, Vietnam
	8	27 February 2016	Da Nang, Vietnam	Qingdao, China
6	9	20 March 2016	Qingdao, China	Seattle, USA
7	10	28 April 2016	Seattle, USA	Panama
	11	30 May 2016	Panama	New York, USA
8	12	20 June 2016	New York, USA	Derry-Londonderry, Northern Ireland
	13	17 July 2016	Derry-Londonderry, Northern Ireland	Den Helder, Netherlands
	14	28 July 2016	Den Helder, Netherlands	London, United Kingdom

Table 1: 2015-2016 Race schedule

1.3 VESSEL AND ACCIDENT PARTICULARS

VESSEL PARTICULARS		
Vessel's name	*CV21*	
Flag	United Kingdom	
Classification society	Not applicable – certificated under the Small Commercial Vessel Code	
IMO number/fishing numbers	Not applicable	
Type	Clipper 70 sloop	
Registered owner	Clipper Ventures plc	
Manager(s)	Clipper Ventures plc	
Construction	Foam reinforced plastic	
Year of build	2013	
Length overall	21.15m	
Length at waterline	20.70m	
Displacement	34.7t	
Authorised cargo	None	
VOYAGE PARTICULARS		
	Accident 1	**Accident 2**
Port of departure	London, UK	Qingdao, China
Port of arrival	Rio de Janeiro, Brazil	Seattle, USA
Type of voyage	Commercial event	Commercial event
Cargo information	None	None
Manning	22	16
MARINE CASUALTY INFORMATION		
	Accident 1	**Accident 2**
Date and time	4 September 2015 at 2356 UTC+1	1 April 2016 at 2324 UTC+12
Type of marine casualty or incident	Very Serious Marine Casualty	Very Serious Marine Casualty
Location of incident	Open sea	Open sea
Place on board	Main deck	Main deck
Injuries/fatalities	One fatality	One fatality
Damage/environmental impact	None	None
Ship operation	Under sail	Under sail
Voyage segment	Mid-water	Mid-water
External & internal environment	Wind north-north-east at 20 knots with gusts of up to 30 knots, fine and clear with moderate seas and swell	Wind north-east at over 40 knots with gusts over 60 knots, and rough seas

1.4 *CV21*

1.4.1 General

The Clipper 70 yachts were constructed in China in 2013. The yachts were equipped with 24 bunks, 2 toilets, a galley and a navigation station **(Figure 1)**. They had twin wheels and twin rudders.

Figure 1: Navigation station, viewed from port side

The navigation station was located on the centreline aft and there was a hatch that could be opened to allow persons below deck to speak to the helmsman or other crew who were in the vicinity on deck. Equipment at the navigation station included:

- Folio of paper navigational charts for the entire Race
- Radar
- Chart plotter
- Very high frequency (VHF) radio
- Shortwave radio
- Satellite telephone
- C-Band satellite communications – with distress alarm button
- Speed log
- Barometer.

During the Race, an independent meteorologist emailed a weather report to the fleet daily at 0900 UTC.

1.4.2 Sail arrangement and practices

The Clipper 70s carried a wardrobe of 11 different sails to cover different wind conditions and circumstances. The sail area and recommended maximum wind speed for each sail are given in **Table 2**.

Sail	Area(m^2)	Recommended maximum apparent wind strength (knots)
Asymmetric spinnaker 1	326	12
Asymmetric spinnaker 2	322	20
Asymmetric spinnaker 3	261	30
Windseeker	162.5	8
Mainsail	123	Reef to conditions
Yankee 1	116.6	16
Yankee 2	88.86	25
Yankee 3	59.43	34
Staysail	46	40
Storm tri-sail	14.3	
Storm jib	17.5	

Table 2: Clipper 70 sail wardrobe

The mainsail measured 8.87m along its foot, 23.38m vertically (luff) and 25.00m at its leech **(Figure 2)**. The mainsheet's attachment point was 0.70m from the aft edge of the boom.

When reefing the mainsail, crew, positioned at the mast, hauled down the sail luff in coordination with other crew, positioned in the cockpit, who eased the main halyard, hauled in reefing lines to secure the leech, and then retightened the main halyard.

The staysail and yankee headsails were secured to the forestays with piston hanks **(Figure 3)**. In light airs, each sail was lowered under gravity by heading the yacht upwind and releasing the sail halyard. In strong winds, several crew were required to haul down the sail and prevent it from self-hoisting.

1.4.3 Deck layout

CV21, in common with the other Clipper 70s, had a wide cockpit with an open transom **(Figure 4)**. In comparison with other professional racing yachts, the Clipper fleet was supplied with ropes that were generally of a larger size and strength to improve reliability for the relatively inexperienced crews.

The yacht's liferafts, horseshoe life rings and dan buoy were stowed on an aft gantry positioned just forward of the transom and between the two wheels **(Figure 5)**. The mainsheet winch was located on the centreline forward of the gantry. On either side of the cockpit were the jammers, which were used to secure halyards, reefing lines and other lines. Two grinders were located on the centreline forward of the mainsheet traveller. The grinders were used to power the mainsheet winch or primary sheet winches. Forward of the primary sheet winches were two staysail winches and two halyard winches, all of which required handles to operate them. When not in use, the winches' handles were stowed in pockets located on the sides of the cockpit.

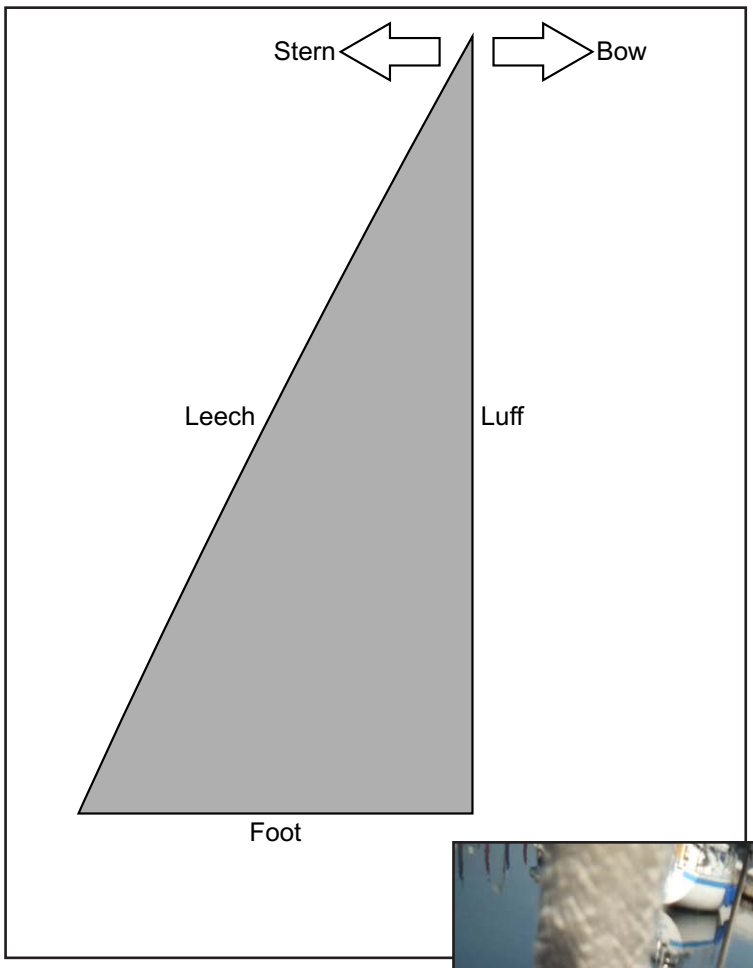

Figure 2: Parts of a sail

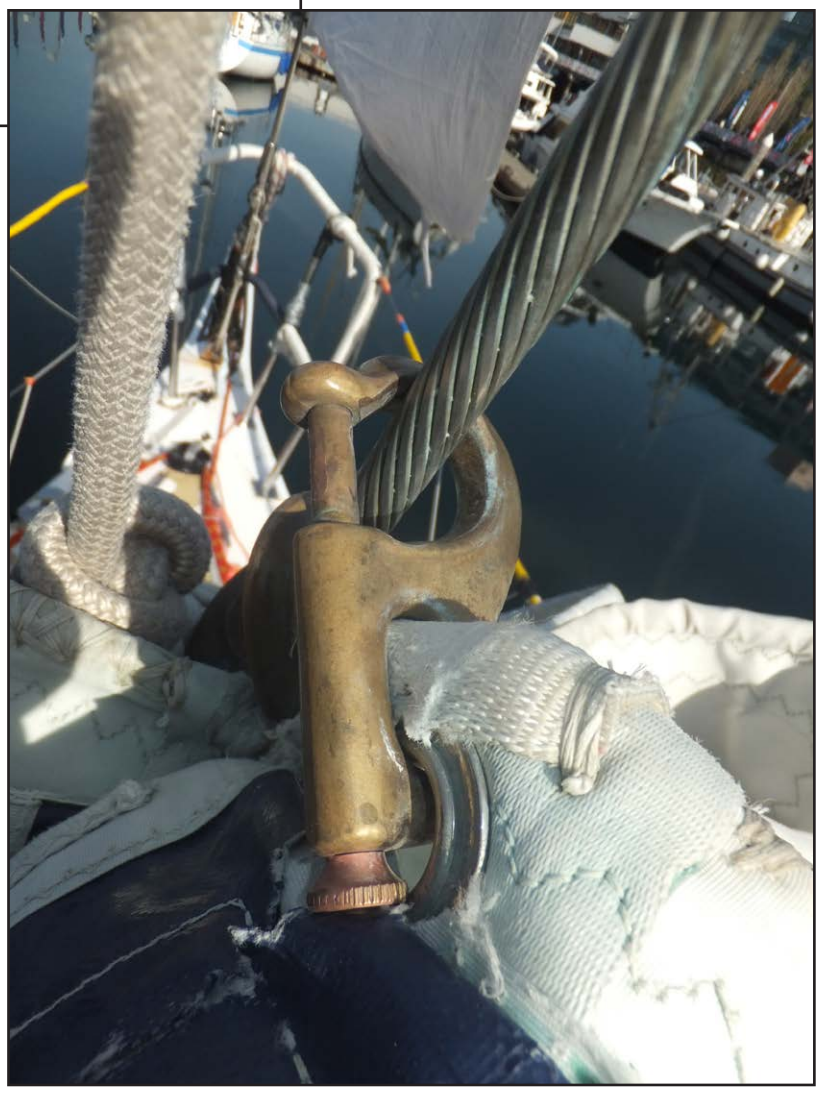

Figure 3: Piston hank used to attach headsail luff to forestay

Image courtesy of Clipper Ventures plc

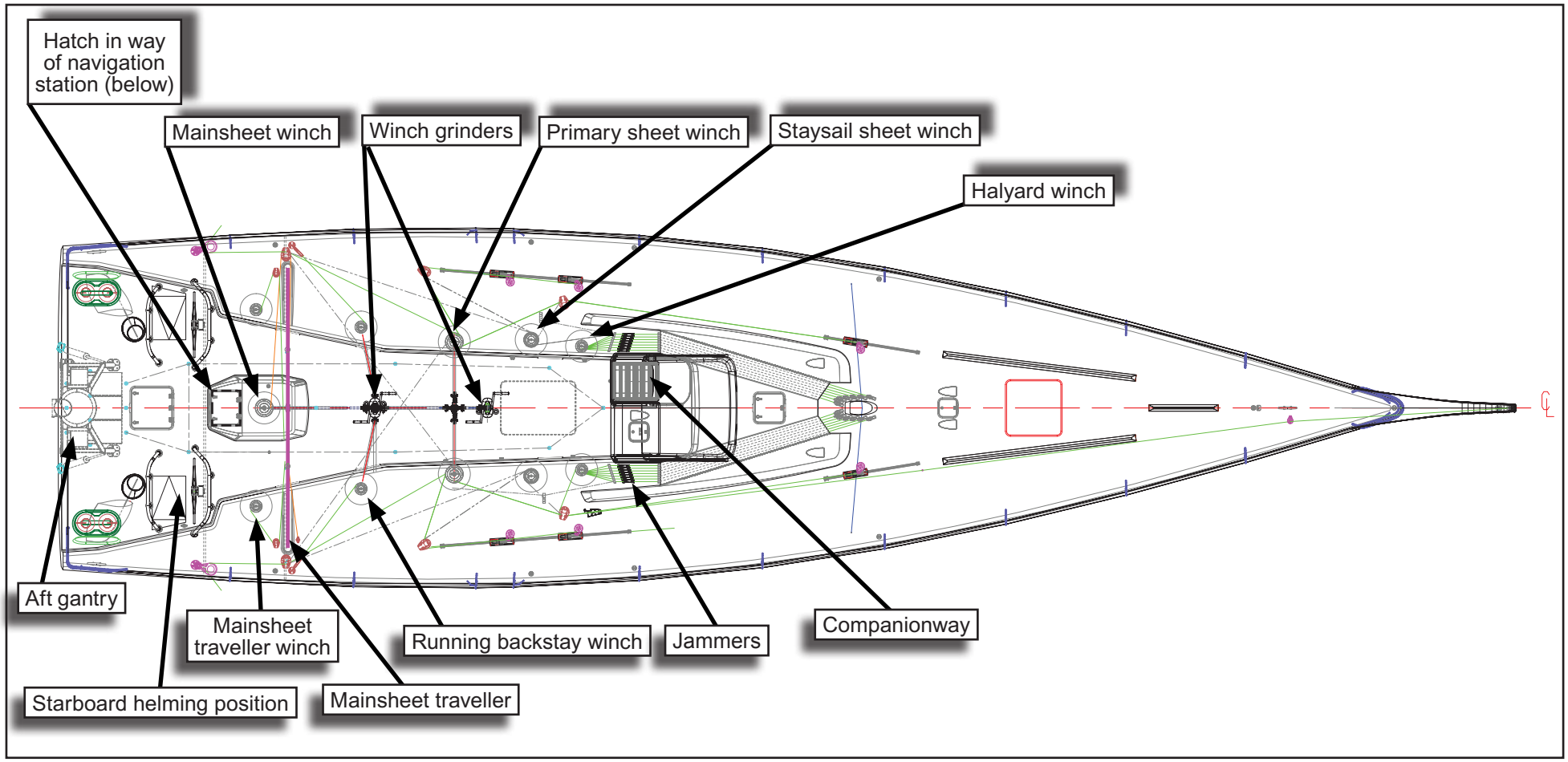

Figure 4: *CV21* deck layout

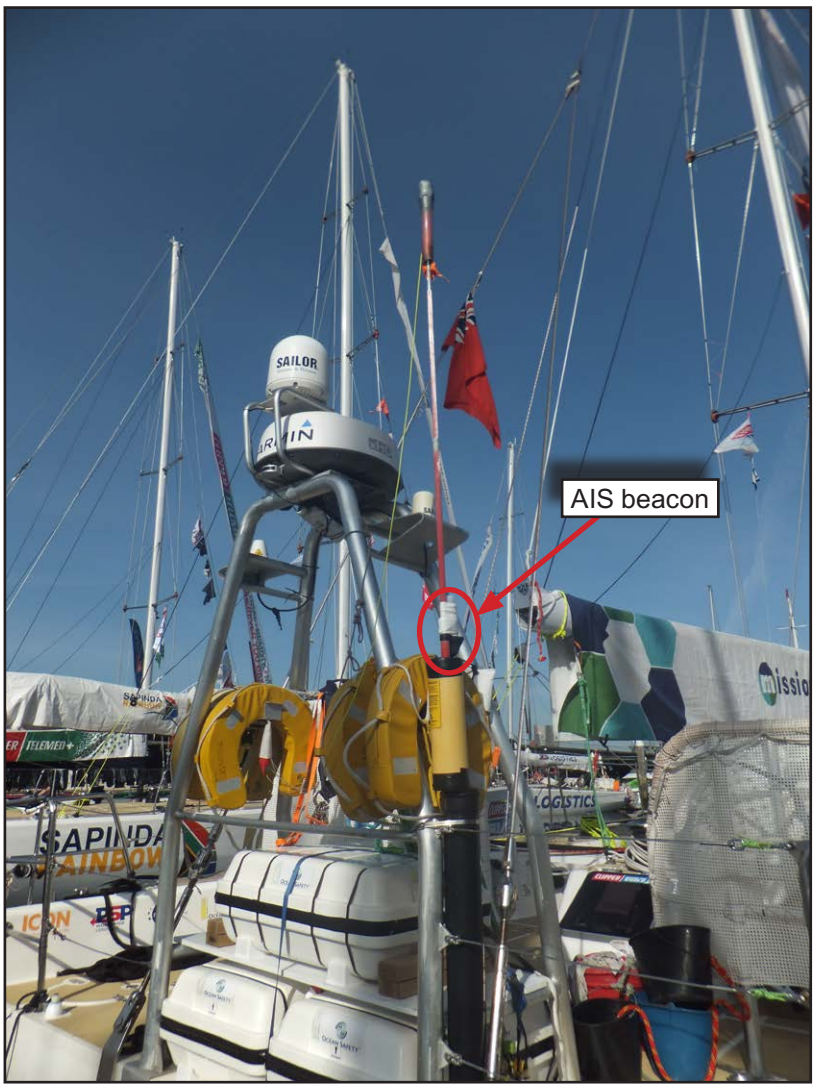

Figure 5: Aft gantry, showing liferafts, dan buoy with AIS beacon and horseshoe life rings

The area forward of the mainsheet traveller winches to the aft grinder had been identified as a danger zone. The area was recognised as being unsafe when sailing downwind as, should an accidental gybe occur, there was a risk of the mainsheet whipping across the area and potentially injuring anyone there. The danger zone was not marked out on deck but the crews' training made it clear that the area was to be avoided.

Secure points to which tethers could be attached were distributed throughout the cockpit. To enable ease of movement about the yacht, jackstays were also provided to which tethers could be secured. Jackstays ran forward to the bow from the outboard ends of the mainsheet track **(Figure 6)**. On the cockpit floor were two further jackstays **(Figure 7)** that ran from the companionway to the two helming positions. Where the jackstays passed over the grinder axle covers, anti-chafe covers were fitted, which prevented the clips of the tethers from sliding freely.

The yacht's deck edge was protected by an 800mm high guardrail. An intermediate guardrail was positioned 380mm above the deck.

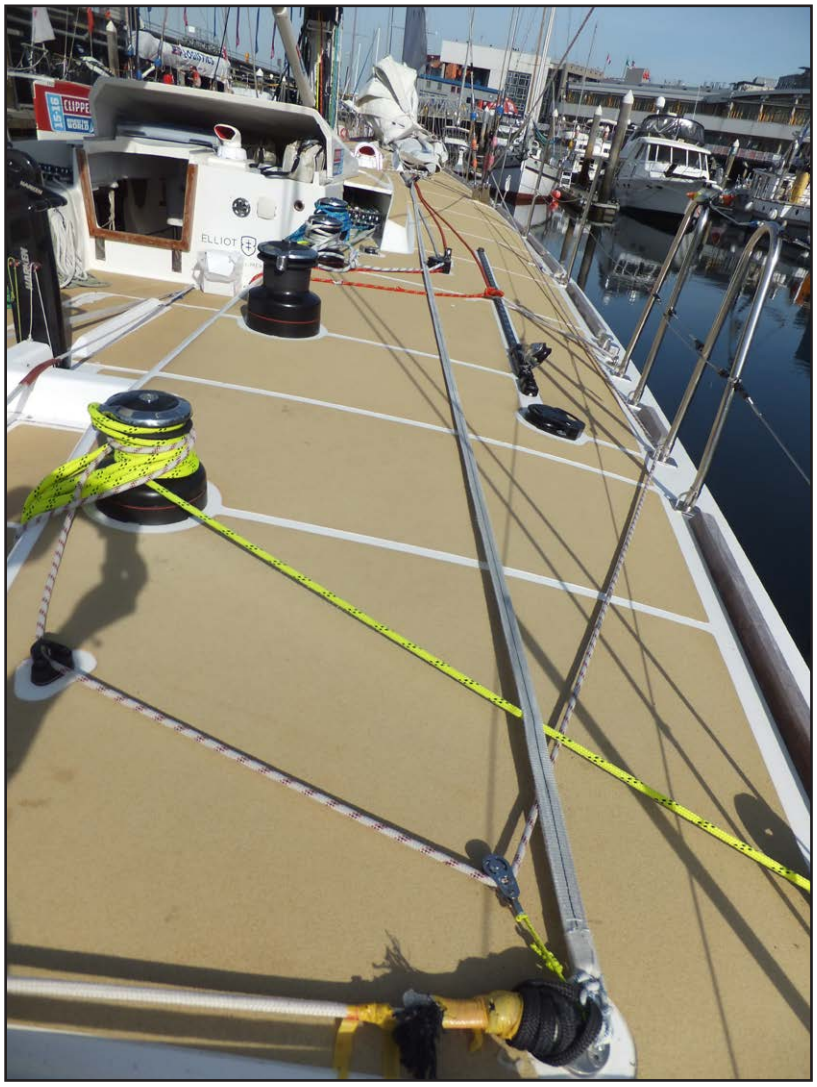

Figure 6: Starboard jackstay

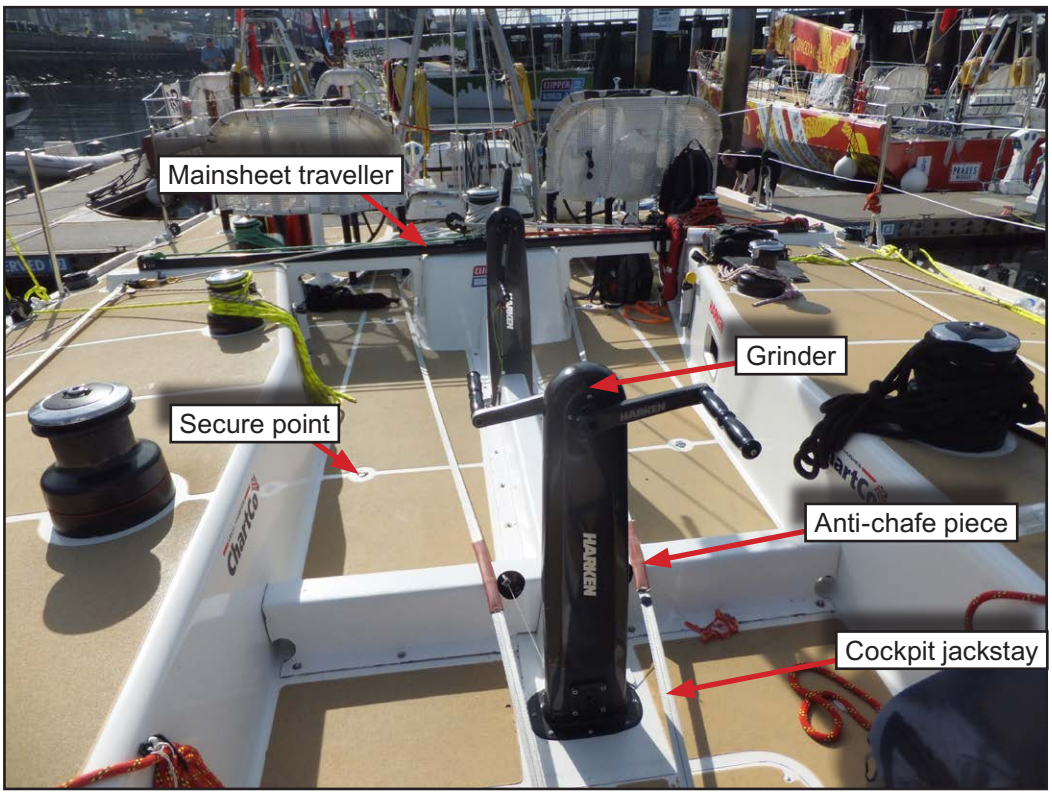

Figure 7: Securing points and jackstays in cockpit

1.5 CREW

1.5.1 Crew selection

Clipper received thousands of expressions of interest from individuals who wished to participate in the Race. They were required to apply to Clipper for a place and provide proof of medical fitness, vaccinations and insurance. Prospective crew members were then interviewed before starting the Clipper training programme.

1.5.2 Crew allocation

For each Race, Clipper assigned the crews to the yachts to ensure that no one yacht had an advantage over the others. The criteria used took into account the following factors:

- Sailing ability, and number of race legs chosen to complete
- Age and sex
- Vocational skills (e.g. medical, engineering)
- Personality
- Clipper coxswain training.

A crew member could request a particular allocation based on experience with a specific skipper, or friends made during training. However, there was no guarantee that this request would be accepted.

Each crew member was required to enter into a Crew Agreement, which required the crew member to, inter alia,

> *'…while on a Yacht accept the authority, decisions and instructions of its Skipper…'*
>
> *'…follow all safety instructions issued by Clipper or its representatives;…act in a responsible manner with a realistic sense of safety awareness;…and… immediately bring any safety concerns You may have to the notice of the Skipper or another member of Clipper's staff.'* [sic]

A 'skipper' was interpreted in the Crew Agreement as meaning '…*Clipper's representative appointed to manage…a Yacht and the crew allocated to that Yacht*.'

1.5.3 Onboard roles

Once assigned to a yacht, it was then up to each yacht skipper and crew to decide upon who was to fulfil the various crew roles necessary to run it. Roles included the team co-ordinator, treasurer, victualling officer, safety officer, bosun, sail repairer, engineer and medic. Most roles necessitated a day or part day's training. For example, the bosun spent a half day with the rope supplier learning to splice and examine ropes.

The Clipper Race Crew Manual defined the following crew roles that the skipper assigned to the crew:

'Helm

The art of good helming is the ability to maintain a steady course and get the most out of the yacht in all conditions and especially in light winds.

A good helm should develop a natural feel for the yacht and have the ability to remain focused when everyone else is working rapidly around them. They are often the first to notice changes in wind direction or strength and should communicate this information to the watch leader.'

'Watch Leader

The watch leader is the skipper's right hand man. He or she is responsible for running the yacht when the skipper is sleeping. They must maintain a cohesive functioning team, coordinate sail changes and trimming as well as ensuring a steady course and standard of helming. In addition to this they must always have an eye on the meteorological and tactical situation. With good all round knowledge they are able to act quickly to remedy a problem encountered during a manoeuvre.'

'Medic

This role is normally filled by someone who has medical training, a doctor, nurse, paramedic or even a vet. Working with the skipper (who is also medically trained) they take responsibility for the welfare of the crew, treating any illness or injuries that occur on board.'

While the role of medic could be assigned to a medically trained person, each yacht's skipper had completed the Maritime and Coastguard Agency's (MCA) STCW[1] Proficiency in Medical Care course and was the designated primary medic on board.

The crew were allocated to one of two watches, termed port and starboard. The skipper, who was not part of the watch routine, chose two watch leaders and assistants for each leg of the Race. Their roles included ensuring the safety and wellbeing of the crew on their watch and the yacht itself, as well as ensuring that the yacht sailed at its optimum speed/configuration.

1.5.4 Skipper selection

Skippers for the 12 Clipper 70s scheduled to take part in the Race, which commenced in August 2015, were appointed around March 2015. The skipper selection process had started during the previous year with prospective skippers applying to Clipper and those deemed suitable being invited to interview. Candidates had to hold a commercially endorsed Yachtmaster Ocean qualification and ideally also have an instructor qualification.

[1] STCW – The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended.

Following an interview, a successful candidate was invited to complete a 3-day practical assessment conducted on a Clipper yacht. The Clipper senior management team then observed how the candidate performed as various scenarios were presented to them.

Those candidates who passed the 3-day practical assessment of Clipper's skipper selection process were invited to become a training mate and, when deemed fully familiar with Clipper's procedures, a training skipper. While in the role of training Clipper crews, the potential skippers continued to be assessed until a decision was finally made on which of them were to be appointed for the Race.

Each yacht skipper was required to enter into a Race Skipper's Contract of Employment, which required the skipper (referred to in the contract as 'The Seafarer') to, inter alia,

> *'…work for no longer than 16 hours per day, allowing for any watch system that is being operated as appropriate and ensuring the safe and effective operations of the Yacht at all times…'*
>
> *'…take full responsibility for his Yacht's crew while they are members of his crew ensuring that they are organised and managed effectively…'*
>
> *'…operate the Yacht under his command in accordance with any reasonable orders or instructions that the Company may issue.'*
>
> *'…ensure that the log of hours on watch is maintained whilst on passage.'*

1.5.5 *CV21*'s skipper

CV21's skipper was 51 years old and had held a commercially endorsed Royal Yachting Association (RYA) Yachtmaster Ocean Certificate of Competency (CoC) since 2006. He had been involved in sailing for about 30 years, had been a professional sailing instructor since 2005 and had completed three Atlantic crossings. Previously employed as a delivery skipper, he had joined Clipper as a training mate in September 2012 and progressed to training skipper, undertaking 37 training courses, before being selected as a skipper for the 2015-2016 Race.

The skipper's approach to the Race was one of facilitating the crew in completing 'their Race' safely. The watch leaders were in charge on deck. However, the skipper decided Race tactics and passage planning taking account of the weather forecasts. Furthermore, he required the watch leaders to clear all intended course and sail plan changes through him.

The time the skipper spent on deck reduced as the Race progressed as he became more confident in the abilities of his appointed watch leaders. Keeping himself out of the watch routine, he tried to rest as much as possible to be ready to assist whenever required.

1.6 TRAINING

1.6.1 Crew training

Prior to the Race, participants were required to complete a compulsory training programme, which was divided into four levels:

- Level 1 – crewing skills (7 days)
- Level 2 – offshore sailing and life on board (6 days)
- Level 3 – asymmetrical spinnaker training and racing techniques (6 days)
- Level 4 – team tactics and offshore fleet racing (7 days).

Level 1 training could begin up to 18 months before the start of the Race. Training for Levels 1, 2 and 3 was completed at either of Clipper's training bases, which were located in the UK and Australia. Level 4 training was completed only in the UK. Crew were continually assessed during the training programme, with levels repeated if deemed necessary by the training staff.

Level 1 training was based on the water and introduced the basic principles of sailing, personal safety and good seamanship. The yacht generally returned to port overnight with one overnight passage to introduce the crew to working in watches. Sail reefing, abandon ship and manoverboard (MOB) drills were all covered during the week, which also incorporated the RYA Competent Crew qualification. Crew were specifically trained on how to examine and test their lifejackets, a routine that was expected to be completed before each training session and each Race leg.

Five days of Level 2 training were based on the water with a further day spent ashore completing a Basic Sea Survival course. The training was designed to further develop basic sailing and seamanship skills, with the crew working in watches and conducting a number of passages at night. Crew were also instructed on the various onboard roles and MOB drills were revisited.

The Basic Sea Survival course held in the UK was contracted to an approved training provider and was conducted at a local swimming pool. As well as meeting RYA requirements, the course was tailored to Clipper's specific requirements. The liferafts and lifejackets employed were the same as those used on the Clipper yachts. Participants were required to jump into the pool in shorts, T-shirt and lifejacket, practise swimming together and then inflate and board a liferaft. The use of a spray-hood was discussed and demonstrated.

As well as further developing crew sailing skills, a key focus of Level 3 training was to introduce the use of the asymmetric spinnaker. Racing techniques and greater emphasis on sail trim were also covered. Drills were again conducted during the week to ensure familiarity. Prior to 5 days training afloat, a day was spent ashore covering the World Sailing (ISAF) offshore safety course.

Level 4 training consisted of 7 days afloat consolidating everything learned from the previous three levels in simulated race situations. Crew raced with their allocated Race skipper and competed against other Clipper yachts, enabling the Race skippers to develop their respective teams in a realistic environment. Drills, including

MOB, were also conducted. Each Race skipper took part in several Level 4 training trips to ensure that he/she trained all 50-60 crew assigned to their yacht for the Race.

Each crew member was given a copy of the Clipper Race Crew Manual and Wet Notes[2] that provided guidance throughout the training programme and during the Race.

The training sections included details for each training level. For example, Level 1 described the basic principles of sailing, the collision regulations[3] and personal safety on board, including the safety briefing.

1.6.2 Clipper coxswain training

In addition to the training completed by all crew members, Clipper offered coxswain training to selected crew. Those qualified as Clipper coxswains were expected to take command of a Clipper yacht in the event of the skipper becoming incapacitated and to navigate the yacht to safety.

Candidates were required to complete the RYA Coastal Skipper/Yachtmaster Offshore shore-based course as part of a bespoke theoretical and practical course developed by Clipper and approved by the MCA. It was envisaged that, in the event of a yacht's skipper becoming incapacitated, another qualified skipper would be transferred to meet the yacht and bring it into port. No prerequisite sailing experience was required to complete the Clipper coxswain course, the syllabus for which is at **Annex A**.

1.6.3 Skipper training

Once appointed for the Race, skippers received further training as required in areas including medical and media skills, food hygiene, yacht equipment and documentation management.

1.7 SAFETY BRIEFING

The skippers were required to conduct safety briefings for all new crew each time they joined or re-joined a Clipper yacht. The briefing provided clear and precise instructions on the wearing of lifejackets when on deck, and tethering to the vessel. Safety equipment was issued to each crew member, and they were each responsible for inspecting and cleaning their equipment. The briefings included an explanation of the danger zones on board and how they were to be treated, along with more general advice on good working practices such as '*one hand for the boat, one for yourself*'. A safety briefing had been completed on board *CV21* prior to departure from London on 30 August 2015, and from Qingdao on 20 March 2016, as required before the start of each leg of the Race.

During the Race, weekly 'Safety Sunday' meetings allowed specific issues and safety concerns to be raised by the crew and advice to be given.

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[2] Wet Notes were a laminated pocket guide for use by the crew.

[3] Collision regulations – International Regulations for Preventing Collisions at Sea 1972, as amended.

1.8 RULES AND REGULATIONS

1.8.1 The Small Commercial Vessel and Pilot Boat Code

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 MCA's Small Commercial Vessel and Pilot Boat (SCV) Code to be used to fulfil the requirements of the Regulations.

CV21 was surveyed against the SCV Code. Surveys in accordance with the SCV Code are conducted by Certifying Authorities authorised by the MCA. In this case, the International Institute of Marine Surveying (IIMS) was the Certifying Authority. Following an examination on 6 May 2013, *CV21* was issued with an SCV certificate valid until 5 May 2018.

CV21 was certified as both a Category 2 vessel, which permitted it to operate up to 60 miles from a safe haven while training, and an unrestricted Category 0 vessel while undertaking the circumnavigation, with a maximum of 24 persons on board.

Table 1 of Annex 3 of the SCV Code provides details of manning requirements for the Category areas and is at **Annex B**. Operating in Category 0 necessitates a second person on board who holds at least a commercially endorsed Yachtmaster Offshore qualification. However, in 2013, the MCA issued Clipper an exemption to permit persons who have completed the Clipper coxswain course to satisfy this requirement.

The SCV Code requires the skipper to hold a radio operator certificate, medical fitness certificate and to have completed a Basic Sea Survival course. The skipper must also be first-aid trained and, in the case of operating in Category 0, hold a Proficiency in Medical Care Certificate, enabling the skipper to deal with basic medical procedures.

Section 2.9.1 of Annex 3 of the SCV Code states:

> *'Fatigue at sea is a serious safety issue and operators should ensure that all vessels certificated under the Code are sufficiently manned to avoid the need to work excessive hours. The skipper is responsible for ensuring, so far as is reasonably practicable, that he/she and all crew members are properly rested when they begin work and obtain adequate rest when not on duty. The minimum hours of rest for anyone employed on board should be not less than:*
>
> *.1 ten hours in any 24-hour period; and*
>
> *.2 77 hours in any seven day period.'*

There is no requirement under the Code for the skipper or anyone else employed on board to maintain a record of their hours of rest.

1.8.2 The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997

CV21 was required to comply with The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997.

The Regulations place a duty on an employer to ensure the health and safety of workers and other persons so far as is reasonably practicable. They also place a duty on every worker or seafarer aboard a ship to take reasonable care for the health and safety of themselves and of any other person on board who may be affected by their acts or omissions.

A 'worker' is defined as:

> *'…any person employed by an employer under a contract of employment, including trainees or apprentices.'*

A 'seafarer' is defined as:

> *'…any person, including a master, who is employed or engaged or works in any capacity on board a ship which is not a fishing vessel and whose normal place of work is on such a ship.'*

1.8.3 MGN 492 (M+F) – Health and Safety at Work: Protecting those not employed by the ship owner

MGN 492 (M+F) refers to an employer's duty of care towards workers and other persons on board, and its obligation to take reasonably practicable steps to avoid relevant risks. In particular, it states:

> *'…What is reasonable for the employer to do may be different depending on whether the person at risk or posing the risk is employed, (who can be trained, given and required to take account of information and to follow instruction as contractual requirements), or on the vessel for other reasons, (who may or may not be available to be trained, given information and to follow instruction).'*

1.8.4 Clipper Notice of Race 2015-2016

All yachts raced under the Clipper Notice of Race, which stated that the Race would be governed by:

- The Racing Rules for Sailing (RRS) for 2013-2016.
- The International Regulations for Preventing Collisions at Sea 1972, as amended.
- The Clipper 15-16 Sailing Instructions (SIs) and subsequent amendments.

The Notice of Race also stated:

> *'Yachts will be equipped to the standards required by the UK MCA Category 0 Coding supported by all associated documentation.*

Yachts will be operated in accordance with:

- *Crew Training Manual;*
- *Clipper Ventures Standard Operating Procedures for On Water Operations;*
- *Clipper 15-16 Round the World Yacht Race Supplementary Standard Operating Procedures;*
- *Clipper 15-16 Round the World Yacht Race Sailing Instructions;*
- *The Skipper and Crew Contracts; and*
- *Other special instructions that may be issued by Clipper to control the running of the Clipper 15-16 Race.'*

The SIs provided race information including the start and finish procedure, position reporting, race scoring, protests and declarations that had to be submitted before and after each race. The instructions stipulated that rig, sail and safety checks had to be performed by the skipper at every stopover and the relevant checklist submitted within 36 hours of arrival.

1.9 SHORE-BASED MANAGEMENT

Clipper managed the operations associated with maintaining the Clipper yachts, selecting and training the crew and skippers, and running the Race itself.

Training conducted in the UK was based at Gosport, which enabled shore management to oversee training operations and the progress of individual crew. When a Race was running, a team from the office relocated to the stopover ports to manage the local arrangements, including crew changeovers, crew feedback, corporate events, yacht maintenance and berthing. While a Race was underway, training of crew for the next race continued in the UK and Australia.

During the Race, yacht skippers were required to report back to the office twice daily including a skipper's blog. The report included the status of yacht and any defects, as well as any crew injuries/illness and whether they had missed their watches. At each stopover, each Clipper skipper had a meeting with a member of the shore management team to discuss the previous leg.

SECTION 2 - ACCIDENT TO ANDREW ASHMAN

2.1 NARRATIVE

2.1.1 Events leading up to the accident

At 2130 (UTC+1) on 4 September 2015, *CV21* was 122nm west of the Portuguese coast, 4 days into the first race from London to Rio de Janeiro, Brazil. The wind was north-north-east at 20 knots (kts), and the yacht was on a broad reach (points of sail are described in **Figure 8**) on port tack following a southerly course at a speed over the ground (SOG) of approximately 11kts. The yacht was sailing under the yankee 1 headsail and full mainsail. The skipper and the crew from the port watch were on deck. The starboard watch crew members were below deck preparing to come on watch at 2200.

The sea state was moderate with a low south-westerly swell. It was a clear night and the weather was fine with *CV21*'s crew able to see the stars clearly.

By 2200 the starboard watch were on deck, with the exception of the three crew assigned duties below deck, and ready to take over the watch. The crew were all wearing oilskins, head torches, lifejackets and tethers that were secured to the deck.

During the watch handover the starboard watch leader, Andrew Ashman, commented to the offgoing port watch leader that he had noticed the yacht had seemed a "*bit lively*" over the previous 30 minutes, on its downwind course of 160º. The port watch leader disagreed and stated that there had been no problem running downwind during his watch.

The skipper had noticed that *CV21* was to the east of his planned course so he instructed the watch leader to gybe the yacht onto a south-westerly course. Accordingly, *CV21* was gybed onto a course of 240° at 2219. The yacht was now on a broad starboard reach, with the apparent wind at an angle of approximately 130° on its starboard side. The yacht was heeled over onto its port side at an angle of approximately 10° and the starboard wheel was in use. The mainsheet traveller was locked out to port and the preventer line was rigged **(Figure 9)**. Following the gybe, the port watch went below deck and before he, too, went below, the skipper instructed Andrew to call him if he became concerned about anything.

Andrew and another crew member sat on the upper, starboard side of the deck waiting to take their turn on the wheel. The helmsman was changed every 30 minutes, and at 2230 Andrew took the helm. He helmed for 30 minutes, and at 2300 he passed the helm to the other crew member who, although a competent helm, was nonetheless inexperienced. At 2307[4], Sarah Young logged the vessel's position in the logbook **(Figure 10)**.

At 2330, the helm was passed to one of the least experienced helmsmen, with Andrew monitoring him. Andrew was standing aft of the traveller and to port of the helmsman **(Figure 11)**, with his tether fixed to a D-ring to starboard of the navigation station hatch.

[4] The log entry was marked as 2200 (UTC) but was in fact *CV21*'s position at 2307 (UTC+1).

Image courtesy of RYA

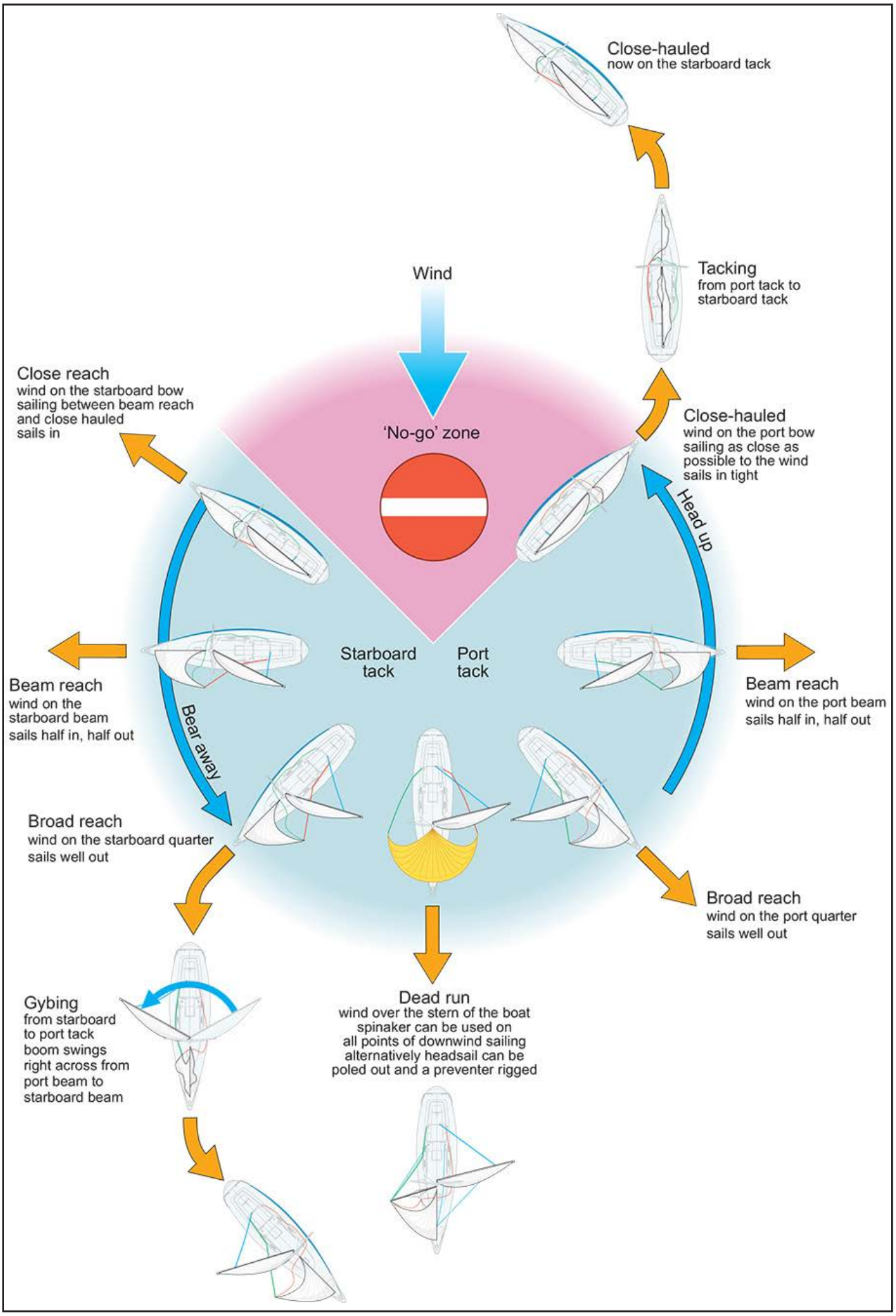


Figure 8: Points of sail

Base image courtesy of Clipper Ventures plc

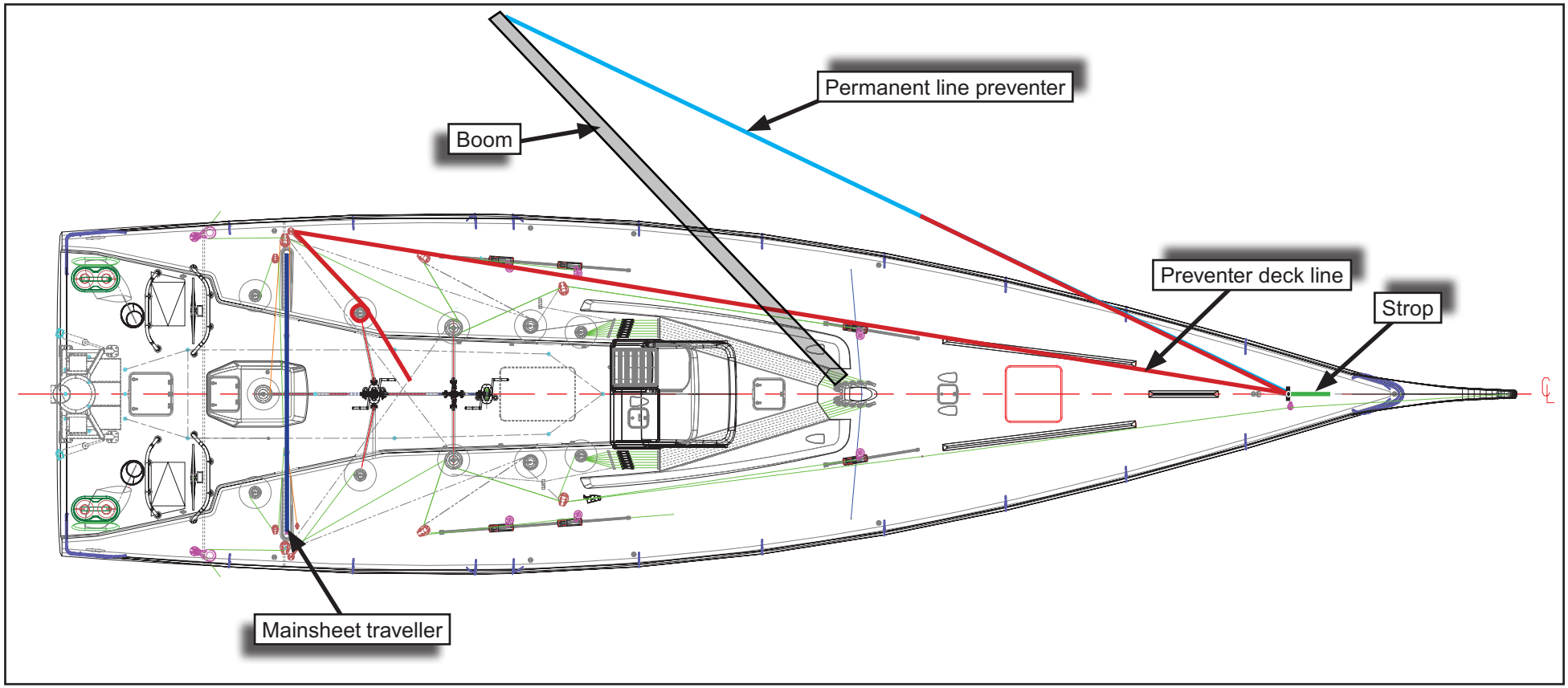
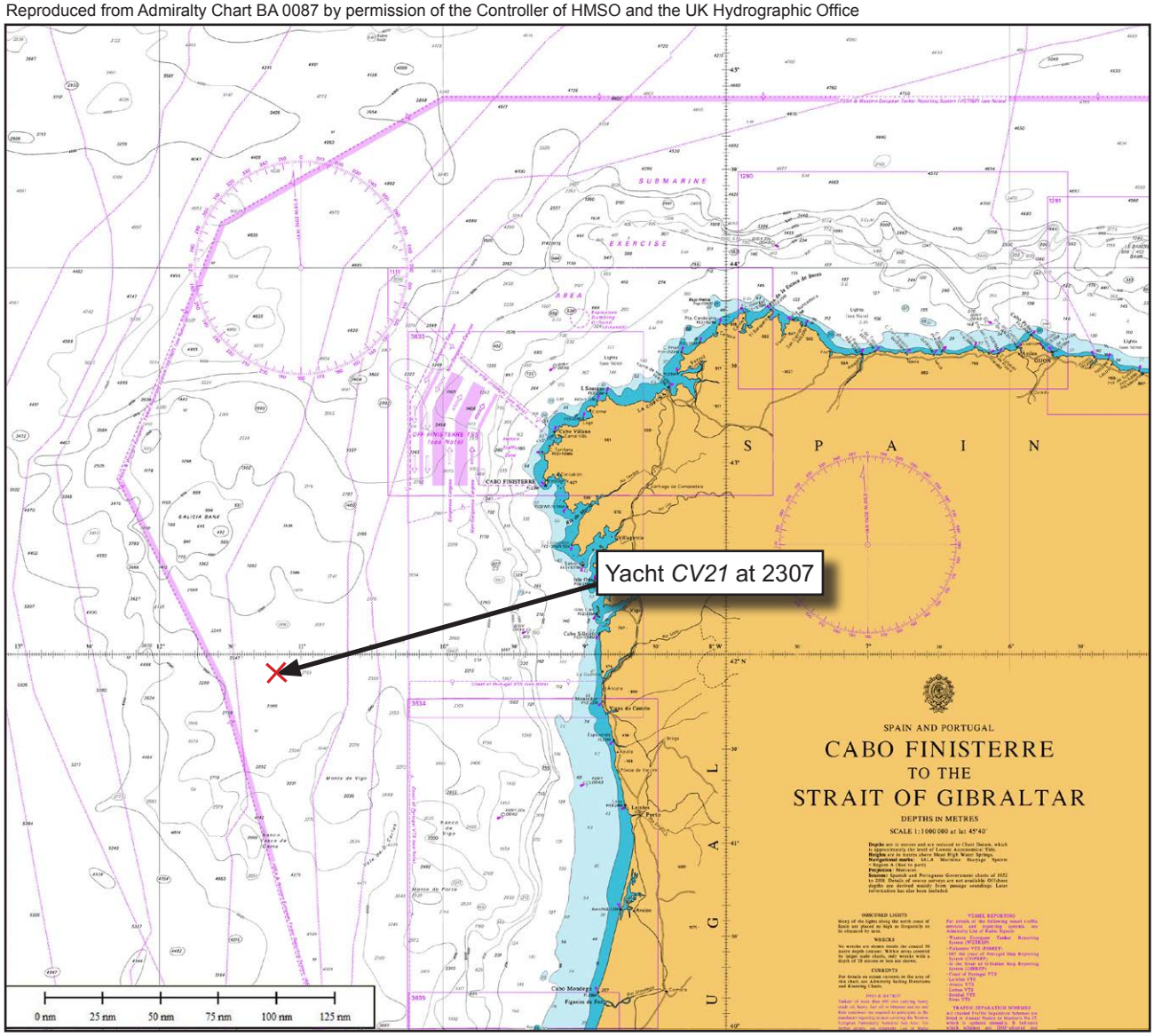
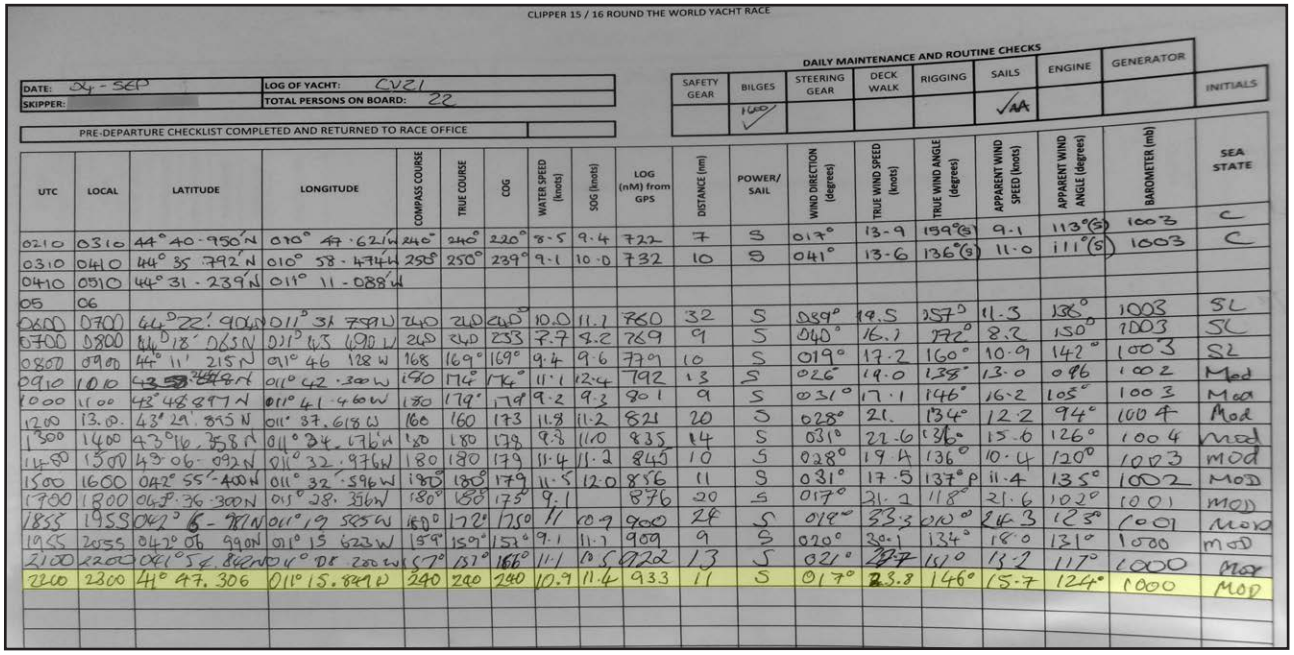


Figure 9: Preventer line arrangement (as illustrated by MAIB)

Reproduced from Admiralty Chart BA 0087 by permission of the Controller of HMSO and the UK Hydrographic Office





CLIPPER 15 / 16 ROUND THE WORLD YACHT RACE

DAILY MAINTENANCE AND ROUTINE CHECKS

DATE: 04-SEP | LOG OF YACHT: CV21 | SKIPPER: | TOTAL PERSONS ON BOARD: 22

PRE-DEPARTURE CHECKLIST COMPLETED AND RETURNED TO RACE OFFICE

SAFETY GEAR	BILGES	STEERING GEAR	DECK WALK	RIGGING	SAILS	ENGINE	GENERATOR	INITIALS
	1000 ✓				✓AA			

UTC	LOCAL	LATITUDE	LONGITUDE	COMPASS COURSE	TRUE COURSE	COG	WATER SPEED (knots)	SOG (knots)	LOG (nM) from GPS	DISTANCE (nm)	POWER/ SAIL	WIND DIRECTION (degrees)	TRUE WIND SPEED (knots)	TRUE WIND ANGLE (degrees)	APPARENT WIND SPEED (knots)	APPARENT WIND ANGLE (degrees)	BAROMETER (mb)	SEA STATE
0210	0310	44°40·950'N	010° 47·624'W	240°	240°	220°	8·5	9·4	722	7	S	017°	13·9	199°(S)	9·1	113°(S)	1003	C
0310	0410	44° 35 ·792'N	010° 58 · 474W	255°	250°	239°	9·1	10·0	732	10	S	041°	13·6	136°(S)	11·0	111°(S)	1003	C
0410	0510	44° 31 · 239'N	011° 11 · 088'W															
05	06																	
0600	0700	44°22' 906N	011° 31 758W	240	240	240°	10.0	11.2	760	32	S	059°	19.5	257°	11·3	138°	1003	SL
0700	0800	44°18' 065N	011° 43 490W	260	260	253	7.7	9.2	769	9	S	040°	16.1	172°	8.2	150°	1003	SL
0800	0900	44° 11' 215N	011° 46 128 W	168	169°	169°	9·4	9·6	779	10	S	019°	17·2	160°	10·9	142°	1003	SL
0900	1000	43°[illegible]	011° 42 ·300 W	190	174°	174°	11·1	12·4	792	13	S	026°	19·0	138°	13·0	096	1002	Mod
1000	1100	43°48·897 N	011° 41 ·460W	180	179°	179°	9·2	9·3	801	9	S	031°	17·1	146°	16·2	105°	1003	Mod
1200	13.00	43°29. 895 N	011° 37. 618 W	160	160	173	11.8	11.2	821	20	S	028°	21.	134°	12·2	94°	1004	Mod
1300	1400	43°16. 358 N	011° 34. 476W	180	180	178	9.8	11.0	835	14	S	031°	22.6	136°	15.6	126°	1004	Mod
1400	1500	43°06· 092N	011° 32 ·976W	180	180	179	11·4	11·2	845	10	S	028°	19 4	136°	10·4	120°	1003	MOD
1500	1600	042° 55'·400N	011° 32 ·596W	185	180	179	11·5	12.0	856	11	S	031°	17·5	137°P	11·4	135°	1002	MOD
1700	1800	042°.36 ·300N	011° 28· 396W	180°	180°	175°	9.1		876	20	S	017°	21·2	118°	21·6	102°	1001	MOD
1855	1955	042° 6 ·981N	011° 19 585W	169°	172°	175°	11	10.9	900	24	S	018°	33.3	010°	24.3	123°	1001	MOD
1955	2055	042° 06 ·990N	011° 15 ·623W	159°	159°	151°	9.1	11.1	909	9	S	020°	30.1	134°	18·0	131°	1000	MOD
2100	2200	041°54. 860N	011° 08 ·280W	157°	157°	166°	11·1	10.5	922	13	S	021°	27.7	151°	13·2	117°	1000	MOD
2200	2300	41° 47. 306	011° 15. 899 W	240	240	240	10.9	11.4	933	11	S	017°	23.8	146°	15·7	124°	1000	MOD

Figure 10: Position at 2307 and logbook entry

Base image courtesy of Clipper Ventures plc

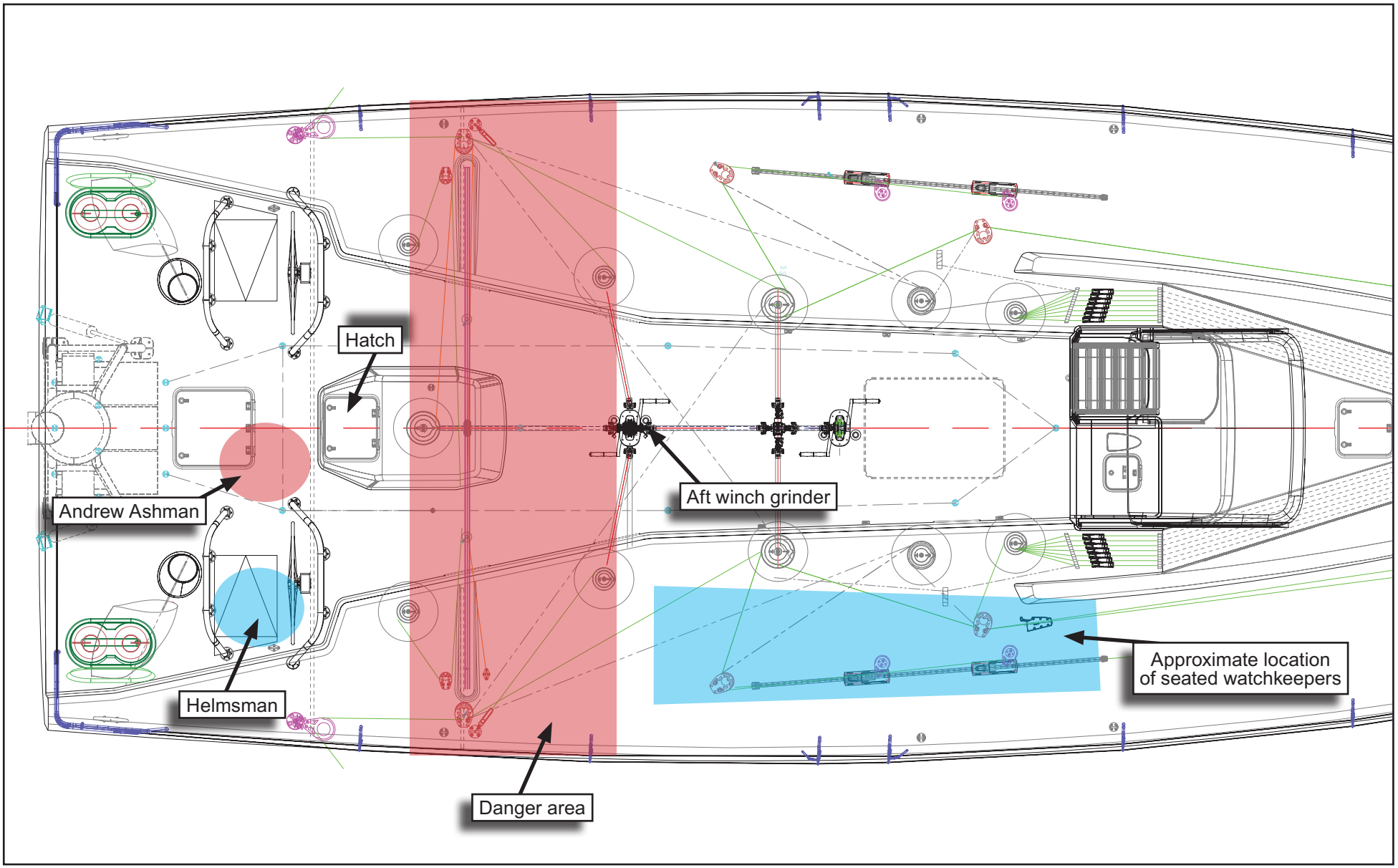


Figure 11: Position of crew prior to accident

2.1.2 The accident

CV21 continued on its 240° course and the wind remained from the north-north-east but, by 2330, had increased and was gusting up to 30kts at times. Cloud cover had also increased, creating a dark night, making it more difficult for the helmsman to see the shape and set of the mainsail.

The sea state had also worsened and the helmsman found it increasingly difficult to control the vessel's head, which was veering up to 50° off course at times. By 2345, the weather conditions were such that Andrew decided to reef the mainsail. He instructed a crew member to go below and to ask the skipper if he was content for the crew to complete the reefing evolution.

The crew member left the cockpit to wake the skipper. However, due to the yacht's increasingly erratic movements the skipper had already woken up, and by the time the crew member reached him, the skipper was discussing the intended reefing operation with Andrew through the navigation station hatch. The skipper gave his approval for the reef and the crew member made his way back towards the companionway and up onto deck.

Meanwhile, Andrew moved forward into the area known to the crew as the danger zone and stepped over the mainsheet traveller. Still tethered to the same D-ring, Andrew moved towards the aft winch grinder and called for his watch to gather for a briefing on the reefing evolution.

At 2356:30, without warning, the yacht suddenly gybed. The boom swung rapidly across the cockpit from port to starboard and the yacht heeled violently to starboard. The crew member who had gone below to wake the skipper shouted "*down, down!*" and the crew on deck, who had just started to get to their feet for the evolution, immediately complied, as did the helmsman.

The helmsman was unable to regain control of the yacht's heading before a second gybe returned the boom back to port and the yacht onto a broad starboard reach again. A crew member saw that the boom preventer was flying free and, thinking it had failed, he returned below to the sail locker to get a spare preventer line.

2.1.3 Post-accident actions

The helmsman saw Andrew lying motionless on the cockpit deck **(Figure 12)** and alerted his crew mates by shouting "*man down*!" Another crew member quickly assessed the situation and took charge of the deck. Staying low and close to the deck, he crawled under the port side of the traveller and began to centre the traveller car. He then calmly instructed the crew to operate the grinders in order to regain control of the mainsail and boom, and sent one to notify the skipper of the situation.

The violent motion of the yacht during the gybes had already alerted the skipper that all was not well. On hearing the news, the skipper, who was already donning his oilskins, immediately made his way up onto deck, taking a head torch with him.

After making sure that it was safe to enter the danger zone the skipper crossed to the starboard side of the deck, where Andrew was lying at a slight angle to the cockpit side coaming. Sarah Young was already with Andrew and informed the skipper that she could not find a pulse. The skipper used his head torch to shine

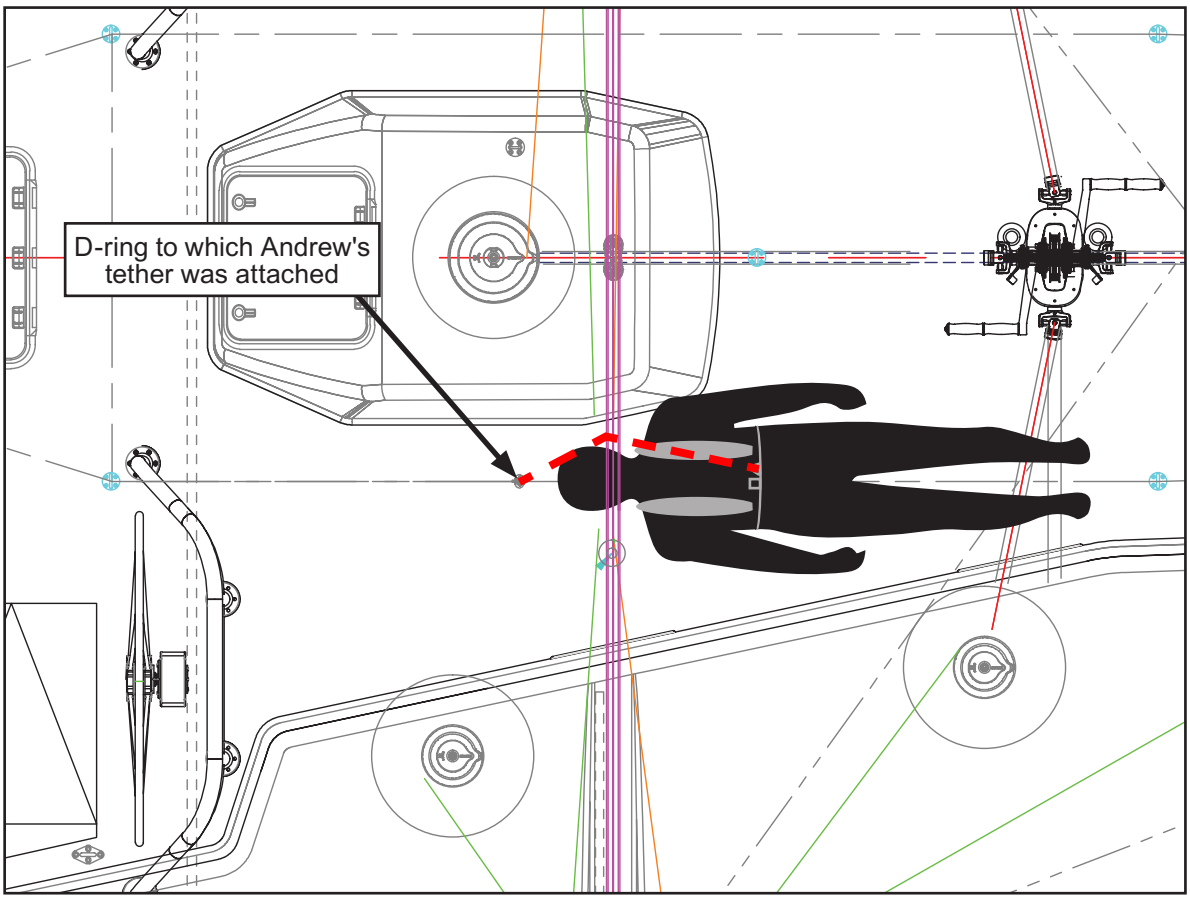


Figure 12: Indicative position of Andrew following gybe

a light in Andrew's eyes, but there was no response. As the skipper could not see any sign of obvious injury, he concluded that Andrew had suffered a major trauma. Sarah then urged the skipper to call the Praxes Medical Group[5] (Praxes) for advice. The skipper put Sarah in charge of the first-aid response and then went below to use the satellite telephone.

Sarah saw that with Andrew's head abaft the traveller, it was not possible to commence cardio-pulmonary resuscitation (CPR). After a neck support had been located and fitted, the crew attempted to unclip Andrew's tether in order to move him clear of the traveller, but there was too much tension on it for them to achieve this. Eventually, the tether was cut and, with some effort, the crew moved Andrew clear of the traveller. The crew then began CPR in earnest. CPR continued for more than 50 minutes until Praxes advised them to stop when it was clear that Andrew was not responding.

The skipper then notified the Clipper race office of the accident by satellite telephone and *CV21* was steered towards Porto, Portugal, arriving the following evening.

2.2 *CV21*'S CREW

2.2.1 General

At the time of the accident there were 22 people on board *CV21*, all with varying levels of sailing experience and competence.

[5] Praxes Medical Group was the medical support sponsor of the 2015-2016 Race.

2.2.2 Andrew Ashman

The starboard watch leader, Andrew Ashman, was 49 years old and was a paramedic and HART[6] responder and trainer. Andrew was said to be an encouraging trainer who would allow others to take the lead but would step in if required. He could be strong willed but would ask for help when needed.

Andrew had been a keen sailor for a number of years. He held an RYA Day Skipper course completion certificate and had completed the Clipper coxswain course. He had completed his Level 1 and Level 4 training with *CV21*'s skipper and had made a favourable impression on him. Andrew had signed up for Legs 1, 3 and 7 of the 2015-2016 Race.

2.3 POSTMORTEM EXAMINATION

A postmortem examination of Andrew Ashman identified that he had died as a result of a broken neck from contact with a solid object. There was damage to his spinal cord and he had suffered a brain haemorrhage. The report also stated that Andrew had a bruise measuring approximately 6cm x 3cm on the right side of his neck, along with bruising to the back of his arms, left knee and right shin. Andrew was 170cm tall and weighed 105kg.

2.4 *CV21*'S PREVENTER ARRANGEMENT

During previous Races, Clipper yachts had experienced numerous problems with the preventer line arrangement causing severe distortion to cleats and deck fittings. Originally, the preventer line ran from the boom end to a snatch block on the foredeck, then back to the cockpit. This avoided the need for a crew member to go forward to adjust the line. After numerous failures, Clipper sought to replace the snatch blocks with an alternative arrangement.

Accordingly, Clipper's in-house rigger constructed a strop using a 14mm diameter Marlow D2 Racing rope, incorporating a 12-strand core manufactured from Dyneema ® SK78, a proprietary high modulus polyethylene (HMPE) based material. The strop consisted of the rope and two high load round metal thimbles **(Figure 13)**. The rope's polyester cover was removed to facilitate splicing and a partial splice was created in the middle of the line to prevent one end from becoming longer than the other. The rigger then eye-spliced the two metal thimbles in, one on each end, to make a strop with two hard eyes. The partial splice loop was then passed through a pad-eye and the hard eyes hitched through the loop to attach the strop to the yacht. On board *CV21*, a preventer line of 14mm diameter D2 Racing 78 rope was rigged on each side of the yacht to run from the cockpit along the deck and through one of the hard eyes in the preventer strop, before being tied off. The preventer line on the required side was untied and clipped to a line of uncovered 14mm diameter D2 Racing 78 rope, which was permanently rigged along the boom, as required. In this format, one strop thimble was in use while the other lay in readiness.

An assessment of the preventer arrangement by Clipper concluded that it was fit for purpose and the rigger's line managers gave him approval to fit the strop onto the Clipper 70 fleet before the beginning of the 2015-2016 Race. The strengths of the preventer line, strop and pad-eye were estimated but not documented and no estimate of their expected in service loading had been recorded.

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[6] HART - Hazardous Area Response Teams comprise specially recruited and trained personnel who provide the ambulance response to particularly hazardous or challenging incidents.

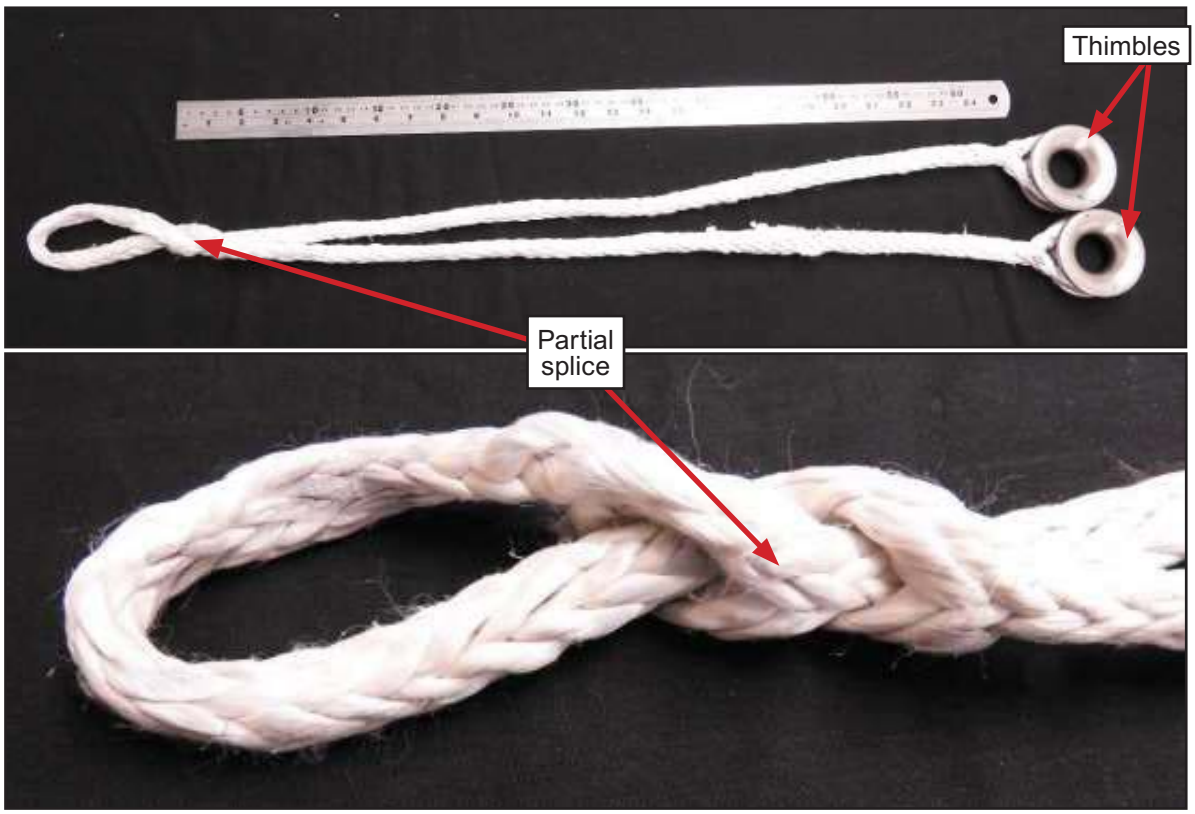

Figure 13: Preventer strop

2.5 HIGH-MODULUS POLYETHYLENE (HMPE) ROPE

HMPE rope is widely used in both the commercial and recreational maritime sectors. HMPE has many advantages over natural and steel wire rope. It has a good strength to weight ratio and is reasonably resistant to water and the effects of ultraviolet light.

The material consists of extremely long molecular chains, which serve to transfer load more effectively to the polymer backbone by strengthening intermolecular interactions. This results in a material with very low elasticity and the highest impact strength of any thermoplastic presently made.

The *RYA Rigging Handbook for Cruisers*[7] publication's advice on HMPE includes:

> *'Markets under brand names Spectra and Dyneema, these have similar properties to Vectran*[8] *as well as a very good strength-to-weight ratio. HMPEs have good UV resistance and are often used unjacketed. Commonly used for halyards, guys and sheets – particularly on racing boats, for instance …' [sic]*

Marlow, one of the industry's leading rope manufacturers, supplied the HMPE rope used on board Clipper yachts. The data sheet for the D2 Racing rope supplied to the Clipper 70s is shown at **Annex C**.

[7] RYA Rigging Handbook for Cruisers, Barwell A, 2013, ISBN 9781906435509.

[8] Vectran – A liquid-crystal polymer rope.

2.6 POST-ACCIDENT INSPECTION AND TESTS

2.6.1 Boom and cockpit area

MAIB inspectors attended *CV21* following its arrival in Porto. The following points were noted:

- The boom was complete with no signs of contact with a foreign object
- The lines, sheets and halyards were stowed
- The cockpit area was clear of debris and unmarked
- The preventer strop was found broken **(Figure 14)**
- The traveller was not damaged and was unmarked.

Figure 14: Failed preventer strop

2.6.2 The preventer strop

The MAIB recovered the parted preventer strop and sent it to Materials Technology Ltd (MTech) for inspection and testing.

The test report concluded that the primary failure mode was consistent with overload failure at the strop's partial splice, which might have been exacerbated by uneven loading of the splice, resulting in fewer fibres bearing the load, thereby creating a high stress point and pinch points.

The test report also referred to information sources indicating that HMPE ropes are particularly sensitive to strength loss through bending owing to their low elasticity.

2.6.3 Standard operating procedures

Clipper's standard operating procedures were laid out in a number of documents that were reviewed before each Race. The Clipper 15-16 Round the World Yacht Race Supplementary Standard Operating Procedures stated:

'Safety Around Spars

The mast and boom are both spars. It is very important that the crew are aware of their position and movement as they transmit substantial loads and have the potential to move rapidly.

- *The boom – be aware of it at all times, and do not look up if somebody says "DUCK"*

- *Main sail traveller – (death alley) never sit in line with the traveller, never walk around the leeward side of the traveller, never walk over the traveller and never hold the mainsheet between the traveller and the boom or sit between the traveller winches and aft 'coffee grinder' when running down wind*

- *Boom preventer – This is to be used at the skipper's discretion and at all times that the yacht is sailing deeper than a beam reach. Whenever sailing deeper than a beam reach, no crew shall sit in the area between the main sheet traveller winches and the aft 'coffee grinder'. In case of failure of the preventer, the skipper is advised to rig a second temporary preventer when the course they are on is likely to be steady for a considerable time'.*

2.7 PREVIOUS ACCIDENTS

Liquid Vortex

On 28 May 2011, a 23-year-old crew member on board the commercially operated yacht *Liquid Vortex* was seriously injured when the yacht gybed unintentionally while sailing downwind. The MAIB investigation found that the yacht's skipper had not adequately assessed the risks involved when leaving a relatively inexperienced crew member unsupervised when helming.

Buccaneer of Upnor

On 22 August 2007, a crew member on board the 10m yacht *Buccaneer of Upnor* sustained fatal injuries when he was struck by the mainsheet during an uncontrolled gybe. The skipper was briefly below decks at the time when a gust caused the boat to broach to windward. The helmsman had the wheel hard over to try to counteract the broach so that when the wind subsided the boat altered course quickly and the gybe occurred. The investigation highlighted the need to assess the capabilities of each crew member to carry out particular tasks when the skipper is absent from the cockpit, and to ensure that inexperienced crew are properly supervised.

Roaring Meg of Cowes

Two crew members were injured when a yacht made two accidental gybes on 20 May 2006. *Roaring Meg of Cowes* was completing a 'sailing taster day', with a skipper and nine passengers crewing. In worsening weather, a succession of events led to a crew member's leg becoming trapped and fractured by the mainsheet during the first gybe while another crew member was struck on the head by the boom during the second uncontrolled gybe. The investigation identified several safety issues, including the lack of comprehensive risk assessments and poor decision-making processes on board.

2.8 ANALYSIS

2.8.1 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.

2.8.2 Overview

Andrew Ashman died of a fatal neck injury sustained during an accidental double gybe on board *CV21.* Although the accident occurred within the cockpit area, there were no eyewitnesses to the mechanism that led to Andrew's fall. However, the investigation has identified the most probable cause and a number of contributory factors.

2.8.3 Decision to reef

When a yacht is carrying too much sail downwind for the conditions it can become overpowered, resulting in the helmsman having difficulty in maintaining the yacht's heading.

At the watch changeover, Andrew's observation that the yacht had been a '*bit lively*' was dismissed by the off-going watch leader, and the starboard watch did not find it difficult to maintain a steady heading at the start of their watch. As the watch progressed, the wind increased and, by 2307, the apparent wind speed of 15.7kts was approaching the 16kts limit recommended by the sailmaker for the yankee 1 headsail. As the wind speed continued to increase, the helmsman found it increasingly difficult to maintain the yacht's heading, occasionally veering up to 50° off course. While he did not ask for assistance or state that he was having difficulty, Andrew was standing to his immediate left and would have been aware of the situation.

There is no exact formula for knowing when to reef, and the evolution can be challenging and potentially dangerous for an inexperienced crew. As the wind increased and *CV21* responded with increased movements, it would have been wise for Andrew to replace the helmsman with a more experienced crew member. However, his decision to reef at 2345 was timely. It was also appropriate for him to confirm his intentions to the skipper.

It is possible that Andrew intended to place a more experienced helmsman on the wheel prior to the actual reefing evolution, and was planning to provide detailed roles to his team once they had assembled. However, this was the first reefing evolution that the starboard watch had completed during the Race, so Andrew's intentions and expectations cannot be known.

2.8.4 Skipper's decision to remain below

The accident occurred during the first week of the first leg of the Race. While members of *CV21*'s crew had sailed together during training, the Race leg crew had been together for only 4 days and so were still getting used to working together as a team. The crew were inexperienced at ocean racing and it is possible that the skipper was spending considerably more time monitoring the crew than he would have done had they been more experienced or further into the Race. It is also likely that his rest periods were irregular, which would have exacerbated any adverse effects of fatigue that he might have been suffering.

The skipper had appointed Andrew as watch leader having spent two of the four pre-Race training courses working with him; he clearly trusted Andrew and had faith in his abilities. Although reefing had been conducted by all crew during training, this was the first reefing evolution by the starboard watch during the Race, but the skipper was content that Andrew was capable of leading the evolution unsupervised. Consequently, he decided to remain below.

Despite Clipper's requirement for the skipper to keep a log of his hours on watch, no such records were available. However, as the skipper was not part of the watch routine, it is unlikely that the log would have provided an accurate reflection of his actual hours of work, and would certainly not have provided a record of his hours of sleep. Therefore, at the time of reefing, the extent to which a breach of SCV Code hours of rest requirements were at risk and the degree to which fatigue might have adversely affected the skipper's decision-making are unknown.

While the reasoning behind the skipper's decision to remain below is perhaps understandable, it resulted in the deck being left unsupervised by him at a time of heightened risk.

2.8.5 Route taken by Andrew

Before the gybes, Andrew had been standing behind the traveller tethered to a D-ring on the deck. Following the gybes, Andrew was found with his tether over the traveller, still attached to the same D-ring. Therefore, it is clear that he must have entered the danger zone and stepped over the traveller without challenge from other crew members.

Clipper's training and safety briefs were specific on the requirement for crew to avoid remaining in the danger zone when the vessel was sailing downwind. It cannot be known why Andrew entered the zone on this occasion, but it is possible he was preoccupied considering the reefing evolution and the pre-reefing brief he was about to give his team, and so forgot about the zone.

The danger zone was not marked on the deck and there were no visual hazard markings to remind the crew of the danger. Additionally, Andrew moved forward just before the accidental gybes, leaving little time for him or anyone else to realise that he had entered the danger zone.

2.8.6 Injury mechanism

When the accidental gybes occurred, the yacht heeled violently to starboard and then to port. Andrew was standing in the danger zone, with no obvious hand-holds available to him at the time. After the double gybe, he was found motionless on the deck, having received a fatal injury to his neck, along with other injuries. There are three possible mechanisms leading to these injuries.

Struck by the boom

MAIB statistics show that it is not uncommon for a crew member to be struck by the boom on board a sailing vessel, especially when an accidental gybe occurs. However, the boom on board *CV21* was rigged at a height above the cockpit deck of 2.0m. As Andrew was 1.70m tall it is considered very unlikely that he was struck by the boom.

Struck by the mainsheet or other rope

The danger zone is so called because of the potential for the mainsheet to pass across the area during a gybe. As the boom passed from port to starboard and back again during the double unexpected gybe that led to the accident, the mainsheet would have swung across the area twice at speed, possibly catching Andrew and throwing him into the starboard deck coaming or causing him to lose balance and fall onto the deck coaming.

It is also possible that he was struck by the preventer line that was freed by the failure of the preventer strop. However, given the non-elastic nature of this HMPE line, any energy stored in it at the time of failure would have dissipated instantly. Consequently, the line would not have had sufficient force to cause the injuries sustained by Andrew.

Motion of vessel

Immediately before the accident, *CV21* was heeled to port at an angle of between 10 and 20°. However, the accidental gybes threw the yacht violently to starboard before, almost immediately, returning to port, causing the deck to roll rapidly to starboard and then to port.

At the time of the gybes, Andrew was standing in the danger zone, tethered to the deck behind him with no readily available hand-holds. If he was not struck by the mainsheet, it is likely that Andrew was thrown off balance by the rapid rolling of the yacht which, possibly combined with the limiting effect of his tether, led to him falling against the starboard deck coaming.

It is not possible to establish with certainty how Andrew sustained the fatal injury to his neck. However, the most likely cause is a fall, either having been struck by a rope and/or due to the vessel's motion during the unintentional gybes, resulting in a heavy impact with the starboard deck coaming.

Had Andrew not taken the short-cut across the traveller, but skirted around the starboard side where both tethering points and hand-holds were readily available, this accident might have been avoided. Andrew might have been prompted to take the route prescribed during the Clipper training sessions had there been a visual reminder of the danger zone, such as visible markings on the deck.

2.8.7 Failure of the preventer strop

The exact load on the preventer strop at the time of failure cannot be known and, for yachts of the size used by Clipper, it is neither feasible nor desirable to design a preventer arrangement that will not fail under any circumstances. However, it is possible to ensure that the likely threshold at which such failures will occur is more predictable by identifying the strengths of the individual components and their potential in service loading. For this to be done in a practical way, the limiting characteristics of equipment, such as HMPE, needs to be properly understood by the industry.

When *CV21* moved to place the wind on the opposite side of the mainsail, the direction of the force generated by the sail reversed, acting to drive the boom across the yacht. The load on the mainsheet would have been transferred onto the preventer arrangement, and at some point this load exceeded the load bearing capability of the strop, causing it to part. The preventer line then released and the boom was able to move across the yacht in the first accidental gybe.

Had Clipper been aware of the strop's actual breaking load and its relative weakness in the preventer arrangement, the strop could have been redesigned so as to ensure its load capacity was more consistent with its intended application. The manufacturer's data sheet for the D2 Racing rope supplied to the Clipper 70s did not contain information on the loss of strength caused by splices, hitches or knots. Wider promulgation of the limitations of HMPE rope would be beneficial.

SECTION 3 - ACCIDENT TO SARAH YOUNG

3.1 NARRATIVE

3.1.1 Lead up to accident

On 21 March 2016 *CV21* set sail from Qingdao on Leg 6 of the Race. In addition to the skipper, there were 15 crew on board, five of whom were on board for the whole circumnavigation. The SIs included that all yachts were to remain below a latitude of 45N until past a longitude of 150W to restrict exposure to severe weather.

At 2100 (UTC+12) on 1 April, the skipper received the daily weather report **(Figure 15)**. At 2116, the yacht gybed on to a starboard tack **(Figure 16)**, the wind having been backing since 1700, to maintain an easterly course. From examining the data, he anticipated the wind would increase early the following morning as a weather system moved through from west to east. He briefed the ongoing watch leader prior to the starboard watch taking over at 2200. The port watch leader completed a handover with the starboard watch leader before the port watch then went below.

At the time of watch handover on *CV21*, the wind was 20-25kts from a south-westerly direction, the sea state was moderate, and it was dark with no moon. The sea temperature was approximately 13ºC. The sail configuration consisted of a full mainsail, staysail and yankee 2 headsail, which had been the case for that and the previous day.

Shortly after watch changeover the wind backed rapidly becoming easterly, then north-easterly, and increased in strength. It quickly became apparent that the sail plan needed to be reduced. At approximately 2223, the watch leader, following the skipper's agreement, started organising his watch to reef the mainsail. The assistant watch leader, who was down below repairing the toaster, was called up on deck to help. He donned his lifejacket but not his foul weather gear. The wind was over 40kts and gusting over 60kts.

The skipper, who was below at the navigation station, sensed that the situation was deteriorating, and the watch leader, who was now on the helm, accepted the skipper's offer of help. The skipper dressed in his foul weather gear and went up on deck, taking over the starboard wheel from the watch leader. The watch leader then proceeded to the mast to assist with reefing the mainsail. Given the wind strength it was decided to take in two reefs with the yacht heading in a west-north-westerly direction. Sarah Young was working at the mast with the watch leader, both attached to the yacht by their tethers.

After approximately 20-30 minutes, the reefing of the mainsail was complete and attention turned to lowering the yankee 2 headsail. Before doing so, the skipper decided to tack and head the yacht in an easterly direction. However, while he then tried to swing the yacht's bow through the wind, the wind and wave conditions were such that, on two occasions, the yacht lost all way and started sailing backwards with the rudder being forced over and onto its stops.

At 2307, the skipper finally managed to turn *CV21* onto a port tack on a south-easterly heading. The boom was on the starboard side and the yacht was heeling to starboard. The assistant watch leader had gone below to warm up, having become wet during the reefing process. The crew on deck tidied the lines and

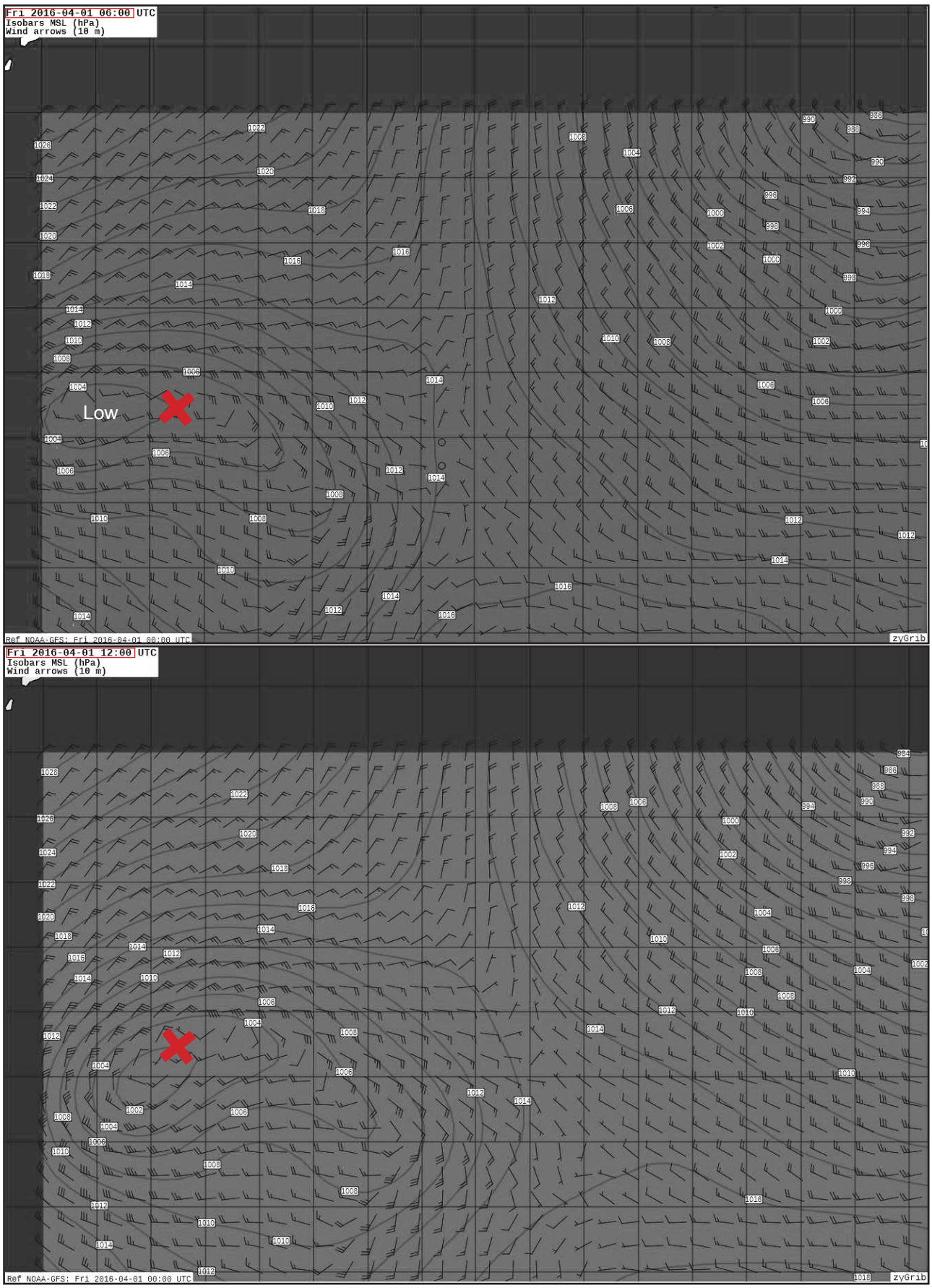

Figure 15: Zygrib weather forecast issued at 0900 (UTC) on 1 April 2016 with MOB position marked

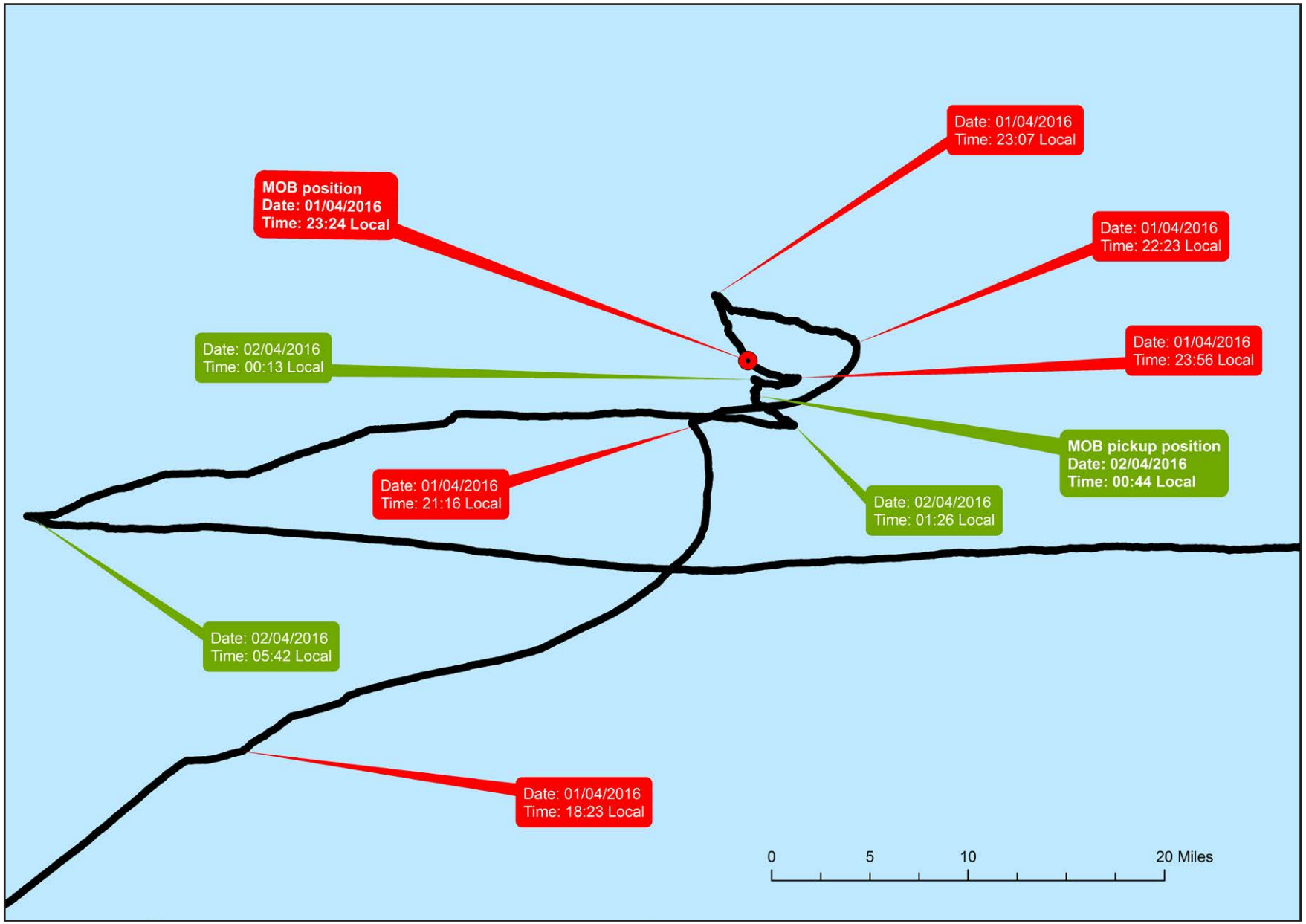

Figure 16: Track of CV21
Note: Red is for 1 April 2016 and green for 2 April 2016

started to prepare for lowering the headsail. Sarah was asked to go below to wake two of the port watch to help as there were insufficient crew in the starboard watch to lower the headsail in the prevailing conditions. She asked two of the port watch crew to help, and a further crew member volunteered his assistance.

Leaving the three crew below to get ready, Sarah climbed back up the companionway steps into the cockpit **(Figure 17)**. Without first clipping on her tether, she assisted another crew member in reattaching a winch handle pocket **(Figure 18)** onto the port forward side of the cockpit. The combination of a wave breaking over the deck from the port side and *CV21* heeling further to starboard led to Sarah losing her footing, and falling over and down the deck, ending up lying next to the starboard guardrail with a winch handle in her hand. The watch leader, who was sitting on the starboard side of the cockpit, tried to grab her, but before he was able to do so another wave washed down the starboard side, forcing Sarah over the side.

3.1.2 MOB recovery

At 2324, the shout of *'man overboard'* was made and two of the crew down below manned the navigation station, pressing the MOB button on the global positioning system (GPS) plotter and starting the engine. A crew member positioned by the mainsheet winch was prevented by the limit of his attached tether from reaching the dan buoy on the aft gantry. The watch leader unclipped his tether and rushed to the automatic identification system (AIS) beacon on the dan buoy. He removed the base pin and twisted the bottom one way and then the other, which caused the beacon light to activate. He then threw the dan buoy, horseshoe life ring and attached buoyant light over the side. The watch leader, who was already dressed in a dry-suit, then went below to don the rescue swimmer harness and helmet.

The skipper tried to heave-to[9] but, as earlier, he was unable to turn the yacht's bow into the wind. Conscious that he did not want to risk the yacht losing way and sailing backwards, potentially damaging the steering gear, he instructed the crew to get the headsails down. The crew who had been roused by Sarah were now on deck and the rest of the crew were all out of their bunks. The appointed medic on board prepared for receiving Sarah below deck with the assistance of other crew. The crew in the navigation station transmitted a "Mayday" emergency call on VHF radio, but there was no response. By this time, an AIS target had appeared on the GPS plotter marking the MOB position.

The skipper steered to keep the yacht's bow up into the wind as much as possible without losing steerage. Three crew on the foredeck hauled the staysail down first. The conditions were such that as the crew hauled the sail down it filled and self-hoisted again. After eventually managing to secure the staysail, they repeated the operation with the yankee 2 headsail. By that time there were four crew on deck manhandling the headsail down, but again the conditions made the process difficult. At one stage, one of the crew was lifted off his feet by the self-hoisting headsail and it was only the limit of his attached tether that prevented him from being lifted higher.

At 2356, with the headsails almost down and the mainsheet centred, the skipper was able to steer towards Sarah. The crew at the navigation station used the GPS waypoint 'Goto' function, updating the position as the target moved, to provide a

[9] When hove-to the yacht is tacked but the headsail is left sheeted in on the wrong side, the mainsail is eased and the helm is held over to counteract the wind filling the headsail.

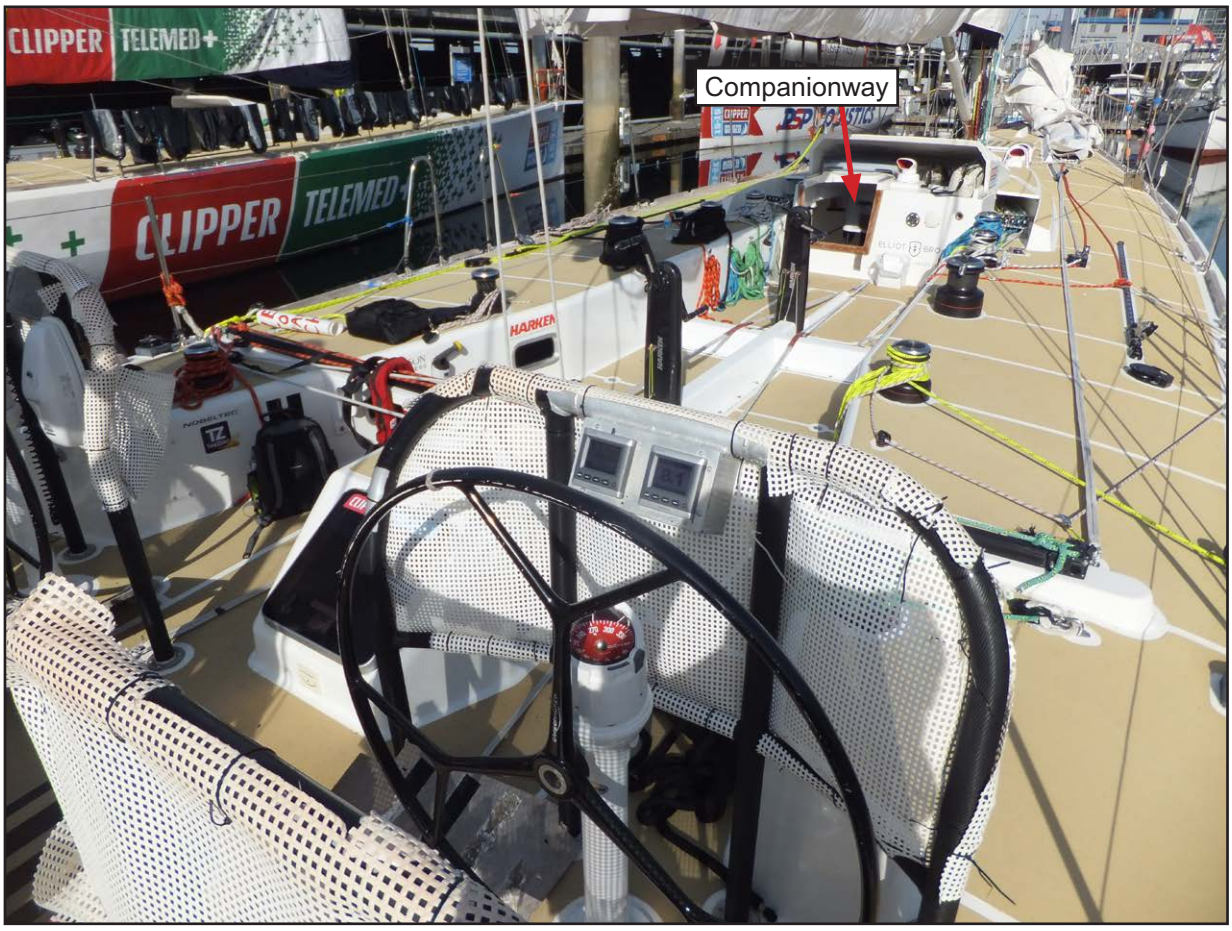

Figure 17: Cockpit showing companionway

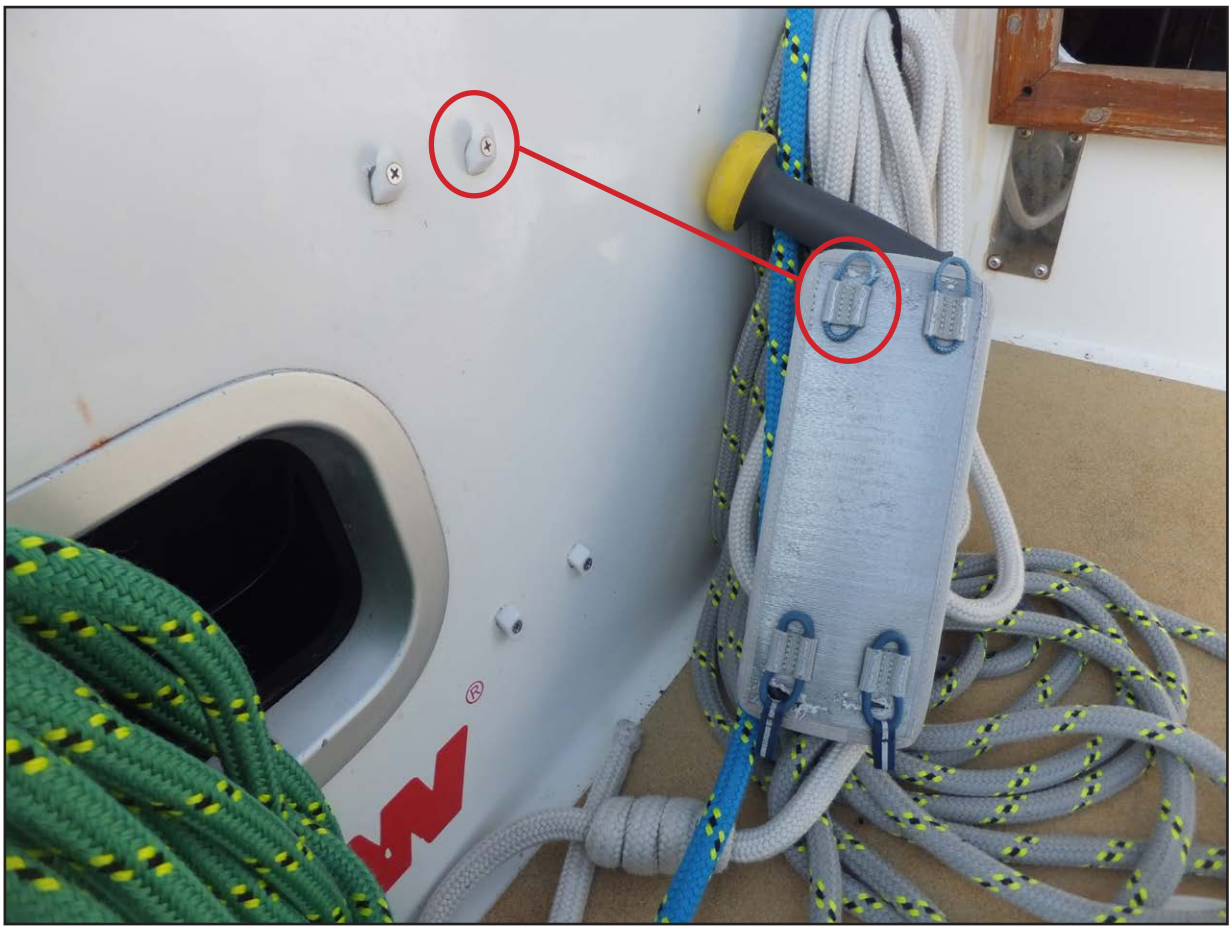

Figure 18: Detached winch handle pocket

course and distance to the AIS target on the navigation display at the wheel. When the skipper first started heading towards the AIS target it was 2 nautical miles (nm) away and appeared to be moving at 2kts.

The rescue swimmer was on deck at the port shrouds and had been assisted by another crew member in attaching a halyard to his harness. This process was made difficult by the windage on the halyard. Although it was normal practice to rig a second halyard, this was not possible due to the other halyards becoming twisted in the prevailing conditions. A tether was secured around the shrouds and the halyard to prevent the rescue swimmer from swinging too far from the yacht's port side. Another crew member was standing on the bow acting as a lookout to direct the skipper towards Sarah.

Lights were spotted in the water and the skipper headed towards the one he thought was nearest. The light was attached to the horseshoe life ring, so the skipper headed towards another light, which was attached to Sarah's lifejacket. At 0013 on 2 April, as the yacht approached Sarah it was apparent she was conscious, but that her lifejacket spray-hood was not in position. The skipper made several attempts to approach Sarah. On the first attempt Sarah was not close enough to the rescue swimmer, who had been lowered down, his lifejacket inflating as he entered the water. On the next pass, the rescue swimmer made contact with Sarah, but she slipped free. Shortly afterwards, Sarah was seen briefly grabbing the port guardrail before she let go and drifted out of sight astern. Once winched out of the water, the rescue swimmer released an estimated 50-75% of inflation gas from his lifejacket to make it easier for him to work when in the water.

On the next approach, Sarah appeared to have lost consciousness. One of the crew hanging over the side managed to grab hold of her. The rescue swimmer, who had been lowered back into the water, asked for slack in the halyard and swam to Sarah. Believing he had secured the halyard to her, he instructed the crew to winch up on the halyard. However, the lifting hook had not been connected securely and Sarah dropped back into the water. The swimmer was then towed along underwater for a short period as the yacht picked up speed until he was winched up clear of the water once again.

On the final approach, Sarah was level with the shrouds and the rescue swimmer was able to swim out and place the loop of Sarah's long tether, which was still attached to her harness at both ends, over his head. He then successfully attached the lifting hook to her. At 0044, Sarah, who was unresponsive at this time, was lifted on board and lowered onto the deck.

3.1.3 Medical response and post-accident events

The medic asked for Sarah to be carried down below immediately as conditions on deck would make any resuscitation efforts very difficult. As Sarah was lowered below, her lifejacket crotch strap became snagged and it had to be cut. Her outer clothing was removed and CPR was commenced. A short time later, the medic requested that the skipper be called below so that he could call the Praxes emergency medical care service on the satellite telephone.

At 0111, the skipper contacted Praxes and was connected to the duty doctor. The skipper informed the doctor that Sarah had been in the water for 1 hour and 20 minutes and was unresponsive with dilated pupils. The doctor asked whether there were any life signs and, on being told there were none, the doctor stated there was nothing more they could do and, at 0114, Sarah was declared deceased.

The watch leader, who had been the rescue swimmer and had been submerged in the water several times, was monitored for signs of any secondary drowning by another crew member with medical experience.

At 0126, the crew on the helm, following instruction from the skipper, altered onto a westerly course towards Japan, which was approximately 1000nm away. A third reef was then taken in the mainsail, taking 45-60 minutes to complete, with the wind gusting up to 90kts.

The skipper contacted Clipper Race Control who, following consultation with Praxes and the MCA, instructed the skipper to bury Sarah at sea when sea conditions allowed as there was no means to store a body for the duration of the voyage back to Japan. At 0543, *CV21* was turned onto an easterly course towards Seattle.

3.2 *CV21*'S CREW

3.2.1 Starboard watch

Of the 16 persons on board at the time of the accident, there were seven crew in the starboard watch, varying in age between 20 and 63 years. Sarah was one of three female members of the watch.

The watch leader, who was 42 years, had sailed from an early age and had been a dinghy instructor. He was a circumnavigation crew member and had been a watch leader since the beginning of Leg 5 of the Race. Prior to the Race, he had qualified as a Clipper coxswain. He was also one the crew who fulfilled the role of engineer on board. Prior to the start of Leg 6 to Seattle, he and the port watch leader had selected the crew members they wanted in their watches, the skipper still having the ultimate decision. Until this point in the Race, it was the skipper who had decided who was to be in each watch.

3.2.2 Sarah Young

Sarah, who was 40 years old, had no previous sailing experience before deciding to circumnavigate the world in the Race. She had been a trek leader with Raleigh International[10], was physically fit and enjoyed outdoor pursuits, including marathon running. She was also a qualified divemaster and a strong swimmer. She was 170cm tall with a slim build. She was described as very safety conscious and had conducted many safety briefings while working as a leader with Raleigh International.

Sarah had signed up for the Race in March 2015 and commenced her training in April 2015. All the skippers involved in Sarah's training reported on her abilities very favourably and that, although she had little experience of sailing, she had the

[10] Raleigh International is a sustainable development charity. They work in remote, rural areas to improve access to safe water and sanitation, build community resilience, to sustainably manage natural resources and to protect vulnerable environments.

potential to be a watch leader. She was trained in first-aid to expedition standard and had been awarded the RYA's Competent Crew course completion certificate during her training with Clipper.

On board *CV21*, Sarah was willing to work on deck in various roles. She worked forward of the mast changing headsails, at the mast reefing the mainsail and up the mast. She was able to steer the yacht and, by the time of the accident, having logged between 20,000 and 25,000 nautical miles, was considered a very competent crew and helm.

She returned to the UK from Albany at the end of Leg 3 for personal reasons and rejoined *CV21* in Sydney at the start of Leg 5.

3.3 EXAMINATION OF SARAH YOUNG

An examination, conducted by the medic on board, revealed Sarah had two lumps on the back of her head, one showing signs of bleeding, indicating she had impacted her head during the accident. At the time of the accident, Sarah had been wearing a thermal base layer, fleece top, mid-layer salopettes, a thermal soft shell jacket, and waterproof salopettes and jacket.

At 1200 on 3 April, when the sea conditions had calmed sufficiently, Sarah was buried at sea following a short ceremony.

3.4 GUARDRAIL REQUIREMENTS

The SCV Code normally requires a bulwark or three courses of rails or taut wires with an overall height achieving a minimum of 1000mm. Additionally, the distance between the lowest course and the deck should not exceed 230mm. However, the SCV Code expressly permits sailing vessels, where their proper working may be impeded, to have bulwarks, or two rails or taut wires with a minimum height of 600mm overall, with no maximum spacing specified for the gap between the intermediate rail and the deck.

World Sailing's (formerly ISAF) Offshore Special Regulations 2014-2015, required an upper lifeline with a minimum of 600mm above the deck and an intermediate lifeline. Furthermore, it specified the maximum vertical opening should not exceed 380mm and the gap between the intermediate line and the deck should be at least 230mm.

ISO 15085 Small craft- Man-overboard prevention and recovery, specifies for vessels operating in Category A, offshore and wind strengths greater than Beaufort Force 8, an overall height of guardrails of at least 600mm and the gap between the deck and intermediate guardrail to be between 230mm and 300mm. The ISO standard also covers requirements for tether and jackstay securing points.

3.5 LIFESAVING APPLIANCES AND PROCEDURES

3.5.1 Lifejackets

Clipper provided inflatable lifejackets for all the crew **(Figure 19)**. The lifejackets had an integral safety harness and were fitted with a crotch strap with a metal buckle attachment. On entering the water the lifejacket was designed to automatically inflate

and provide 150N of buoyancy. A water activated light and a whistle were included, as well as a spray-hood that the wearer could pull down over their face to prevent the inhalation of water **(Figure 20)**.

At the start of each training course or leg of the Race a lifejacket was assigned to each crew member. The crew member was responsible for inspecting and looking after their lifejacket. They were required to unpack and orally inflate it to ensure it stayed inflated. They were then required to inspect the gas bottle, buckles and straps for wear, and then repack the lifejacket, taking care to concertina the spray-hood back into position.

Lifejackets frequently self-activated at sea, particularly when working on the foredeck in heavy weather. The yacht therefore carried rearming kits and spare lifejackets.

Clipper's standard operating procedures required all crew to wear their lifejackets at all times when on deck and to always attach the crotch strap.

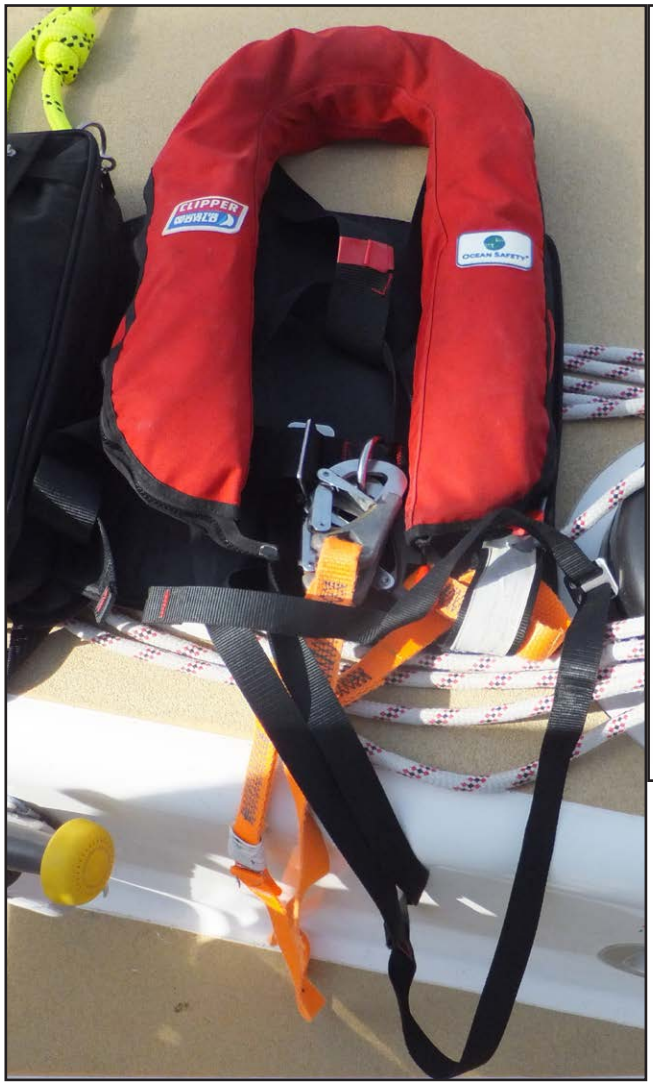

Figure 19: Clipper inflatable lifejacket

Figure 20: Example of spray-hood deployed on an inflated lifejacket (not a Clipper lifejacket)

3.5.2 Tethers

The crew were issued tethers of the three-point variety **(Figure 21)** which were attached to individual lifejackets when they were on deck. While moving around the vessel the long tether was employed and once in position the short tether could be used. Crew were responsible for checking their tethers and ensuring the overload indicator had not been activated.

Figure 21: Tether supplied by Clipper

The yacht carried spare tethers to enable swift replacement or additional tethers if a crew member wished to use two. Instructions on when to clip on were contained in the following:

The Clipper Race Crew Manual stated:

'You should clip on at all times but particularly in the following situations

- *At night*
- *When working on the foredeck*
- *In heavy weather…*

Also ensure you always clip on the windward side of the yacht as this will prevent you falling overboard'

The Clipper Ventures Standard Operating Procedures for On Water Operations stated:

- *'All crew shall clip on during any of following: at night, when offshore, and when reefed*
- *All crew shall clip on inshore, when reefed and crew are working on the foredeck'*

The Clipper 15-16 Round the World Yacht Race Supplementary Standard Operating Procedures stated:

'Safety tethers shall always be worn with the lifejacket and shall be attached to jackstays or appropriate strong points on deck at the appropriate times such as (this list is not considered exhaustive):

- *At all times, when in the Skipper's opinion, the conditions warrant it.*
- *Always at night.*
- *Always in poor visibility.*
- *If the crew member wishes to use it.*
- *When operating on the foredeck.*

Remember clip on early. Skippers will set an example in the wearing of lifejackets and in the use of safety tethers.'

While some crew members clipped on to varying degrees in accordance with the above instructions, others clipped on only when they deemed necessary because, in doing so, they considered their movement was hampered significantly. Crew members sometimes reminded each other to clip on.

While the skipper always wore a lifejacket when on deck, he did not always clip on when other crew considered it appropriate to do so.

3.5.3 Personal AIS beacons

Personal AIS beacons, when activated, enable the wearer's position to be indicated on AIS equipment carried by vessels that are within reception range.

Prior to the start of the Race no automatically operated personal AIS beacons were approved to be used with the Clipper supplied lifejackets. However, manually operated personal AIS beacons were permitted.

Although not supplied by Clipper, most of the Clipper yacht crews carried personal AIS beacons fitted to their lifejackets. Circumnavigation crew often purchased their own, and the yacht fund, to which crew contributed, was often used to buy sufficient personal AIS beacons. Other crew could rent a beacon for the Race legs they were on board.

The AIS beacon was slipped over the lifejacket light retainer with the plastic trigger arm removed **(Figure 22)**. When in the water with the lifejacket inflated the MOB activated the AIS by pulling down the red plastic sleeve. The antenna then deployed and started to transmit, with a typical reception range of 4nm at sea level.

In the case of *CV21,* the safety officer briefed any new crew on the use of the personal AIS beacon when they first joined the vessel.

Figure 22: McMurdo S20 personal AIS beacon as rigged in Clipper lifejackets

3.5.4 Dan buoy, horseshoe life ring and AIS beacon

Each Clipper yacht was fitted with a dan buoy mounted on the aft gantry. The dan buoy was attached with a length of floating line to a horseshoe life ring and a buoyant light. In an MOB emergency the dan buoy, life ring and light were thrown overboard to mark the position of the MOB.

The dan buoy had taped to it an AIS beacon, which was a different model to that fitted to the lifejackets. This AIS beacon was submersible to 60m water depth and had a typical reception range of 4nm at sea level **(Figure 23)**.

Figure 23: McMurdo S10 AIS beacon mounted on dan buoy

The AIS beacon needed to be activated prior to the dan buoy being thrown overboard. This required a crew member to remove the base pin, twist the bottom of the unit clockwise, and then push the base upwards. To check the battery, the base pin was left in place and the bottom twisted anticlockwise and released. The resulting flashing light sequence then indicated the residual battery life. To conduct a full system check, the bottom was twisted anticlockwise and held for 10 seconds, which caused a test message to be transmitted.

No signals from the AIS beacon attached to the dan buoy were received on board *CV21* following its deployment.

3.5.5 Other equipment

Clipper supplied each crew member with a set of foul weather gear. Crew members could decide if they wished to additionally purchase a dry-suit. Those completing the warmer legs of the Race or those unlikely to be working on the foredeck often decided the cost of a dry-suit was unjustified. Sarah had her own dry-suit, which she sometimes wore under her foul weather gear. However, she was not wearing it at the time of the accident.

3.6 MOB RECOVERY

3.6.1 Procedure

The Clipper Race Crew Manual listed the required actions to be taken in the event of an MOB. These are paraphrased below:

- Raise the alarm, with a call of ‘Man Overboard’.
- Stop boat by performing a crash stop or heaving to.
- Locate and have a crew member point towards the casualty.
- Throw the dan buoy, life ring and buoyant light overboard (activating the AIS beacon before throwing overboard).
- Press MOB button on GPS.
- Start the engine.
- Drop headsails.
- Prepare equipment:
    - Boat hook and scramble net made ready and lifting hook attached to appropriate halyard.
    - Swimmer to don harness, helmet and manual inflation lifejacket, as well as immersion suit if sea temperature dictates and time allows.
- Recover casualty under engine, manoeuvring downwind and approaching casualty into the wind:
    - Pick up casualty on port side by shrouds.
    - Halyard with lifting hook **(Figure 24)** lowered to casualty.
    - If casualty is conscious, attach hook to lifting beckets on their lifejacket and crew winch casualty out of the water.
- If casualty is unconscious:
    - Swimmer lowered into water on halyard with tether round shrouds and halyard to prevent too much swinging.
    - Swimmer attaches lifting hook to casualty’s lifejacket.
    - Both casualty and swimmer are winched out of the water.

The MOB recovery was required to be conducted using the yacht's engine to ensure that the casualty was recovered as quickly as possible. However, the same MOB process could be conducted under sail if the engine was not functioning, by sailing back to the casualty with only the mainsail hoisted.

Figure 24: MOB lifting hook

3.6.2 Drills

MOB drills were conducted frequently during training to ensure crew were familiar with the process. Each Clipper yacht had an MOB mannequin on board with which to conduct MOB drills during the Race.

The Clipper 15-16 Round the World Yacht Race Supplementary Standard Operating Procedures stated:

> *'MOB drills cannot be practiced enough. Skippers are to drill/brief crew as often as practical in the MOB procedure. This should be done at least once per leg, and always prior to the start of the 1st race of that leg.'* [sic]

Although the MOB procedure was briefed on various occasions a practical MOB drill had not been conducted by *CV21*'s Race leg crew together since the start of the Race in August 2015. There is evidence that practical MOB drills were also not conducted by other Clipper yachts during the Race.

However, all new crew who joined yachts for a leg of the Race completed a refresher training day together before departure. In Qingdao this evolution had been limited as fog had prevented the yachts from going to sea. The MOB procedure was run through while alongside in the marina with an MOB mannequin recovered from the pontoon.

The operation of the AIS beacon attached to the dan buoy was briefed to the crew but a full system check had not been conducted on board *CV21*.

3.7 PRAXES MEDICAL ASSISTANCE

In addition to Clipper skippers holding a Proficiency in Medical Care Certificate, Praxes medical group, based in Canada, provided a service delivering 24-hour remote access to medical advice. Clipper yacht skippers were able to call Praxes from their yacht's satellite phone and were able to speak to a doctor within 5 minutes. Praxes was also involved in determining the medical supplies carried on board a Clipper yacht and the basic training of those who volunteered as medics during the race.

3.8 PREVIOUS INCIDENTS

In the 2013-2014 Race Andrew Taylor went overboard in the Pacific Ocean during heavy weather. He was on the foredeck and was not clipped on when a wave washed him overboard. He was wearing a dry-suit and was carrying his own AIS beacon, which he activated. However, the beacon did not activate initially and it was only after a second attempt by Andrew Taylor sometime later that a target appeared on the yacht's GPS plotter. He was recovered conscious after being in the water for 1 hour and 45 minutes and went on to make a full recovery. As a result of this accident Clipper attached AIS beacons to their yachts' dan buoys for use in an MOB emergency.

Since 2012, there have been four tethered and one untethered reported MOB incidents occurring on Clipper yachts during racing and training. There was also a further tethered MOB incident that occurred on *CV21* during the 2015-2016 Race that was not reported to the MAIB.

3.9 ANALYSIS

3.9.1 Overview

Whereas the previous accident was a consequence of Andrew Ashman entering the cockpit danger zone, this accident was a consequence of Sarah Young not clipping on.

Sarah had signed up to circumnavigate the world on *CV21* and, although a relative novice at the start of the Race, was an experienced and able crew member by the time of the accident. The training she had received and Clipper's standard operating procedures had all made it clear that at night and with a reefed mainsail, she should have been clipped on as a primary defence against her being lost overboard.

Why Sarah did not clip on when she returned to the cockpit from below is uncertain, but it could have been for one or more of the following reasons:

- She was fatigued, which adversely affected her mental performance.
- She forgot to clip on.
- She was distracted while going to the assistance of another crew member.
- She decided that it was unnecessary to clip on at that time.

The analysis explores what additional factors might have contributed to Sarah's omission. It also examines the limitations of other risk control measures, such as the yacht's guardrails and the subsequent MOB procedure, and why they failed to prevent Sarah from being either washed overboard or recovered safely from the sea.

Lack of effective supervision featured in both accidents. The potential difference in the level of risk posed by employees as opposed to other persons on board is identified in MGN 492(M+F). Effective supervision at the time of the previous accident would have provided an opportunity to challenge Andrew's decision to enter and remain in the cockpit danger zone. It would also have provided an opportunity to prompt him to put a more experienced crew member on the helm as steering became more difficult. The prevailing conditions and circumstances at the time of the second accident prevented the skipper from identifying that Sarah was not clipped on. However, continual effective supervision during the Race prior to the accident would have provided an opportunity to challenge similar previous lapses by the crew, and would have instilled a more robust safety culture on board.

As Sarah was buried at sea, the precise cause of her death remains unknown. It is most likely she either drowned or succumbed to hypothermia, having been in 13°C water for 1¼ hours. It is also possible that she was rendered unconscious or injured following contact with *CV21* during the recovery attempts.

3.9.2 Tethering

Background

Tethering crew to a yacht is a well-established practice and it ensures that even if a person does fall overboard they are still attached to the yacht and can be recovered quickly. Although a simple safety precaution, the practicality of being tethered to a yacht does present some challenges. It makes moving around the yacht difficult and will slow operations down, requiring crew to think ahead to where they need to be and how they can get there.

Instructions and procedures

Clipper's instructions, although varying between documents, stated when tethers should be used as a minimum: certainly at night, in heavy weather or when reefed, or when working forward of the mast.

The practical difficulties of moving about the yacht when tethered gave rise to some crew either delaying clipping on or not clipping on at all. Particularly prone were those who were more experienced, considered they were familiar with the yacht's motions and erroneously perceived a lower level of risk in not clipping on as the Race progressed.

Consistent use of tethers requires good personal discipline, but also strong leadership and teamwork in effectively monitoring and challenging all identified lapses. Although crew members challenged each other on occasion, there are reports of when this did not happen, particularly by crew members who did not feel empowered to do so.

Tether securing arrangements

Given the difficulties with moving and working while tethered, the tether securing arrangements, hard points and jackstays must facilitate their ease of use as much as possible. An example in this case was the anti-chafe sleeve on the jackstays fitted to the cockpit floor, which prevented a tether clip from sliding freely over it **(Figure 25)**. This inconvenience led to some crew not clipping on at all when moving between the companionway and the helm positions.

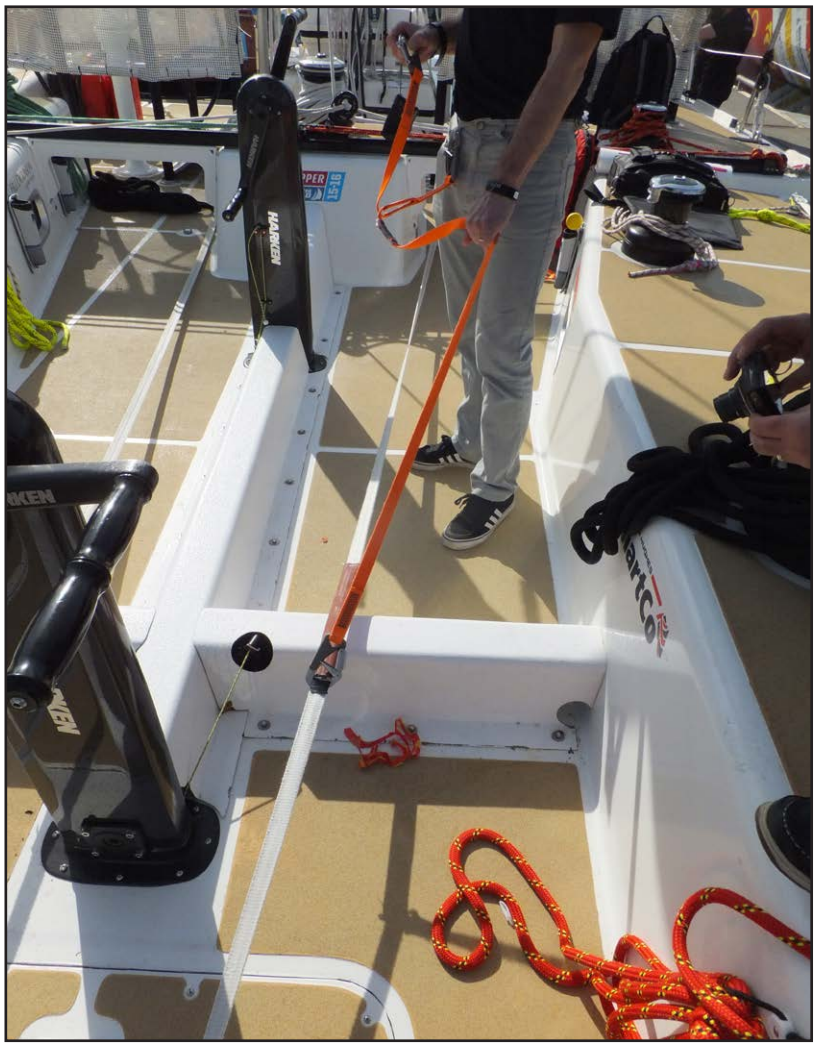

Figure 25: Cockpit jackstay and anti-chafe sleeve

The rigging of jackstays and hard points requires compromises, otherwise cockpit and deck layouts could become unworkable, but securing points must be derived with practicality in mind and procedures for their use developed accordingly. The watch leader, unclipping to move quickly aft to deploy the dan buoy in this accident, placed himself at significant risk of being washed overboard. Ensuring a crew member is always tethered within range of the dan buoy must be a factor to be considered when positioning crew at the start of a watch.

Although the accident occurred shortly after Sarah had come on watch, the yacht had been at sea nearly 2 weeks and was now encountering heavy seas. It is therefore uncertain to what extent Sarah might have been fatigued and, hence, the degree to which fatigue might have influenced her omission to clip on. However, the

effect of any memory lapse or distraction that Sarah might have experienced once on deck could have been countered had best practice been routinely followed to clip on before proceeding from the companionway. Some skippers in heavy weather rigged a spare tether that was clipped to the windward side deck jackstay. The other end was left hanging down into the cabin so that crew were prompted to clip on before leaving the safety of the cabin. Once on deck they attached their own tether and passed the spare tether back down below. How crew move around the yacht on deck must also be thought through so that a crew member is always able to be secured with one of their two tethers.

In conclusion, tethering on board *CV21* was the primary defence against a crew member being washed overboard. Given the limitations of other risk control measures and the severe weather conditions that the yacht was likely to experience during the Race, it was essential that clipping on remained at the forefront of the minds of all of the crew. This required a robust culture built on strong leadership, discipline and effective oversight.

3.9.3 Guardrails

Bulwarks or guardrails are fitted to most seagoing vessels to prevent persons falling overboard. The SCV Code normally requires a maximum distance between the lowest rail or taut wire and the deck of 230mm to ensure an average person cannot slip underneath it. However, the Code does not specify a maximum for this distance on sailing vessels where their proper working may be impeded.

ISAF's Offshore Special Regulations 2014-2015 required a minimum distance between the lowest wire and the deck of 230mm. This is because racing sailing yachts routinely have crew sitting on the windward rail with their legs hanging over the side to maximise the yacht's righting moment.

Guardrails provide an important function in ensuring crew have a hand-hold when moving on deck and also in preventing people and sails from being washed overboard. Clipper 70 yachts were fitted with an upper guardrail 800mm above the deck and an intermediate guardrail 380mm above the deck, thereby meeting the requirements of both the SCV Code and ISAF's Offshore Special Regulations.

As Sarah was last seen lying on the deck before she was washed overboard, it is highly likely that she passed under the intermediate guardrail. This could have been prevented had the distance between the intermediate guardrail and the deck been smaller or had lacing/mesh been fitted to the guardrails.

3.9.4 Sea survival

Sarah's survival time in water of 13°C, while wearing her sailing gear, is impossible to determine accurately. The International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual (Vol II, section 3.8.6e) estimates a 50% survival time for a normally-clothed person after 2 hours in water of 10ºC and 6 hours in water of 15ºC.

Sarah's clothing layer system and conservation of her body heat by not moving were her only defences against the cold. Sarah had a dry-suit, but she had chosen not to wear it on this occasion. Although dry-suits are very effective at keeping the wearer warm, they can be difficult to don and remove, which might have been a factor in her choosing to not wear it.

Once Sarah was in the water she was forced to draw on all her sea survival and offshore safety training. The fact that she managed to manually activate her personal AIS beacon and was still conscious when *CV21* returned to her 50 minutes later is testament to her training and her determination.

When *CV21* returned to Sarah she was not wearing her spray-hood. The reasons for not doing so could have been that she:

- Was unfamiliar with using the spray-hood.
- Chose not to use it.
- Was hampered by the deployed AIS beacon.
- Chose to remove it during the final stages of the rescue attempt to see or hear better and/or allow access for securing a lifting hook to her lifejacket.

When a casualty is in the water, the body will naturally turn to face the waves, therefore placing the casualty at increased danger of inhaling water. Spray-hoods are intended to prevent the inhalation of water and so prevent drowning.

The RYA-approved sea survival training provided by Clipper covered the use of spray-hoods but did not include a practical spray-hood deployment and use by each individual on the course. Deploying the spray-hood even when out of the training pool would ensure that participants were fully familiar with its use and were experienced in pulling it over their face.

The purpose of completing sea survival training is to improve the chances of survival in an emergency if someone finds themself in the water. Subjecting participants to unnecessary risk during training is unwarranted. However, the training should, so far as is reasonably practicable, aim to provide students with a realistic appreciation of the likely conditions that will be experienced when emergencies occur.

Basic sea survival training provides a necessary education in life-saving appliances and survival techniques. However, given the nature of the Race and the sea conditions likely to be encountered, conducting such training solely in a heated, calm swimming pool, dressed in shorts and a T-shirt, falls significantly short of the conditions crew members could be faced with, and what Sarah faced in this accident.

Clipper yachts race in some of the most inhospitable and remote areas of the world and their crews need to be extraordinarily self-sufficient in order to deal with the foreseeable emergencies that will occur during the Race. It is therefore of paramount importance for Clipper to build on any fixed-syllabus courses it procures to provide its crews with training that, in so far as is practicable, give them the best preparation for the challenges they may face.

3.9.5 MOB recovery

Procedure

The MOB process employed by Clipper had been developed following practical trials and experience over the 20 years since the Race's inception. The key steps of the procedure were: stopping the boat as quickly as possible, dropping headsails,

manoeuvring under engine back to the casualty and recovering the MOB by lowering a person, attached to the yacht, into the water to ensure the MOB was secured to a halyard.

In this accident two main factors delayed the recovery process of Sarah. Firstly, the headsails were very difficult to lower in the weather conditions and, secondly, it took significant time to manoeuvre alongside Sarah and successfully secure a line to her.

Lowering the headsails

The wind and sea conditions at the time of Sarah being swept overboard were atrocious, but none that should not be expected when sailing round the World. However, in these conditions the hanked-on headsails became very difficult to lower as the sails self-hoisted, sometimes with sufficient force to bodily lift crew off the deck as they fought to haul them down.

Ideally, the decision to reduce sail area when the wind increases should be taken sufficiently early so as to avoid the situation in which the crew of *CV21* found themselves. The rapid increase of wind speed in the dark conditions made this difficult. By reefing the mainsail first, the power in the foresails hampered the skipper's ability to change direction to tack the vessel, and prevented him from heaving to. The power in the headsails also meant that they were very difficult to lower. In reacting to the MOB, it was necessary for the crew to lower the headsails as quickly as possible to effect Sarah's recovery. The difficulty the crew experienced managing the hanked-on arrangement in the prevailing conditions resulted in them taking 32 minutes to lower the headsails, a period that might have been reduced had a more effective method or procedure for reducing the sail area been followed, for example by tying down or securing the hanks to prevent the sails from re-hoisting.

Following this accident it would be appropriate for Clipper to review how best to reduce sail area in extreme conditions so that it can be effected expeditiously and safely.

Drills

MOB drills were included in all four levels of the compulsory training programme provided to yacht crews prior to the Race.

Although MOB drills were briefed regularly on board *CV21* during the Race, no practical drills were completed with the Race leg crew together, an omission in common with other Clipper yachts. The circumnavigation crew on *CV21* had not completed a practical MOB drill together since their Level 4 training, unless they were Clipper coxswain qualified.

While MOB recovery briefings enable crew to remain familiar with the required procedure, regular practical MOB drills, as promoted in Clipper's standard operating procedures, are necessary to ensure crew are sufficiently practised to be able to follow the procedure correctly in an emergency.

The attempt to rescue Sarah deviated from the prescribed MOB recovery procedure and incurred some difficulties in the atrocious wind and sea conditions, all of which had an impact on the time taken to recover her. Some of the difficulties might have been avoided had the crew been more practised in the procedure:

- The crew nearest the dan buoy was unable to reach it due to the limit of his tether, resulting in the watch leader unclipping his tether to do so.

- A signal from the AIS beacon attached to the dan buoy was not received on board, possibly as a result of the beacon not being activated correctly.

- The rescue swimmer chose to don an auto-inflation lifejacket, which might have restricted his mobility during the early stages of the rescue. It also meant that after the lifejacket had been partially deflated, it would have required oral inflation if needed in an emergency.

- Only one halyard was employed as the others had become tangled in the prevailing weather conditions.

- No consideration was given to deploying the designated scramble net, which could have provided Sarah with an effective hand-hold.

- The lifting hook was not connected securely during the first attempt to winch Sarah from the water.

Casualty location by AIS beacon

It is highly doubtful that Sarah would have been recovered if she had not been wearing a personal AIS beacon.

Attaching an AIS beacon to a dan buoy provides a useful means of locating a man overboard. However, on this occasion its signal was not received by *CV21*'s equipment. The reason for this cannot be determined with certainty as the dan buoy was not recovered. However, it was either not activated correctly, through a lack of familiarity with the equipment, or the signal transmission was hampered by the orientation and positioning of the beacon.

The AIS beacon fitted to the dan buoy was intended to be held vertically out of the water **(Figure 26)** to ensure it was able to locate its position via GPS and transmit the distress message on VHF radio. In the weather conditions encountered, the dan buoy - especially with the additional weight of the AIS beacon attached - is likely to have been blown virtually horizontal. The AIS beacon could at times have been submerged, preventing signal transmission and, with the

Figure 26: McMurdo S10 AIS beacon held in correct orientation

beacon not in a vertical orientation its reception range would have been reduced significantly. The effectiveness of fitting an AIS beacon to the dan buoy needs further consideration.

As demonstrated in this accident, the fitting of personal AIS beacons to individual crew members would appear to offer a more reliable option. Firstly, it locates the person, not a dan buoy thrown over at some stage after the MOB. Secondly, because the orientation of the AIS beacon antenna when deployed will maximise the AIS transmission **(Figure 27)**. Thirdly, it is small enough to be carried on a person and be immediately available at all times.

Figure 27: AIS beacon with antenna deployed on inflated lifejacket

Ideally, AIS beacons should auto-activate. However, the AIS beacons that were voluntarily fitted to the lifejackets of the majority of participants in the Race were manually activated, therefore requiring the casualty to be conscious when in the water. However, the current lack of availability of an auto-activating AIS beacon should not prevent Clipper requiring the compulsory carriage of personal AIS beacons for all Clipper crew in future races.

Rescue swimmer

The rescue swimmer remained attached to the yacht by a halyard. His ability to swim to Sarah was therefore limited, and heavy reliance was placed on the skipper's ability to position the yacht in close proximity to her. This was extremely difficult in the prevailing conditions. The rescue swimmer's decision to don an auto-inflation lifejacket rather than the assigned manually inflated lifejacket for MOB recovery further restricted his mobility during the early stages of the rescue attempt. The consequential need for him to be lowered into, and raised from the water repeatedly, together with the yacht's violent motion, placed him at significant risk of physical injury and water inhalation.

3.9.6 Safety management

Although Sarah did not clip on, contrary to her training and Clipper's standard operating procedures, it was the culture in which she operated that contributed to this happening. Tethering practice on board was inconsistent and it was evident

that some crew were not clipping on when they should have been. While being tethered on board a yacht might, at times, be inconvenient, this accident is a graphic reminder of why it is so important.

The ability of Clipper's shore-based management to monitor working practices on board during the Race was limited and difficult, and it did not identify the factors that contributed to both this accident and that of Andrew Ashman. Stopovers between legs provided an opportunity to debrief skippers and crews, inspect the condition of the yachts and their equipment, and so assess how the yachts were being operated at sea. Despite this, shore-based management staff did not identify that the MOB drills required prior to the start of each Race leg were not being conducted.

The SCV Code specifies minimum manning requirements to ensure sufficient minimum competence is on board a Category 0 vessel and, in the event of incapacitation of the skipper, to return the vessel to port. *CV21* complied with these requirements by virtue of the skipper holding a commercially endorsed RYA Yachtmaster Ocean CoC and by at least one crew member holding a Clipper coxswain qualification in lieu of an RYA Yachtmaster Ocean or Yachtmaster Offshore CoC. However, it was for Clipper to assess what additional manning was necessary, in terms of number, qualification and status, for the vessel to be operated safely in its intended role.

Clipper provided standard operating procedures, with which the crew were required to comply in accordance with the terms of their agreement. The agreement also required the crew to comply with the skipper's instructions. The skipper's contract implied that he, as Clipper's only representative on board, was responsible for the safety of the yacht and its crew, and for ensuring that Clipper's standard operating procedures were followed. The skipper was the only contracted 'seafarer' and employed person on board. He was therefore the only person with a duty to take reasonable care for the health and safety of other persons on board, as identified in The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997. He was also required to comply with the SCV Code's hours of rest requirements. This meant that he was unable to continually supervise activities on board, and so needed to assess when the risks associated with those activities were sufficiently low as to not require his supervision.

Best practice dictates that an action or omission by one person should not result in irreversible adverse consequences. Effective supervision on deck at the time of Andrew Ashman's accident would have provided an opportunity to prompt Andrew to replace the helmsman with a more experienced crew member when steering became difficult, and to challenge Andrew's decision to enter the danger zone. Continual effective supervision on deck prior to Sarah Young's accident would have provided an opportunity to challenge crew member lapses in clipping on.

Such supervision could have been provided had a second employee or contracted 'seafarer', with appropriate competence and a duty to take reasonable care for the health and safety of other persons on board, been carried. As a consequence of their assigned responsibility, that second person would have been empowered to challenge the skipper's decision-making, particularly in respect of non-conformities with Clipper's standard operating procedures, such as the absence of practical MOB drills involving the crew for the Race leg.

SECTION 4 - CONCLUSIONS

4.1 ACCIDENT TO ANDREW ASHMAN

4.1.1 Safety issues directly contributing to the accident that have been addressed or resulted in recommendations

1. It is likely that the skipper was spending considerably more time monitoring the crew than he would have done had they been more experienced or further into the Race. He was content that Andrew was capable of leading the mainsail reefing evolution and, consequently, he decided to remain below. While the reasoning behind his decision is perhaps understandable, it resulted in the deck being left unsupervised by the skipper at a time of heightened risk. [2.8.4]

2. It is possible that Andrew was pre-occupied considering the reefing evolution and the pre-reefing brief that he was about to give to his team, and so forgot about the danger zone. [2.8.5]

3. The danger zone was not marked on the deck and there were no visual hazard markings to remind the crew of the danger. [2.8.5]

4. Had Clipper been aware of the preventer strop's actual breaking load and its relative weakness in the preventer arrangement, the strop could have been redesigned so as to ensure its load capacity was more consistent with its intended application. [2.8.7]

4.1.2 Other safety issues directly contributing to the accident[11]

1. As the wind increased and *CV21* responded with increased movements, making steering difficult, it would have been wise for the helmsman to have been replaced with a more experienced crew member. [2.8.3]

2. Andrew entered the cockpit danger zone without challenge from other crew members. [2.8.5]

4.1.3 Safety issues not directly contributing to the accident that have been addressed or resulted in recommendations

1. The manufacturer's data sheet for the D2 Racing rope supplied to the Clipper 70s did not contain information on the loss of strength caused by splices, hitches or knots. Wider promulgation of the limitations of HMPE rope would be beneficial. [2.8.7]

4.1.4 Other safety issues not directly contributing to the accident[11]

1. The skipper was not keeping a record of his hours on watch. [2.8.4]

[11] 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.

4.2 ACCIDENT TO SARAH YOUNG

4.2.1 Safety issues directly contributing to the accident that have been addressed or resulted in recommendations

1. The reason why Sarah did not clip on her tether when she returned to the cockpit is uncertain, but it could have been for one or more of the following reasons:

    - She was fatigued which adversely affected her mental performance.
    - She forgot to clip on.
    - She was distracted while going to the assistance of another crew member.
    - She decided that it was unnecessary to clip on at that time. [3.9.1]

2. The practical difficulties of moving about the yacht when tethered gave rise to some crew either delaying clipping on or not clipping on at all, particularly those who were more experienced, considered they were familiar with the yacht's motions and erroneously perceived a lower level of risk in not clipping on as the Race progressed. [3.9.2]

3. Tethering practice on board *CV21* was inconsistent and it was evident that some crew were not clipping on when they should have been. Although crew members challenged each other on occasion for not clipping on, there are reports of when this did not happen, particularly by crew members who did not feel empowered to do so. [3.9.2]

4. It is highly likely that Sarah passed under the intermediate guardrail when she was washed overboard. [3.9.3]

5. When *CV21* returned to Sarah she was not wearing her spray-hood. The reasons for not doing so could have been that she:

    - was unfamiliar with using the spray-hood;
    - chose not to wear it;
    - was hampered by the deployed AIS beacon.
    - chose to remove it during the final stages of the rescue attempt to see or hear better and/or allow access for securing a lifting hook to her lifejacket. [3.9.4]

6. Basic sea survival training provides a necessary education in life-saving appliances and survival techniques. However, given the nature of the Race and the sea conditions likely to be encountered, conducting such training solely in a heated, calm swimming pool dressed in shorts and a T-shirt, falls significantly short of the conditions crew members could be faced with, and what Sarah was faced with in this accident. [3.9.4]

7. The difficulty the crew experienced managing the hanked-on arrangement in the prevailing conditions resulted in them taking approximately 32 minutes to lower the headsails. This period might have been reduced had a more effective method or procedure for reducing the sail area been followed. [3.9.5]

8. Although MOB drills were briefed regularly on board *CV21* during the Race, no practical drills were completed with the Race leg crew together. [3.9.5]

9. The attempt to rescue Sarah deviated from the prescribed MOB recovery procedure and incurred some difficulties in the atrocious wind and sea conditions, all of which had an impact on the time taken to recover Sarah. Some of this delay might have been avoided had the crew been more practised in the procedure. [3.9.5]

10. Sarah manually activating her personal AIS beacon was critical in her being located and recovered by the crew. [3.9.5]

11. The ability of Clipper's shore-based management to monitor working practices on board during the Race was limited and difficult, and it did not identify the factors that contributed to both this accident and that of Andrew Ashman. [3.9.6]

12. The skipper, as Clipper's only representative on board, was responsible for the safety of the yacht and its crew, and for ensuring that Clipper's standard operating procedures were followed. However, he was unable to continually supervise activities on board, and so needed to assess when the risks associated with those activities were sufficiently low as to not require his supervision. [3.9.6]

13. Continual effective supervision on deck prior to Sarah Young's accident would have provided an opportunity to challenge crew member lapses in clipping on. [3.9.6]

4.2.2 Other safety issues directly contributing to the accident[12]

1. Sarah had chosen not to wear her dry-suit on this occasion. Although dry-suits are very effective at keeping the wearer warm, they can be difficult to don and remove, which might have been a factor in her not wearing it. [3.9.4]

[12] 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.

SECTION 5 - ACTIONS TAKEN

5.1 MAIB

Following the Andrew Ashman accident and collection of the initial evidence, the MAIB made the following recommendation to Clipper Ventures plc:

2015/152 *Remove the current HMPE preventer strops from service by the 2015/2016 Clipper Ventures Round the World fleet, with immediate effect.*

5.2 CLIPPER VENTURES PLC

- While the fleet continued towards Rio de Janeiro, Clipper:
    - Instructed its skippers to inspect the preventer strops for chafe and wear, and to replace them as required.
    - Installed a temporary secondary preventer system during the remainder of the leg to Rio de Janeiro where this was then replaced with a block.
- After Rio de Janeiro, Clipper marked the danger zone on board the Clipper 70s.
- After Seattle, Clipper took the following actions:
    - Laced up guard rails over the length of the vessel.
    - Ensured MOB drills have been conducted on each yacht:
        - downwind;
        - deploying live AIS; and
        - deploying the scramble net.
    - Re-emphasised the use of lifejacket spray-hoods.
    - Reduced the size of the anti-chafe sleeving on cockpit jackstays.
    - Amended Standard Operating Procedures to impose an 11kts true wind limit speed above which all crew must be clipped on.
    - Provided additional strong points and jackstay, and initiated a further review.
    - Initiated investigation of:
        - alternative AIS beacons for attachment to dan buoys.
        - more versatile tethers to increase clipping on options and reduce the frequency of relocating to another strong point or jackstay.

SECTION 6 - RECOMMENDATIONS

Clipper Ventures plc is recommended to:

2017/107 Review and modify its onboard manning policy and shore-based management procedures so that Clipper yacht skippers are effectively supported and, where appropriate, challenged to ensure that safe working practices are maintained continuously on board. In doing so, it should consider the merits of:

- Manning each yacht with a second employee or contracted 'seafarer' with appropriate competence and a duty to take reasonable care for the health and safety of other persons on board.
- Enhancing shore-based monitoring and scrutiny of onboard health and safety performance.

2017/108 Complete its review of the risks associated with a Clipper yacht MOB and recovery, and its development of appropriate control measures to reduce those risks to as low as reasonably practicable, with particular regard to:

- Ensuring strict adherence to clipping-on procedures
- Reviewing the guardrail arrangements on its yachts to reduce to as low as reasonably practicable the risk of a person falling overboard
- AIS beacon carriage, training and procedures
- Providing training in addition to that delivered on basic sea survival training courses to better prepare its crews for the challenges they could encounter
- Reinforcing the requirement for yacht crews to carry out regular and effective practical MOB recovery drills
- Providing its crews with methods and procedures for reducing sail quickly and safely in extreme weather conditions.

The **Royal Yachting Association**, **World Sailing** and **British Marine** are recommended to:

2017/109 Work together to develop and promulgate detailed advice on the use and limitations of different rope types commonly used, including HMPE, in order to inform recreational and professional yachtsmen and encourage them to consider carefully the type of rope used for specific tasks on board their vessels.

Marlow Rope Ltd is recommended to:

2017/110 Review the information provided on its data sheets to ensure that the user is informed on the loss of strength caused by splices, hitches or knots when using ropes made with HMPE. In addition, work together with other rope producers to ensure that these limitations are promulgated within the maritime sector.

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

Marine Accident Report

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