ACCIDENT REPORT

Report on the investigation of the

fatal man overboard from the UK registered yacht

CV30

approximately 1500nm west of Fremantle, Australia

on 18 November 2017

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 7/2019 JUNE 2019

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

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

NOTE

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

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AIS	-	Automatic Identification System
Clipper Ventures	-	Clipper Ventures plc
COG	-	Course over the Ground
COO	-	Chief Operating Officer
CPR	-	Cardio Pulmonary Resuscitation
DSC	-	Digital Selective Calling
GPS	-	Global Positioning System
HMPE	-	High modulus polyethylene
IIMS	-	International Institute of Marine Surveying
ISO	-	International Organization for Standardization
kts	-	knots
kW	-	kilowatt
m	-	metre
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MLC	-	International Maritime Organization's Maritime Labour Convention, 2006, as amended
MOB	-	Man overboard
MRCC	-	Maritime Rescue Co-ordination Centre
nm	-	nautical miles
OSR	-	Offshore Special Regulations
PPR	-	Professional Practices and Responsibilities
Race	-	Clipper Round the World Race
RNLI	-	Royal National Lifeboat Institution
RTC	-	Recognised Training Centre
RYA	-	Royal Yachting Association
SCV Code	-	Maritime and Coastguard Agency's Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards (MGN 280 (M))

SOLAS	-	International Convention for the Safety of Life at Sea 1974, as amended
SOP	-	Standard Operating Procedure
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

SAILING TERMINOLOGY USED IN THIS REPORT

Apparent wind	-	The wind as it is experienced over the deck of the yacht, the result of the combined effect of the true wind and the yacht's heading and speed
Asymmetric spinnaker	-	Headsails used when sailing downwind. The Code 1 was the lightest sail, the Code 2 was the medium weight sail and Code 3 was the heaviest sail for use in stronger winds
Bear away	-	To steer further away from the true wind direction. For example, if sailing with the wind on the beam, bearing away would place the wind coming from further aft
Boom	-	The spar connected to the mast and rigged horizontally along the foot of the mainsail
Close hauled	-	Sailing close to the wind with the sails sheeted in tight to maximise a yacht's progress into wind
Course	-	The yacht's true course over the ground; information derived from GPS data and displayed as a digital readout
Downhaul	-	In the context of this report, a downhaul is a line attached to the top of a headsail prior to hoisting such that, when lowering the headsail, maintaining tension on the downhaul prevents the headsail from self-hoisting
Forestay	-	Part of a yacht's standing rigging securing the mast vertical, specifically to prevent the mast falling aft, consisting of a wire running from the bow of the boat to the top of the mast
Gybing	-	When under sail, to alter heading so that the stern of the yacht goes through the wind, resulting in the mainsail setting on the opposite side
Halyard	-	A line used to hoist a sail
Hank	-	Brass clip securing luff of headsail to a forestay
Heading	-	The compass direction in which the yacht's bow is pointing
Headsail	-	Sail set forward of the mast

Head up	-	To steer more towards the true wind direction, i.e. the exact opposite of bearing away
Inner forestay	-	Wire secured to the foredeck, aft of the main forestay, and attached to the mast approximately ⅔ of the way up the mast
Kicker/vang	-	Rope and tackle attached between the base of the mast and the underside of boom to control tension of the leech and twist of the mainsail. Can incorporate a strut to help counteract weight of boom in light winds
Leech	-	Aft/trailing edge of a sail
Leggers	-	Crew members completing individual legs of the Race
Luff	-	Leading edge of a sail
Mainsail	-	Sail hoisted with luff secured on aft side of the mast and with the boom along its foot
Mate	-	In the context of this report, a ‘mate’ is a professionally qualified contracted seafarer serving as the second in command alongside the skipper. Under the SCV Code for worldwide unrestricted operation the ‘mate’ was required to hold at least a Yachtmaster Offshore certificate of competency that was commercially endorsed
Outhaul	-	A line run inside the boom to control the tension in the foot of the mainsail
Preventer	-	A line that runs from the boom to the foredeck, intended to prevent (or at least delay) the uncontrolled movement of the boom across the yacht in the event of an accidental gybe. This line was referred to as a ‘fore guy’ on board Clipper 70 yachts
Reach	-	Point of sailing with the apparent wind on the bow (close reach), but not close hauled, or the beam (beam reach) or the quarter (broad reach)
Reef	-	Taking in a reef is an evolution that reduces the area of the mainsail by lowering and securing a section of the sail
Riding turn	-	Occurs when a rope wrapped around a winch jams and locks itself, preventing it from being eased or hauled in
Sailing deep	-	When sailing deep the wind is blowing from nearly directly astern of a yacht
Sheet	-	A rope used to control the power of a sail by determining its angle to the wind and its shape
Skipper		In the context of this report, the ‘skipper’ is a professionally qualified contracted seafarer serving in command as master. Under the SCV Code for worldwide unrestricted operation the ‘skipper’ was required to hold a Yachtmaster Ocean certificate of competency that was commercially endorsed

Staysail	-	A small headsail rigged on the inner forestay
Tacking	-	When under sail, to alter heading so that the bow of the yacht goes through the wind, resulting in the sails setting on the opposite side
Traveller	-	An athwartships rail that facilitates adjusting the transverse position of the mainsheet's connection to the yacht
True wind	-	The actual wind speed and direction, described as the direction the wind is from
Yankee 1, 2, 3	-	High cut headsails graded for wind strengths that are hanked-on to the forestay, with the yankee 1 being the largest sail suitable for lighter wind conditions, yankee 2 a medium size sail, and yankee 3 the smallest and most suitable sail for stronger winds

TIMES: all times used in this report are local time (UTC+6) unless otherwise stated.

SYNOPSIS

On 18 November 2017, Simon Speirs fell overboard from the foredeck of the Clipper round the world racing yacht *CV30* when approximately 1500nm west of Fremantle, Australia. Simon was initially secured to the yacht, but before he could be recovered his safety tether hook distorted and suddenly released. He was recovered, with no signs of life, from the water by the crew and could not be resuscitated.

At the time of the accident the skipper was on the helm and was sailing *CV30* downwind, in very rough seas, to facilitate the lowering of the yankee 3 headsail. Five crew, including Simon, all of whom were secured to the yacht by their tethers, were on the foredeck to haul down and secure the yankee 3. When the sail was ¾ down a large wave on the port quarter caused *CV30* to slew to starboard and then to port, leading the yacht to accidentally gybe. The bowman fell overboard but was then able to haul himself back on board. Shortly afterwards, Simon Speirs fell overboard from his position on the starboard side between the forestays.

The skipper tacked *CV30* to place Simon on the high side of the yacht, but he was limited in his ability to slow the yacht due to damage sustained during the accidental gybe. The bowman was unable to reach Simon, who was being dragged along in the water and buffeted against the yacht's starboard side. A halyard was passed to him, but as he struggled to secure it to his lifejacket his tether hook distorted and released. The yacht's crew immediately initiated the manoverboard (MOB) recovery procedure. In the prevailing wind and sea conditions, and without full control of the sails, the skipper managed to manoeuvre *CV30* alongside Simon, who appeared to be unconscious, 32 minutes later, but following his recovery he was unable to be resuscitated.

The MAIB investigation concluded that the combined effect of Simon's tether length and the hooking point location resulted in him being dragged alongside the yacht, preventing his recovery. It also concluded that Simon's tether hook became caught under the starboard forward mooring cleat, resulting in the hook being loaded laterally, distorting and releasing. On 9 January 2018, the MAIB issued Safety Bulletin 1/2018 regarding the dangers of lateral loading of tether hooks, and recommended that the method used to anchor the end of the tether to the yacht should be arranged to ensure that the tether hook cannot become entangled with deck fittings or other equipment. Further recommendations are made in respect of reviewing and amending international standards for tethers and jackstays.

In view of this and previous MOB accidents, Clipper Ventures plc has been recommended to further review and, as appropriate, modify its risk assessments and standard operating procedures with particular regard to foredeck operations, reducing sail in rough weather and methods for recovery of both tethered and untethered MOBs. This must take account of any safety management guidance and direction provided by the Maritime and Coastguard Agency in response to MAIB Recommendation 2018/116 following the grounding and loss of *CV24*. Clipper Ventures plc has also been recommended to review and amend Clipper 70 yacht maintenance and repair processes to prevent potential additional workload falling on crew, contributing to fatigue and affecting their performance.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *CV30* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*CV30*
Flag	United Kingdom
Certifying Authority	International Institute of Marine Surveyors
Official Number	919480
Type	Clipper 70 sloop yacht
Registered owner	Clipper Ventures plc
Manager(s)	Clipper Ventures plc
Construction	Foam reinforced plastic
Year of build	2013
Length overall	21.32m
Displacement	34.7 tonnes
Authorised cargo	None
VOYAGE PARTICULARS	
Port of departure	Cape Town, South Africa
Port of arrival	Fremantle, Australia
Type of voyage	Commercial sailing event
Cargo information	None
Manning	17
MARINE CASUALTY INFORMATION	
Date and time	18 November 2017, 1414 (UTC+6)
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	42° 30.331'S, 087° 36.317'E
Place on board	Foredeck
Injuries/fatalities	One fatality
Damage/environmental impact	None
Ship operation	Under sail
Voyage segment	Mid-water
External & internal environment	Wind: west-south-west force 5-7 Sea state: very rough Visibility: good


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CV30

1.2 BACKGROUND

CV30 was on its third circumnavigation of the globe as part of a Clipper Round the World Yacht Race[1]; a unique event allowing amateur sailors of varying backgrounds and competence to gain experience of ocean racing. The yacht and crew under the command of the same skipper had completed leg 1 from Liverpool to Punta del Este, Uruguay, and leg 2 from Punta del Este to Cape Town, South Africa.

Leg 3 of the Race was from Cape Town to Fremantle, Australia, sailing across the Southern Ocean. When *CV30* departed from Cape Town, accompanying the professional skipper were 16 crew: six of the crew were on board for the entire circumnavigation. Nine of the crew, 'leggers', had joined in Cape Town and one had sailed leg 2 prior to starting leg 3. One of the other leggers had completed leg 1. As well as sailing the yacht, crew fulfilled various roles on board including watch leader, medic, victualler, engineer and sail repairer. Three of the crew, including the medic, were practising medical professionals. The deceased, Simon Speirs, was appointed as one of the watch leaders for both legs 1 and 2. He started leg 3 as assistant watch leader, as he had requested a break from the watch leader role. Simon also fulfilled the role of sail repairer alongside the medic.

The crew were split into two watches - Jack and Union - operating a system of 6-hour duties during daylight hours, starting at 0800 local time, and 4 hours at night; the watch pattern repeated every 2 days. The skipper arranged the watches to balance experience, strength and crew roles as far as possible. Each day one crew member (excluding watch leaders) dropped out of the watch system for 24 hours to carry out the duties of 'mother watch', providing food for the crew and completing other domestic duties. This crew member normally had a whole night's sleep before their day on 'mother watch'. Simon was a member of Jack watch.

1.3 NARRATIVE

1.3.1 Events leading up to the accident

Following completion of leg 2 of the Race on 19 October 2017, the crew prepared *CV30* for leg 3, conducting a deep clean as well as running repairs to the yacht and sails. Yacht repair work was also carried out as required by Clipper Ventures' maintenance team on all the Race yachts during the stopover. While in Cape Town the yacht and some of the crew also participated in a number of corporate activities.

Two days prior to the start of leg 3, the new leggers, with some of the circumnavigation crew, completed a day of refresher training, including manoverboard recovery, in moderate to rough sea conditions and 30 knots (kts) of wind.

On 31 October, *CV30* departed Cape Town to commence leg 3 of the Race to Fremantle. The yacht headed south, passing close inshore to the Cape Peninsula, before initially making good progress in open seas under an asymmetric spinnaker. *CV30* then encountered very rough seas, with wind gusts of up to 50kts, and had to sail close hauled with just the staysail and fully reefed (three reefs) mainsail.

[1] Hereafter the Clipper Round the World Race is abbreviated to 'the Race'

Overnight into 4 November, during the very rough sea conditions, damage was sustained to the forward two starboard stanchion bases, which supported the guardrails. This occurred when the yankee headsail, which had been stowed on deck, broke free of its sail ties. A wave washed the sail up against the starboard guardrail and the weight of water behind the sail caused the stanchion bases to fracture at the weld joint with the base plate **(Figure 1)**. When the wind eased during the morning, additional high modulus polyethylene (HMPE) lines were rigged and winched on tight as a temporary repair **(Figure 2)** and the skipper minimised work on the foredeck in rough weather, particularly when the damaged guardrail was on the leeward side.

On 8 November, *CV30* suffered further damage, including the breaking of two mainsail battens and the vang strut **(Figure 3)**. The latter occurred when a crew member mistakenly winched on the vang rather than the outhaul, compressing the vang strut and buckling it **(Figure 4)**. The vang strut was removed and a kicker rigged to enable the mainsail leech tension to be controlled. On the same day, the watch leader for Jack watch fell from his bunk, injuring his hand, resulting in him being confined below deck on light duties. Simon Speirs therefore resumed his previous role of watch leader.

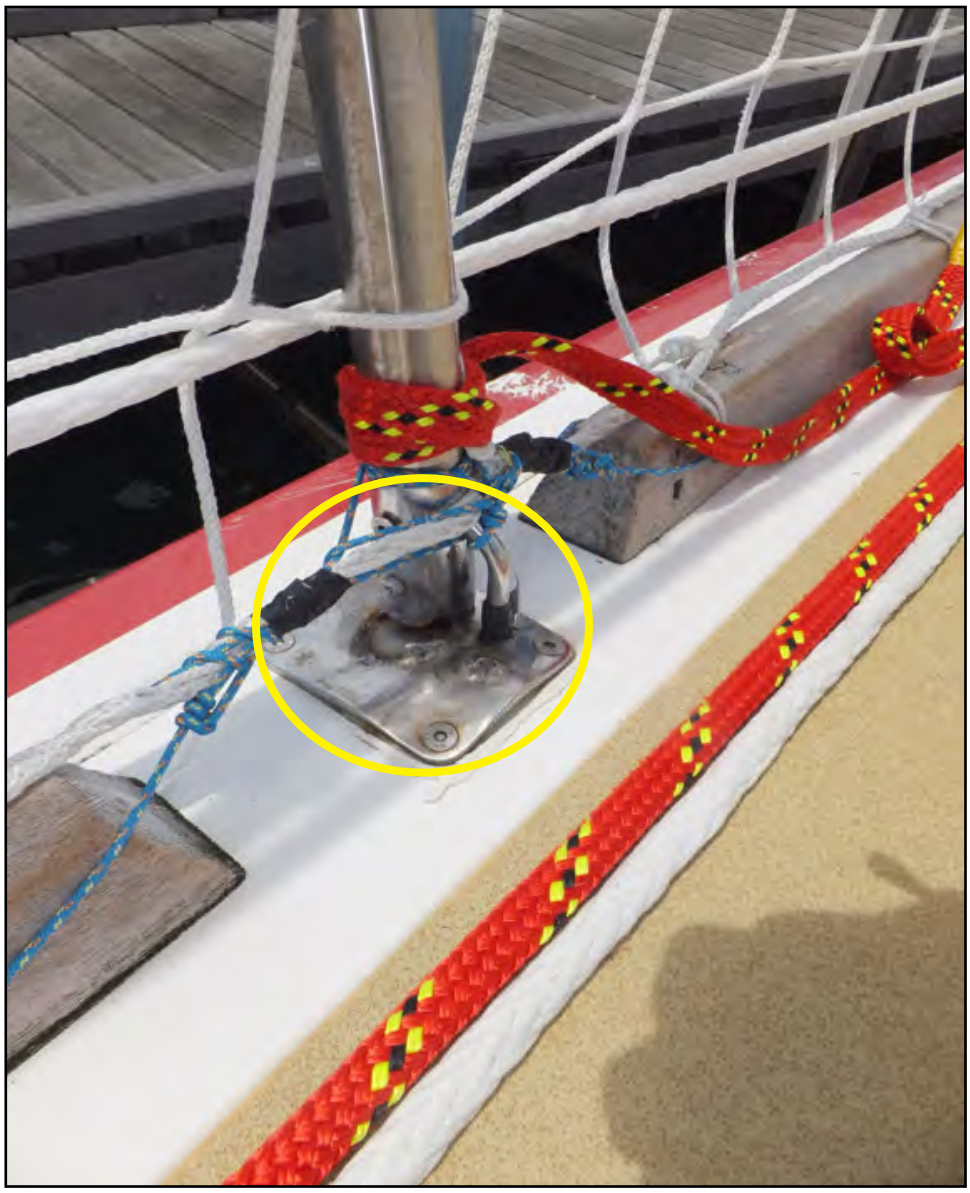

Figure 1: Starboard stanchion base failure in situ

Figure 2: HMPE line temporary repair of guardrail

Figure 3: Vang before damage

Figure 4: Buckled vang strut

After encountering strong headwinds, *CV30* experienced favourable winds until 11 November, when the wind died away before increasing from a westerly direction. This enabled *CV30* to sail downwind with an asymmetric spinnaker for a few days. During this time, Simon conducted repairs to the Code 3 spinnaker, as he had done regularly on the previous Race legs. From about 14 November, as the weather had warmed up Simon elected to switch to wearing his foul weather jacket and sallopettes (foulies) rather than his dry-suit when on deck, probably as they were more comfortable and easier to wear; a practice he maintained up until the accident.

At 1630 on 16 November, following the failure of the forestay shackles on two other Clipper 70 yachts, Clipper Ventures' race director issued instructions via email placing restrictions on the use of headsails:

- Yankee 1 was not to be used.
- Yankee 2 was restricted to a maximum of 15kts of apparent wind.
- Yankee 3 was restricted to a maximum of 24kts of apparent wind.

The skippers were also instructed on how to arrange additional lashings to secure the forestay in case further shackles failed.

That day, the medic injured her hand during the last spinnaker drop prior to the accident and, as a result, was confined to light duties below deck, joining the already injured watch leader. Simon also reported that he was suffering from a hacking cough, which was making him 'feel pretty lousy'. This was in common with other crew, some of whom had missed their watches owing to heavy colds.

1.3.2 The accident

At 1030 on 18 November as *CV30* was sailing under full mainsail, the staysail was dropped and lashed on deck and the yankee 3 hoisted while Union watch were on deck. There was a force 5-6 west-south-west wind, occasionally force 7, during the morning which, with *CV30*'s easterly course (approximately 108° true heading and 098° course over the ground (COG)), was resulting in the yacht experiencing an apparent wind of 20-23kts. *CV30* was on a starboard tack, with the apparent wind on the starboard quarter, tending to heel the yacht to port. The sea conditions were moderate to rough with a predominantly following sea. Visibility was good and the sky was partially overcast. Two preventers were rigged, in accordance with Clipper Ventures' standard operating procedure (SOP) while sailing downwind, to prevent or at least delay the boom from swinging across in the event of an accidental gybe.

As the 1400 watch changeover approached, the skipper asked the watch leader, who was on the port wheel, how the helm felt. He responded that it was controllable and comfortable. The crew were helming with the port wheel only, as the starboard wheel had suffered wear and developed excessive play as a result. Conscious that the wind appeared to be increasing towards the recently introduced maximum apparent wind speed limit of 24kts for the yankee 3, the skipper decided to lower the yankee 3. After lowering the yankee 3 the plan was to reef the mainsail as the recommended maximum wind speed limit for full main was 26kts. He discussed this with the oncoming watch leader, Simon, while down below, and decided that the headsail drop should be carried out at watch changeover when more crew were available. The reefing of the mainsail could then be completed by Jack watch on their own as this operation required fewer crew.

At about 1400, as was normal practice for sail evolutions, the skipper took the port helm as Jack watch came up on deck. Simon was wearing his sailing foulies, including gloves. Four members of Union watch stayed on deck to help Jack watch lower the yankee 3. Five crew made their way forward to the foredeck. One crewman acted as bowman, positioning himself on the pulpit **(Figure 5)**. Simon was standing on the starboard side between the inner forestay and forestay, and the other three crew were positioned on the port side ready to haul and gather the sail over the port guardrail as it was lowered.

All the crew on the foredeck were clipped on to the yacht via their safety tethers. Most were clipped to the starboard jackstay with their long tethers. The bowman was additionally clipped to the pulpit itself via his short tether **(Figure 6)**. There is no clear evidence to indicate what Simon was clipped on to at this stage. However, in moving from the cockpit to the foredeck it was normal practice to be clipped with a long tether to the jackstay on the high side of the yacht **(Figure 7)**.

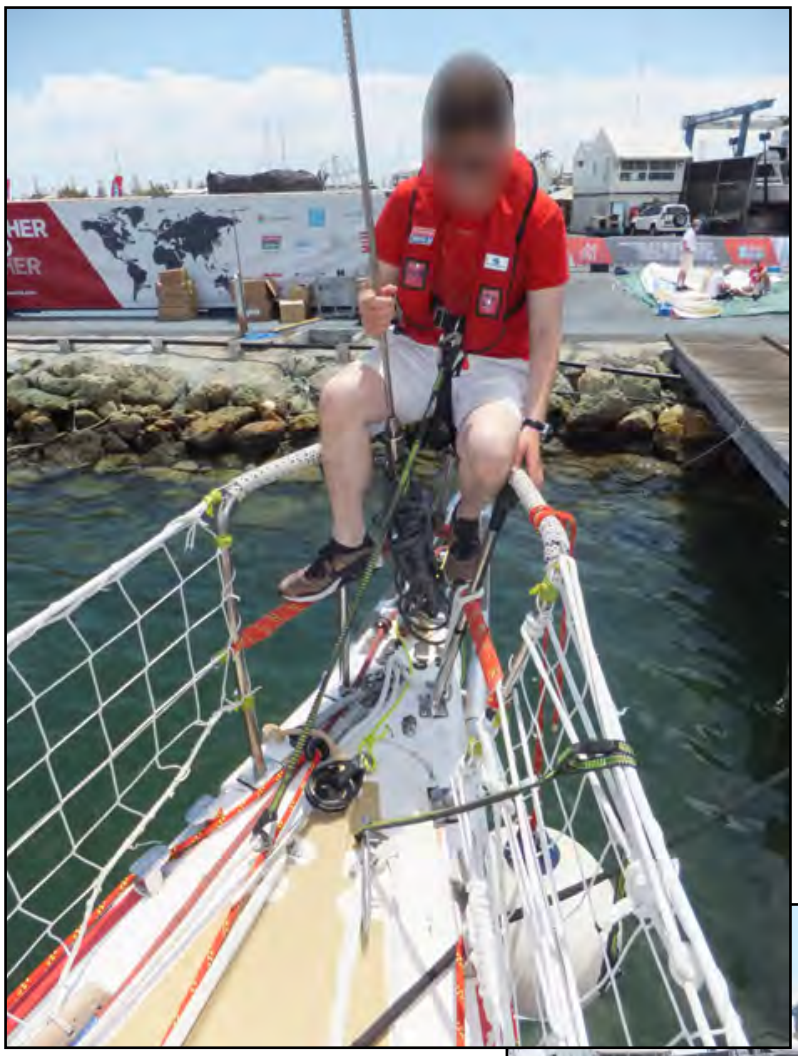

Figure 5: Bowman in position for headsail lowering

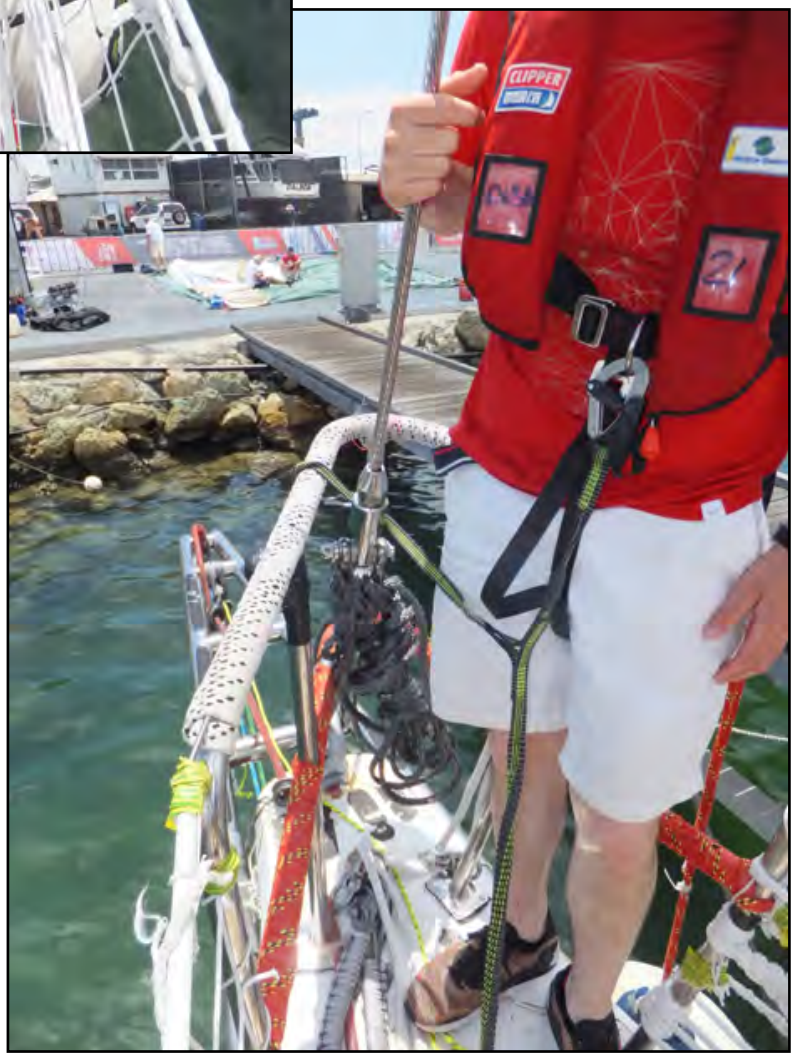

Figure 6: Bowman secured by short and long tether

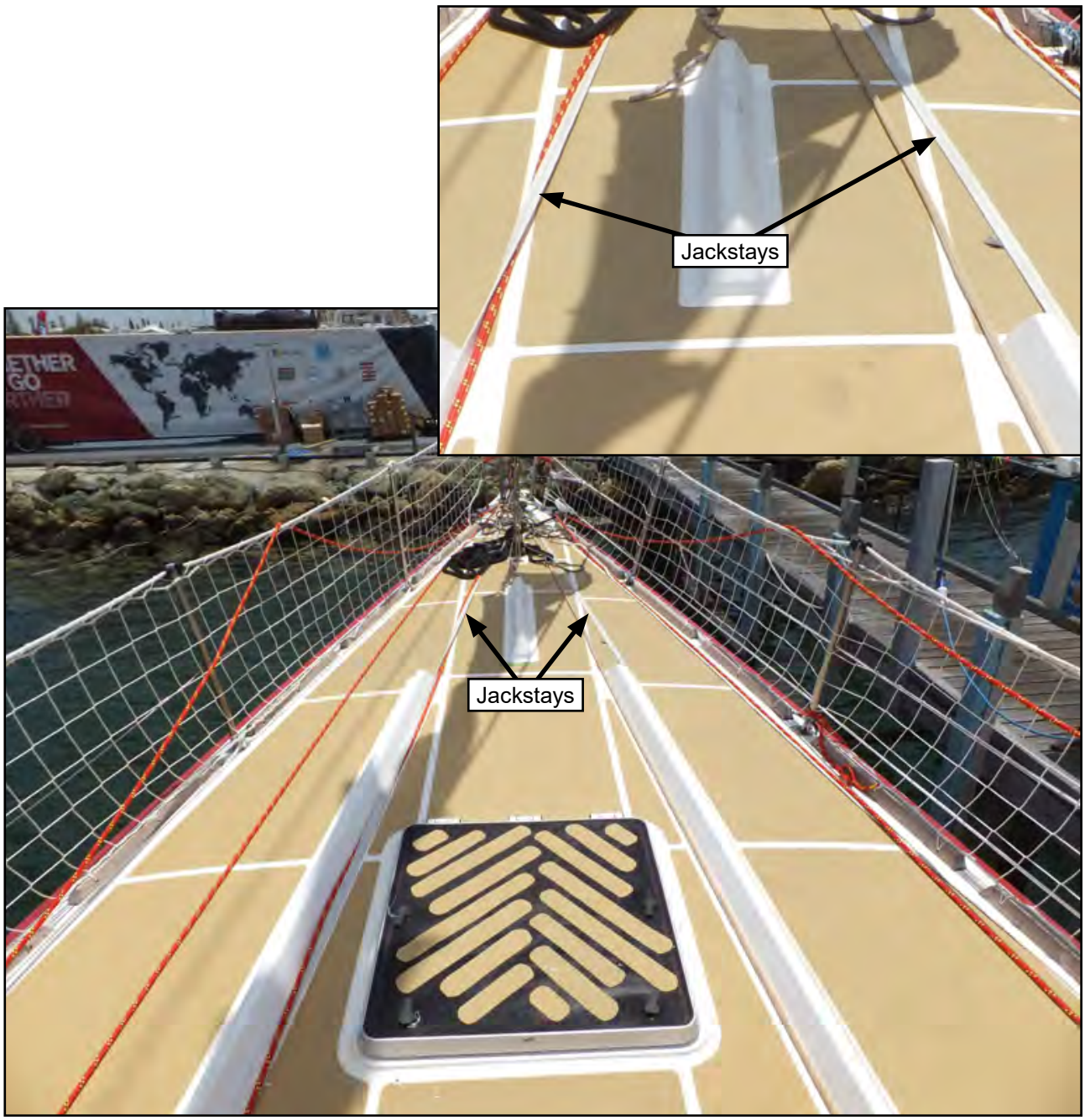

Figure 7: Port and starboard jackstays leading to bow

With a further five crew positioned in the cockpit, the skipper bore away, placing the wind more astern, altering heading by roughly 20° to position the yankee 3 in the lee of the mainsail and depower it. The yankee 3 halyard was released and the crew on the foredeck started hauling the headsail down. It was difficult to lower the sail, and when it was ¾ down the skipper asked one of the crew in the cockpit to go forward to help.

At approximately 1414, with the sea state increasing, the skipper saw a large wave approaching from the port quarter and he shouted a warning to the crew, but most of those who were on the foredeck were unable to hear the warning. *CV30* dropped down into a trough with the foredeck awash for a period, causing the bow to slew to starboard.

During this wave encounter the bowman on the pulpit lost his grip and went over the side, but he was held by his short tether. There was a shout of ‘tethered man overboard’.

CV30's bow then slewed to port as the wave passed, and this resulted in the yacht accidentally gybing on to a port tack as the wind caught the opposite side of the mainsail.

Although the preventers held during the gybe, the block attaching the kicker to the boom parted **(Figure 8)**, resulting in the boom rising and all leech tension being lost. The mainsail filled with the wind on the wrong side, slowing the yacht down. The action of two crew in the cockpit in easing the preventers allowed the mainsail to be centred, but the sheet and mainsail then thrashed about until one of the crew managed to crawl under the traveller to tend the main sheet.

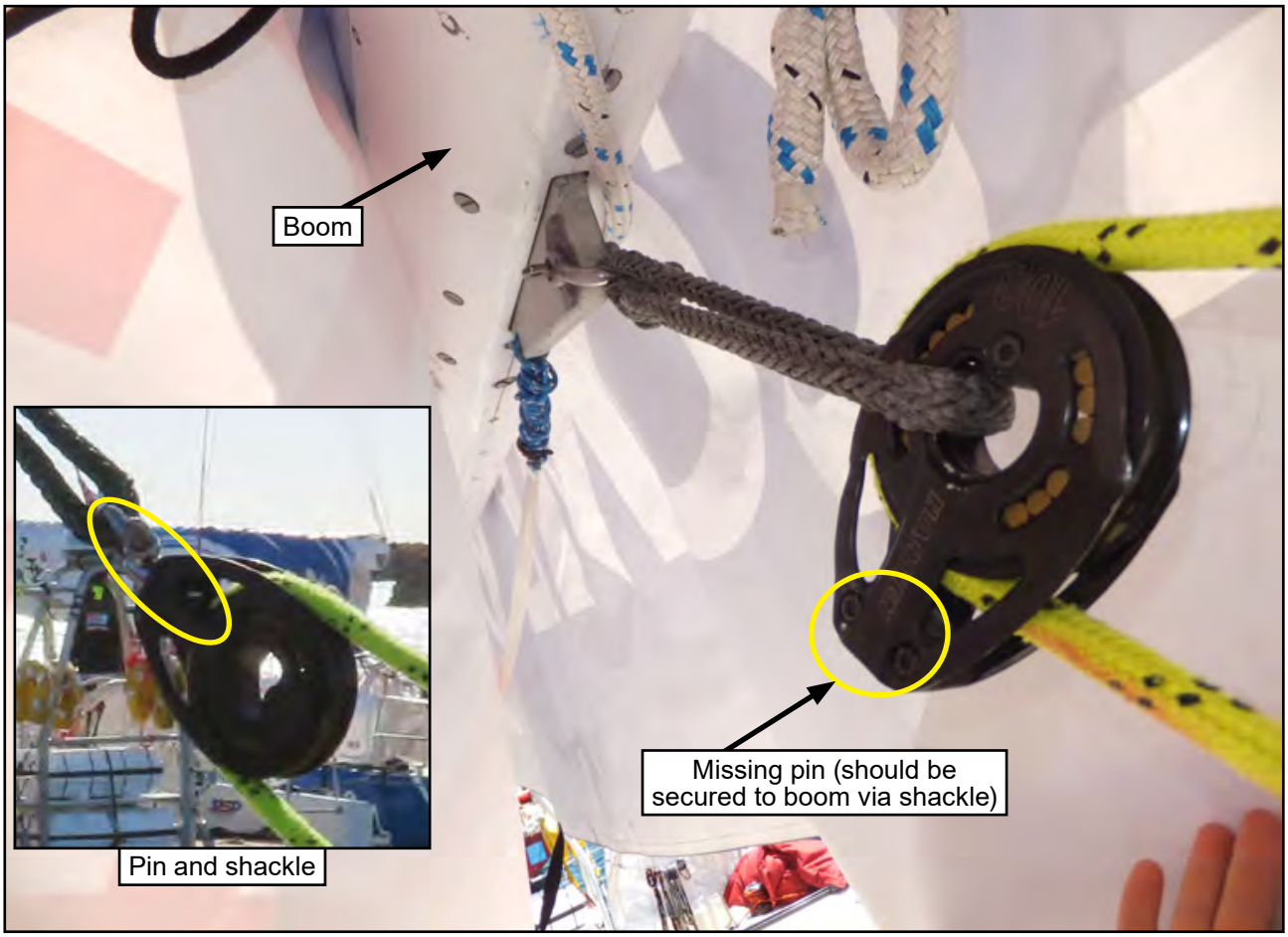

Figure 8: Parted kicker block (with temporary lashing to the boom)

The yacht heeled to starboard during the accidental gybe, but the angle decreased as the preventers were eased. However, the three crew on the port side of the foredeck found themselves trapped between the yankee 3 that was still ¼ raised, now backed with the wind filling the port side, and the staysail on deck. Shortly after the gybe Simon fell over the starboard side.

The bowman had managed to haul himself back on board just after the gybe and, on hearing a shout from Simon, moved himself around the yankee 3 and forestay from the port side, repositioning his short tether clip on the starboard side. He saw Simon, with his lifejacket inflated, being dragged along by his long tether leading over the starboard guardrail, and shouted 'tethered man overboard'. He noticed that the hook of Simon's long tether was caught under the foredeck cleat attached to the secondary jackstay **(Figure 9)**, and immediately positioned himself to try and haul Simon back on board. However, the bowman could not reach Simon and the load on his tether was such that the bowman could not haul him back on board.

From 1414 until 1417, *CV30*'s speed through the water increased to a maximum of 8.5kts. The skipper was aware of the tethered MOB and could see crew leaning over the starboard side. At 1417 **(Figure 10)**, he tacked *CV30* on to a starboard tack to ensure Simon was on the high side. He then tried to slow and stop *CV30* in the water by heading the yacht up into the wind. However, this proved to be impossible in the sea conditions as both sails were unable to be controlled with the yankee 3 still partially hoisted and the main sheet having developed a riding turn on the winch, hampering it being eased.

Figure 9: Reconstruction showing tether hook caught under bow cleat, as observed by bowman

On the foredeck, the crew on the port side managed to release themselves from their entrapment, one crew member cutting his long tether to do so and then making his way aft to retrieve another tether. On instruction from the crew on the foredeck, the staysail halyard was eased after being unclipped from the head of the staysail on deck.

The bowman passed the end of the halyard, with the snap shackle open, down to Simon **(Figure 11)**, who was then seen trying to clip the halyard to his lifejacket harness. *CV30* was moving through the water between 6 and 9kts, making it very difficult for Simon to clip on as the water buffeted and broke over him. Suddenly, at 1422, Simon's long tether released with a bang and he was separated from the yacht **(Figure 10)**.

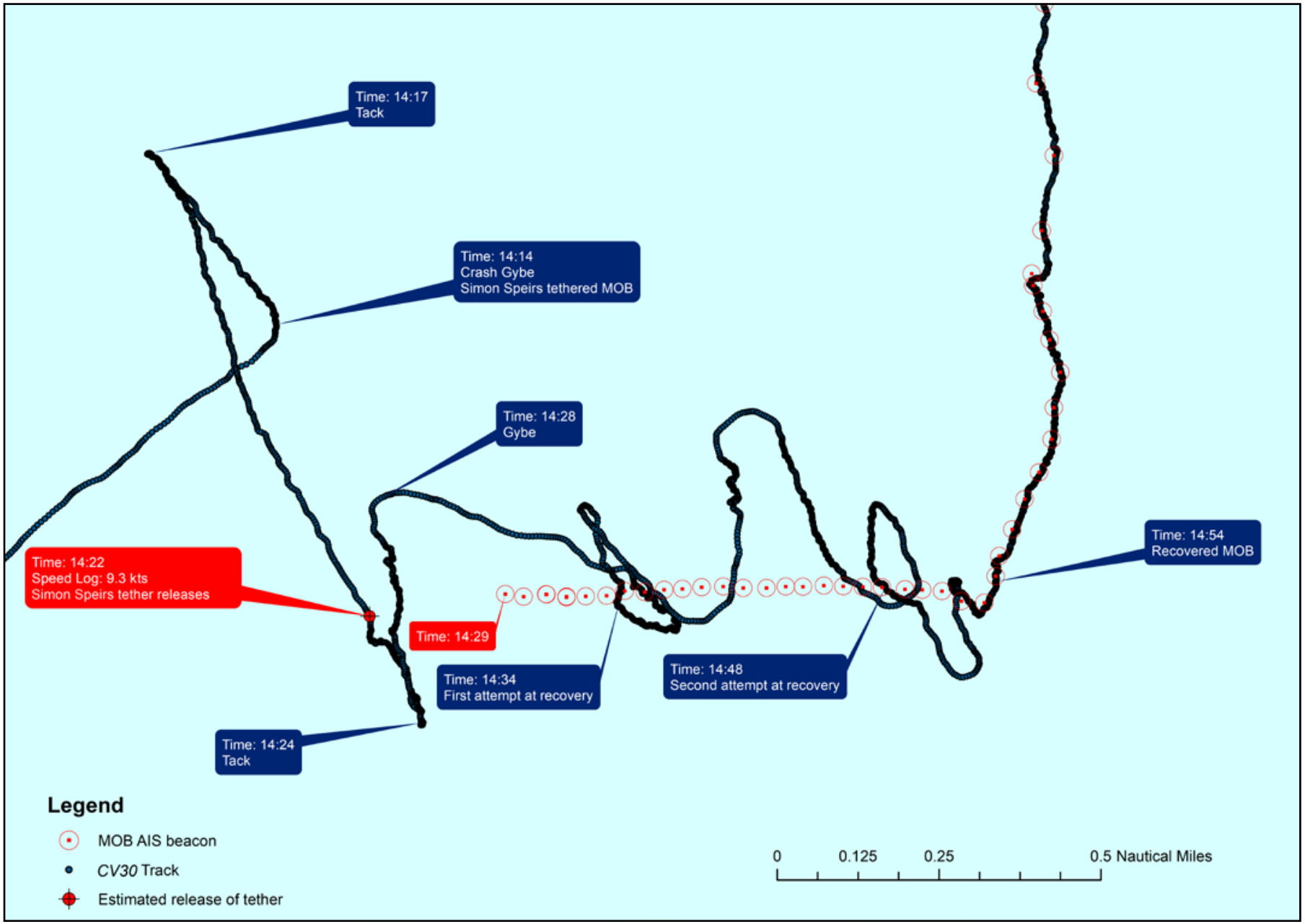

Figure 10: Tracks of *CV30* and AIS MOB beacon

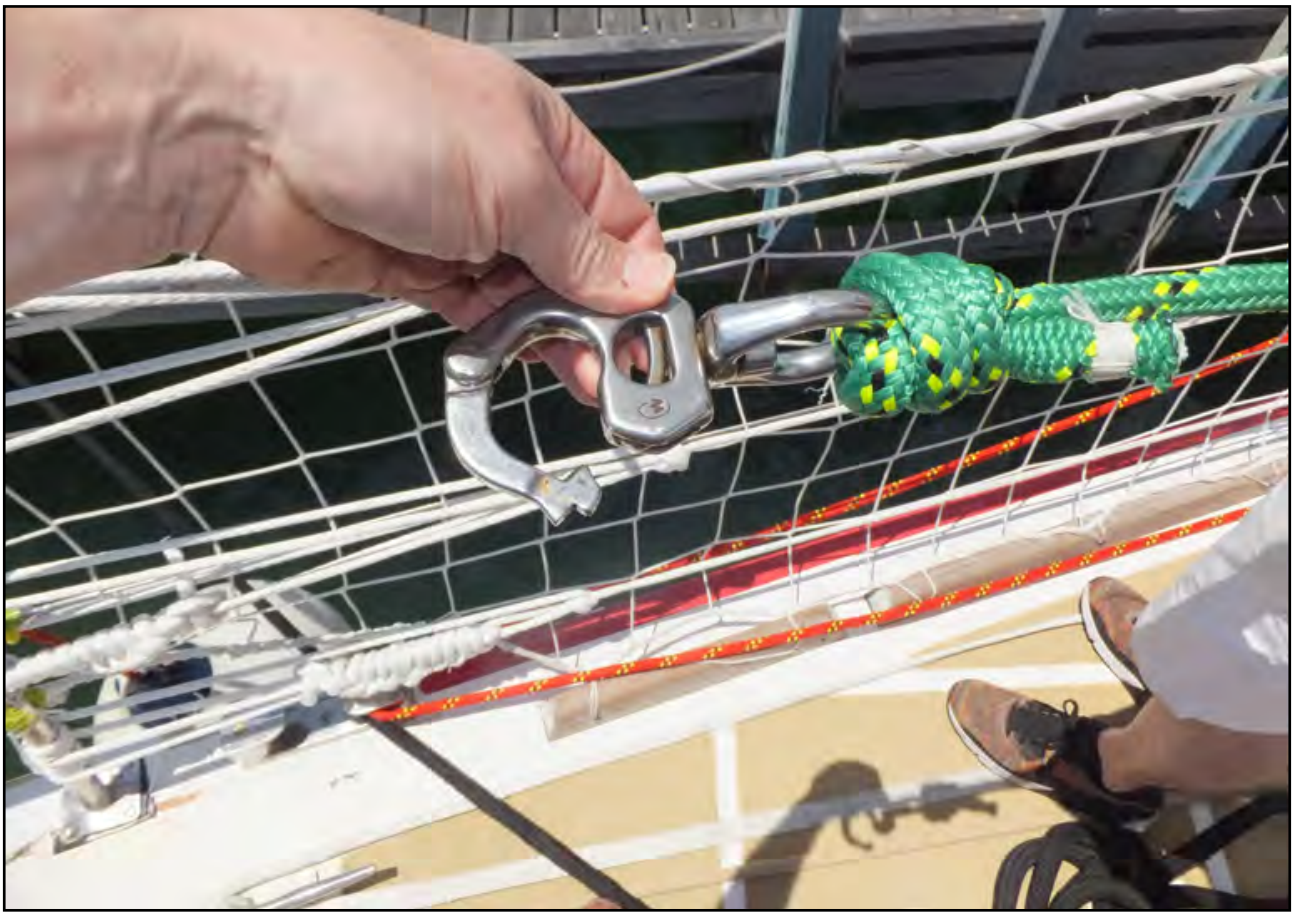

Figure 11: Snap shackle on staysail halyard

1.3.3 MOB recovery

A shout from the foredeck crew of ‘man overboard’ was made and the crew started preparations for MOB recovery. The navigation station below was immediately manned, the main engine started and the MOB global positioning system (GPS), Inmarsat-C distress alarm and very high frequency radio (VHF) digital selective calling (DSC) alert buttons were operated. The medic prepared a berth down below for receiving the casualty. One crewman released the dan buoy from the aft gantry and two others acted as pointers, indicating to the skipper the location of the MOB. However, it was impossible to keep sight of Simon constantly in the very rough sea conditions. A crew member from Union watch down below volunteered to be the rescue swimmer as he was already wearing a dry-suit. He donned the rescue swimmer harness, helmet and his lifejacket before going up on deck. He was then prepared for being lowered over the port side on a halyard adjacent to the shroud, with a sail tie around the halyard and shroud to prevent excessive swinging. Another crewman stood ready to move the scramble net from one side to the other as directed by the skipper.

The yankee 3 started to self-hoist in the strong wind conditions, and a crewman who had been down below went up on to the foredeck to help with lowering it. While he was in the process of gathering the sail, he fell over the port guardrail. He was secured to the port jackstay with his short and long tether and was quickly back on board helped by the crew on the foredeck.

At 1424 the skipper managed to tack *CV30* on to a port tack to head back towards Simon **(Figure 10)**. A few minutes later he tried to tack back, but could not swing the yacht’s bow through the wind in the strong wind and very rough sea conditions.

Instead, at 1428, he gybed the boat on to a starboard tack with some difficulty due to the lack of control of the mainsail and riding turns on the main sheet winch. At about that time, the AIS beacon on Simon's lifejacket started to be displayed on *CV30*'s plotter **(Figure 10)**.

At 1427 a satellite call was received in the navigation station from the Australian Maritime Safety Authority asking if the yacht needed assistance. The crew informed the coastguard that there was an MOB, and that attempts to retrieve him were ongoing.

The skipper employed a combination of tacks, when able to, and gybes to approach Simon in the water **(Figure 10)**. During one gybe the main sheet became caught around the main sheet winch and ripped off the self-tailing mechanism **(Figure 12)**. Additionally, one of the blocks for the main sheet traveller broke. These factors combined to make trimming the mainsail more difficult.

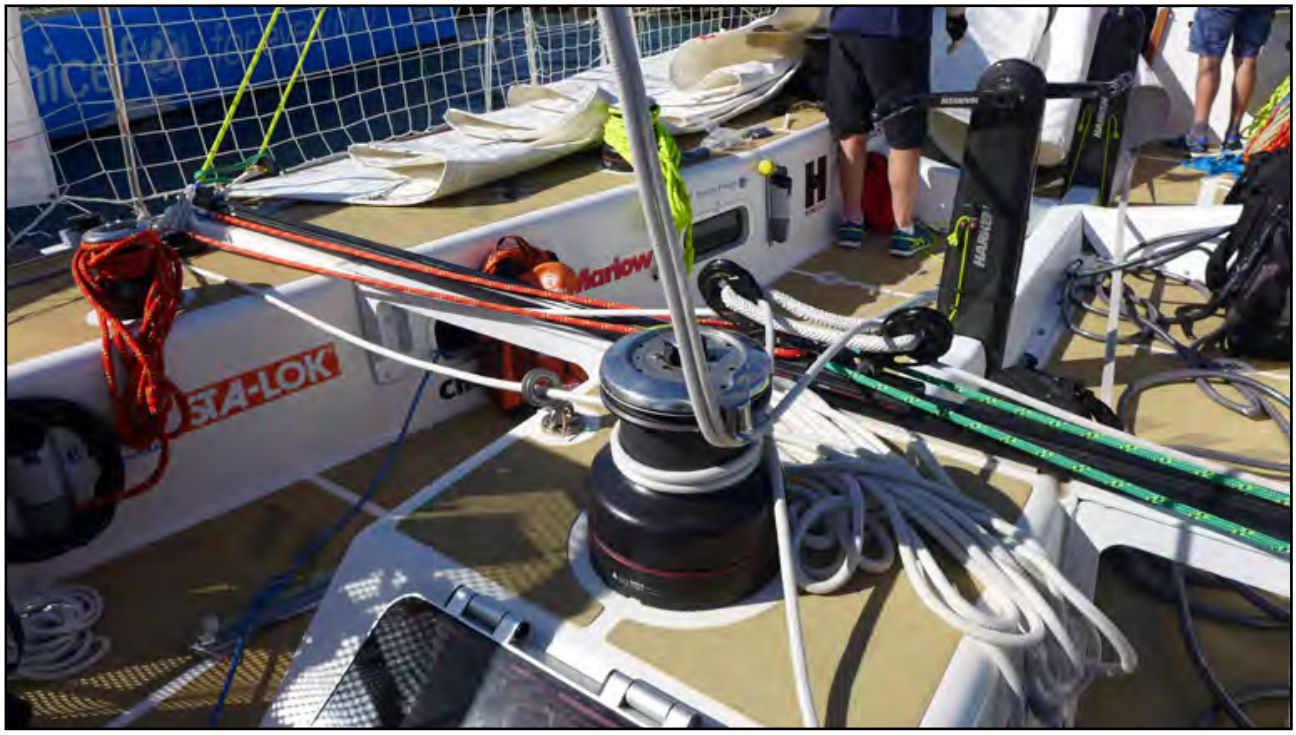

Figure 12: Reconstruction of mainsheet caught around self-tailing winch

At about 1434, on the first attempt to recover Simon, he was too far away from *CV30* and passed 1-2m away from the port quarter. At this stage it was apparent that he had not deployed his sprayhood, was unresponsive and pale in colour.

On the second attempt, 14 minutes later, Simon was lined up for recovery on the port side with the rescue swimmer deployed, but he passed under the bow and along the starboard side 1-2m from the yacht.

On the third and final attempt Simon passed under *CV30*'s bow and down the starboard side, but was secured using a boat hook. At about 1454, six crew lifted Simon over the starboard quarter and on board the yacht. Simon showed no signs of life, and after cutting away his lifejacket the crew carefully carried him down below.

The medic and two further crew, who were also qualified doctors, proceeded to administer cardio pulmonary resuscitation (CPR). The Australian Maritime Safety Authority arranged a link call to a doctor, who spoke to the medic after 30 minutes of CPR. All four doctors agreed to stop CPR and, at 1525, Simon was pronounced deceased.

Simon had no apparent external injuries apart from a graze on one of his elbows. The doctors on board believed the most probable cause of death was drowning. Simon's family were notified, and he was buried at sea at 0900 on 19 November.

1.4 CREW

1.4.1 Skipper

The skipper, who was 31 years old, had been involved in water activities from an early age. He had been a crewman on RNLI inshore and offshore lifeboats until the age of 20, while he worked as a beach lifeguard. Having completed various RYA courses during his time with the RNLI, he qualified as a commercially endorsed Yachtmaster Ocean in 2007. He became a Yachtmaster Instructor in 2014 and he also held a certificate of competency as a master for yachts less than 3000 gross tonnage. More recently, the skipper had shared his time between instructing and crewing megayachts and he had undertaken several ocean crossings.

In 2015, the skipper worked for Clipper Ventures as an instructor for 5 weeks. He applied to be a Clipper Race skipper in 2016 and passed the skipper trials in November 2016. He started work with Clipper Ventures in March 2017, undertaking its skipper training programme. He was appointed as skipper of *CV30* in May 2017 and, in June, undertook a team-building weekend with those crew who could attend prior to the start of the Race.

The skipper was highly regarded by his crew and was viewed as being very safety conscious. He often talked the crew through a number of 'what if?' scenarios. He also assessed the abilities and limitations of his crew to the extent that, during leg 2, he made the decision not to race competitively, but to sail conservatively, given the overall experience and demographic of the crew.

The skipper had taken a number of steps to improve safety on board. Concerned with the difficulty of being able to hear communications between the navigation station down below, and the helm on deck, he had purchased a loud speaker to fit behind the helm. To improve navigational awareness at the helm, he had obtained a second monitor, which he intended to mount inside the aft escape hatch as a repeater for the Timezero navigation computer. At the time of the accident the skipper had not had an opportunity to complete either of these improvements.

1.4.2 Simon Speirs

Simon Speirs was 60 years old and had retired in 2016. He had sailed dinghies throughout his life at his local sailing club. He held several RYA qualifications including Powerboat Level 2, Coastal Skipper and Yachtmaster Offshore shore-based theory, and he had completed a Coastal Skipper practical course that enabled him to charter yachts on flotilla holidays.

Simon was taking part in the Race as a charity challenge in a similar way to other events he had completed previously. Completing the Race had been a long-standing ambition. In January 2014, Simon applied for a berth in the 2015-2016 Race, but once he realised the commitment involved he deferred his place until the 2017-2018 Race, following his retirement. He had opted to sail the whole Race and completed his 4 weeks of mandatory training between signing up and the start of the Race.

In February 2017, Simon was chosen by Clipper Ventures to complete the Clipper coxswain course (section 1.4.4). Simon was the only Clipper Ventures coxswain on board *CV30* for leg 3.

Simon was appointed as watch leader on the first two legs of the Race, which he had found rewarding but also quite stressful. He had requested not to be watch leader on leg 3, but at the time of the accident had reverted to this role as his appointed watch leader was injured.

Simon was also one of two sail repairers on board *CV30*. In addition to repairs conducted during Race stopovers, during legs 1 and 2 he had undertaken substantial repairs to the asymmetric spinnakers during the Race as they frequently became damaged.

Simon was highly respected by other crew members. He was considered to be very safety conscious, and to have led by example in his role as watch leader. He kept a regular blog of the Race, in which he often mentioned the importance of staying safe and ensuring he was tethered to the yacht.

1.4.3 *CV30* leg 3 crew

The average age of the 16 crew was 50 years, ranging from 29 to 63 years. In addition to Simon, five of the crew were on board for the whole Race. Two further crew who had signed up for the whole Race had been assigned to *CV30* but one never started the Race and the other left in Punta del Este due to safety concerns he had about the Race.

Four of the crew were novice sailors prior to starting their Clipper training. However, three of these novice sailors had completed two legs of the Race prior to leaving Cape Town. The rest of the crew's sailing experience prior to the Race varied from flotilla cruising holidays in the Mediterranean to ocean sailing experience, with several of them owning yachts. However, none of the crew had sailed in the Southern Ocean and many of the leggers had wanted to complete leg 3 to gain this experience.

1.4.4 Crew training

Prospective crew applied to Clipper Ventures and were invited to an interview before being offered a place on pre-race training, conditional on proof of medical fitness. While the 17-18 Race was underway but prior to the fatal accident on *CV30*, an agility/fitness test was introduced for crew starting their Clipper training. The fee for taking part in the Race depended on the number of legs of the Race the applicant wished to complete. All crew were required to enter into a contract with Clipper Ventures, which included requiring them to accept authority and instructions from the skipper.

Irrespective of any previous sailing experience, all potential crew had to successfully complete a compulsory training programme, which was divided into four levels:

- Level 1- crewing skills (7 days) (RYA Competent Crew qualification).
- Level 2- offshore sailing and life on board (6 days including 1-day sea survival training).
- Level 3- asymmetric spinnaker training and racing techniques (6 days including 1-day offshore safety course).
- Level 4- team tactics and offshore racing (7 days with the Race skipper).

Crew were assessed by the skipper and mate to highlight areas for improvement and identify if they had the potential to be a watch leader. In addition, those showing the required aptitude were recommended to become Clipper coxswains. If these candidates were willing to be a Clipper coxswain, a further 2 weeks of training was provided. These candidates completed the RYA Coastal Skipper/ Yachtmaster Offshore theory course (40 hours of teaching over 5 days) followed by a 2-day shore-based course covering ocean navigation, VHF radio and radar, and finally a 5-day practical sailing course on board a Clipper yacht. In the event of an emergency that incapacitated the skipper it was intended that a Clipper coxswain would take command and navigate the yacht to a safe haven.

1.5 *CV30*

1.5.1 General description

The Clipper 70's foam reinforced plastic hulls were constructed in China in 2013. The 12 hulls were then shipped to the UK, where the keels were attached, the yachts were rigged and their fit-out completed. The design was intended to reflect the design trend of ocean racing yachts at the time but, crucially, to enable it to be sailed by amateurs and be of a sturdy construction to withstand sailing round the world several times.

The Clipper 70 had 24 berths, although this number of people was never carried. The yacht had a sail locker forward, two toilets, a central galley area, and a navigation station positioned towards the stern. Aft of the navigation station was a lazarette, which was accessed from the upper deck and was used for general storage, including rubbish that was generated during the leg. It also contained the steering gear for the twin rudders. Forward of the sail locker was a transverse bulkhead, which then formed a watertight forepeak space, access to which was via a bolted watertight hatch **(Figure 13)**.

The bilges were cleared using automatic electric bilge pumps, with suctions situated to starboard of the centerline and a separate manual bilge pumping system situated with suctions to port of the centerline. There were eight batteries supplying power for domestic services and for starting the engines. The batteries were charged via a 6kW generator, but the main engine could also be used to charge the batteries. The generator also powered the yacht’s water heater. A salvage/fire pump could be driven by the main engine to assist with clearing a major water ingress or delivering fire-fighting water via a hose.

Image courtesy of Clipper Ventures plc

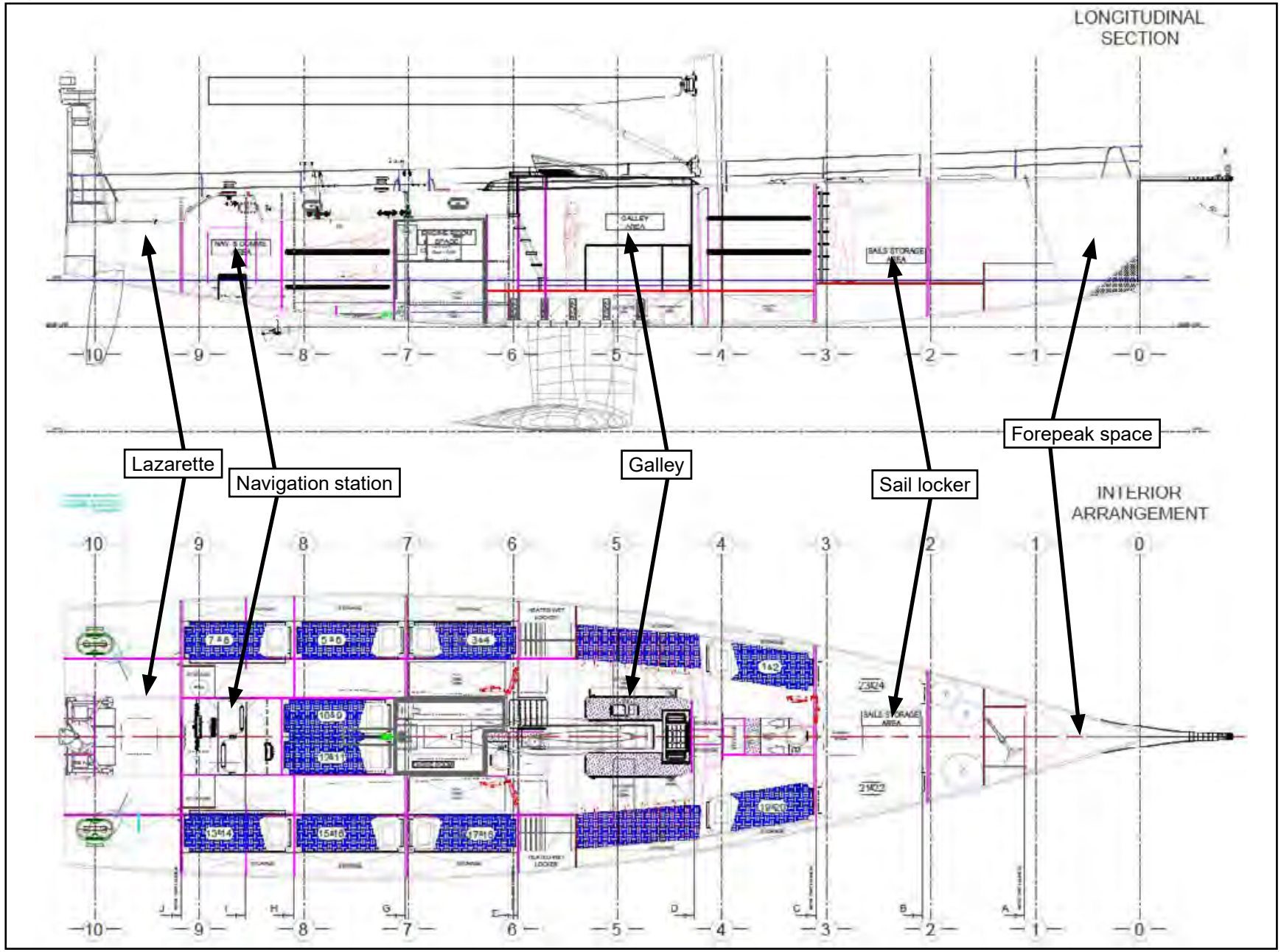

Figure 13: Clipper 70 layout

The yacht had two fresh water tanks with a total capacity of 580 litres. A Ventura Rowboat 150 watermaker was also fitted, which was capable of producing 30 litres of water an hour by the process of reverse osmosis.

1.5.2 Sails

The Clipper 70's sail wardrobe included a mainsail with three slab reefs, a staysail hanked to the inner forestay, three sizes of yankee headsail hanked to the forestay and three asymmetric spinnakers of varying weight of cloth, which were flown with their tack attached to the bowsprit. The yacht also had a windseeker spinnaker for light airs and a storm jib which could be hanked to the inner forestay. Each sail had an apparent wind speed limit recommended by the sail manufacturer **(Figure 14)**. During the Race the crew were responsible for repairing any damage sustained to the sails. To act as an incentive to look after the sails, if a sail had to be replaced at a stopover, the team lost points, which affected their yacht's overall standing in the Race.

Two preventers were rigged to the boom whenever the yacht was sailing with the wind aft of the beam. In the event of an accidental gybe, when the yacht's stern passed through the wind in an uncontrolled fashion, the preventers were intended to prevent or at least delay the boom and mainsail swinging across the yacht **(Figure 15)**.

Apart from putting in and removing reefs to the mainsail the primary sail changing took place on the foredeck. The staysail was normally left on deck when not in use given its smaller size. However, the yankee headsails were normally stowed in the sail locker when not in use. Sails were passed down through the foredeck hatch into the sail locker, but when sea conditions prevented this hatch being opened, the sails were sometimes secured against the guardrail on deck on the high side of the yacht to prevent water building up against the sail on the guardrail.

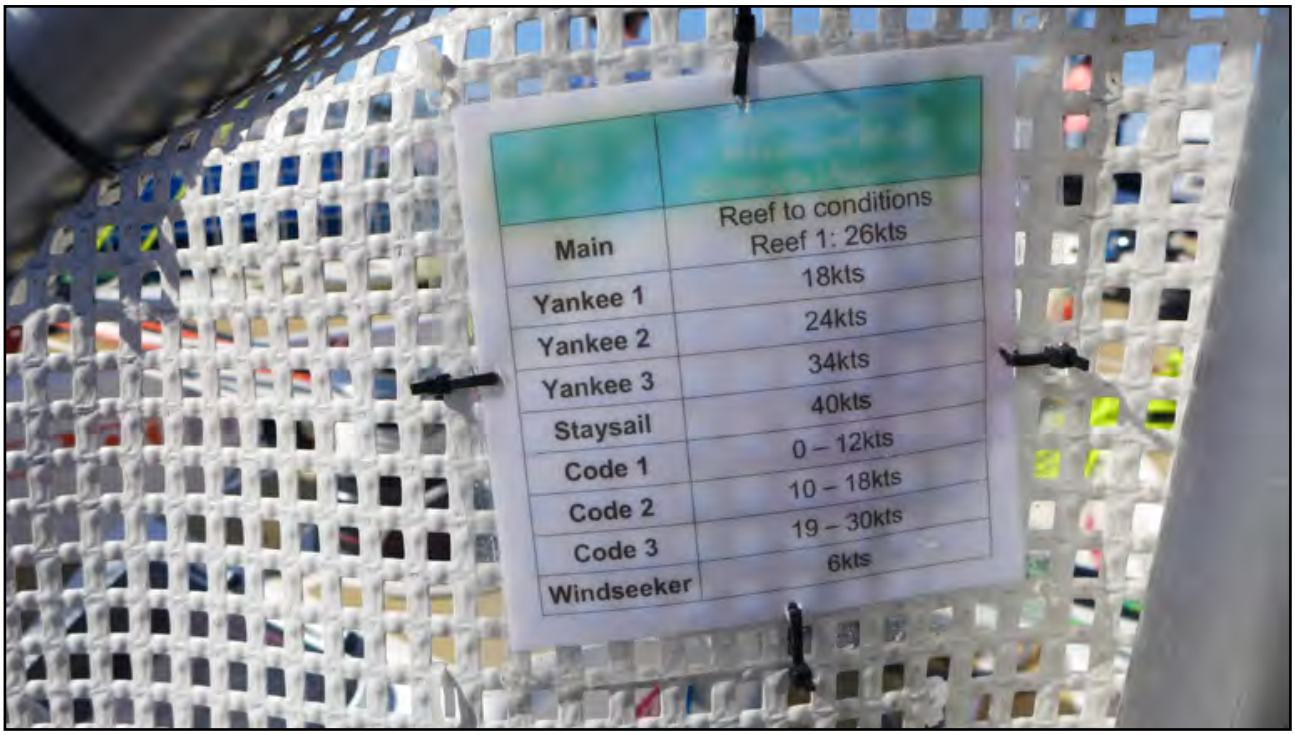

Figure 14: Recommended wind speed limits for sails

Base image courtesy of Clipper Ventures plc

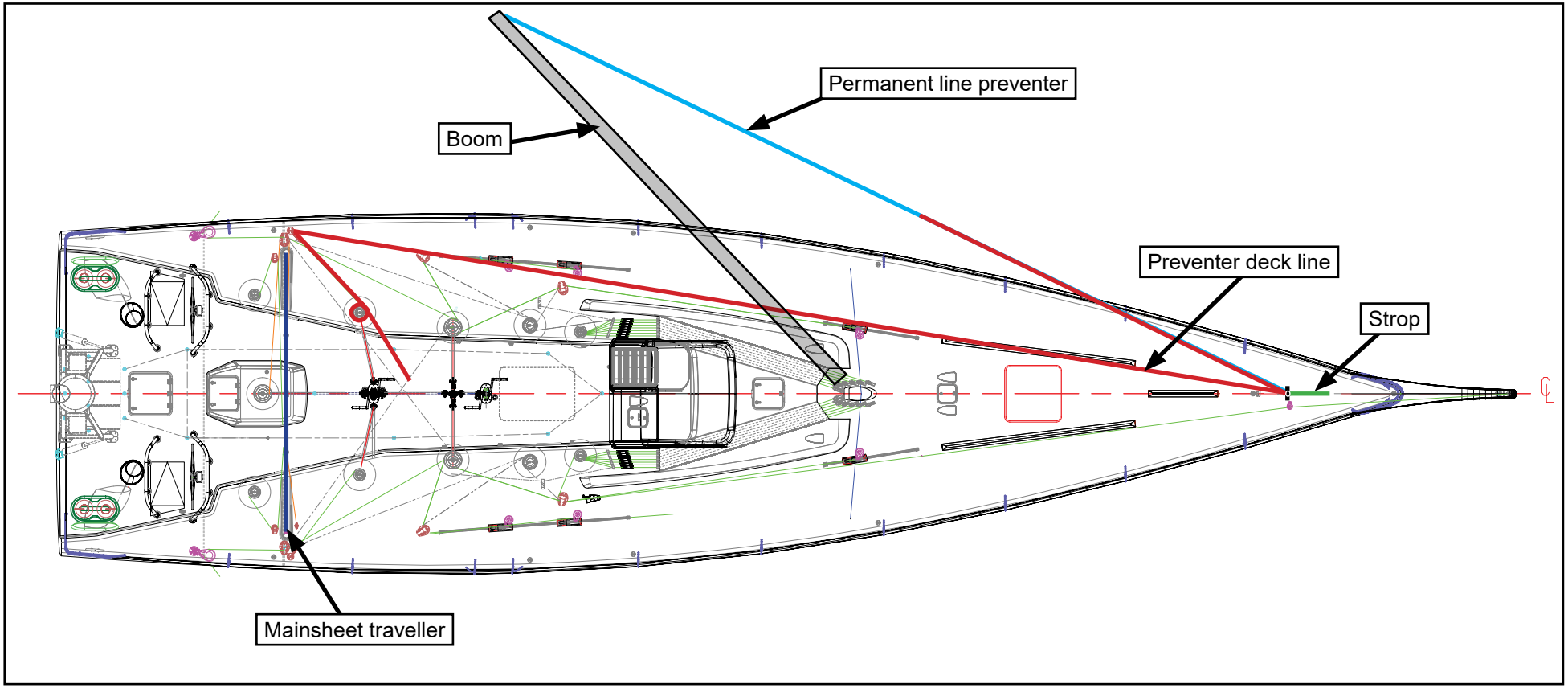

Figure 15: Preventer arrangement (single preventer shown)

1.5.3 Guardrails

The Clipper 70 was fitted with upper and intermediate guardrails, which ran from the pulpit to the pushpit on both sides, passing through supporting stanchions at roughly 2m intervals. The upper guardrail was 800mm above the deck while the intermediate guardrail was 380mm above the deck. To prevent a crew member from slipping or being washed between the guardrails, netting was fitted over their entire length **(Figure 7)**.

The stanchion bases, which located the foot of the stanchion on to the deck, were made of stainless steel and comprised a base plate 95x80mm and a 60mm stainless steel tubing section welded perpendicular to the base plate **(Figure 16)**. There was also a short section of stainless steel rod welded as a support on the inboard side of the tube.

Figure 16: Stanchion base

On inspection of the guardrails in Fremantle, three rows of HMPE line were found weaved through the starboard guardrail netting and secured between the pulpit and the shroud rigging to provide additional support in way of the two stanchion bases that had fractured. However, the two stanchions whose bases had fractured were free to move at their base and, compared to the port guardrail, the upper guardrail dipped lower between the stanchions, was further outboard and had greater lateral movement.

A closer inspection of the failed forward two starboard stanchion bases identified that they had suffered significant distortion and had been re-welded previously following a similar failure in the 15-16 Race **(Figure 17)**. No replacements were available in Fremantle, so the stanchion bases were repaired again before the start of Leg 4 of the Race.

Figure 17: Fractured stanchion base

1.5.4 Jackstays and fixed pad eyes

The Clipper race crew manual instructed crew to attach their safety tethers to the yacht using the jackstays or fixed pad eyes provided. Fixed pad eyes were provided in locations of relatively static operational tasks, for example at the helm positions. To enable movement about the yacht while remaining tethered, jackstays were provided **(Figure 18)**. These were fitted from the ends of the mainsheet track to the bow, allowing tethered access forward, and from the stern to just forward of the shrouds, to allow tethered access aft. Two further jackstays ran from the companionway hatch directly to the helm positions along the cockpit floor, facilitating being clipped on before leaving the cabin. Between the helm positions were a further four short jackstays to enable tethered movement between the helm positions and access to the dan buoy on the aft gantry.

The majority of jackstays were secured to the yacht via pad eyes **(Figure 19)**; the only exceptions being the forward end of the bow jackstays **(Figure 20)** and the stern end of stern jackstays, which were attached with shackles to the port and starboard forward and aft mooring cleats.

The race crew manual stated:

'Never clip on to

- *The steering pedestal*
- *The pulpit/pushpit*
- *Sheets or running rigging*
- *Standing rigging*
- *Guard wires or stanchions'*

1.5.5 Secondary jackstays

In August 2017, prior to the start of the Race, the skipper and some of the crew of *CV30* prepared and personalised the yacht while moored at Clipper Ventures' base in Gosport. Following discussions with another skipper, who had completed the Race previously and in common with other Clipper 70 skippers, the skipper decided to fit a secondary jackstay to be used in conjunction with those already fitted. It consisted of a retired halyard manufactured from HMPE, which had the sheath removed and which was looped through itself at each stanchion base from aft, terminating at the foredeck cleat **(Figure 21)** on both sides of the yacht. The intention was that crew on the high side of the yacht when heeled would be attached to one of the primary jackstays with their long tether, and to the secondary jackstay with their short tether, preventing them from falling a significant distance if the yacht suddenly heeled further.

The failure of the forward two starboard stanchion bases **(Figure 22)** on 4 November released and introduced additional slack into the starboard side secondary jackstay **(Figure 23)**.

Base image courtesy of Clipper Ventures plc

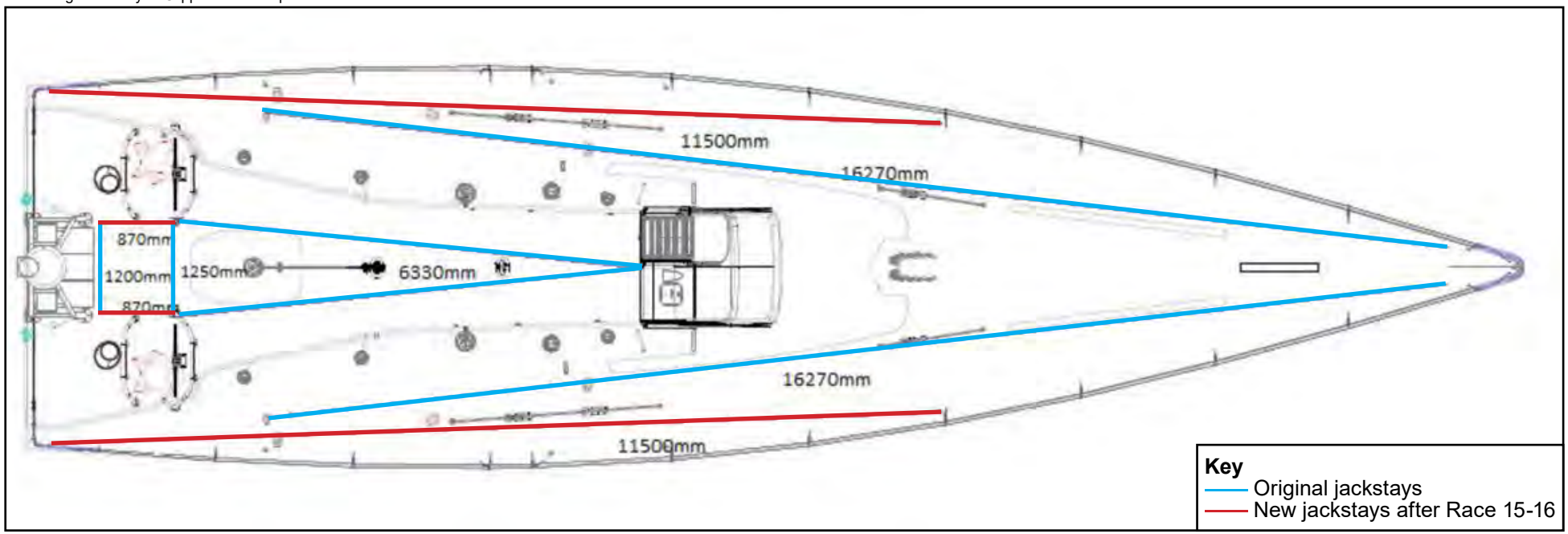

Figure 18: Jackstay layout and lengths

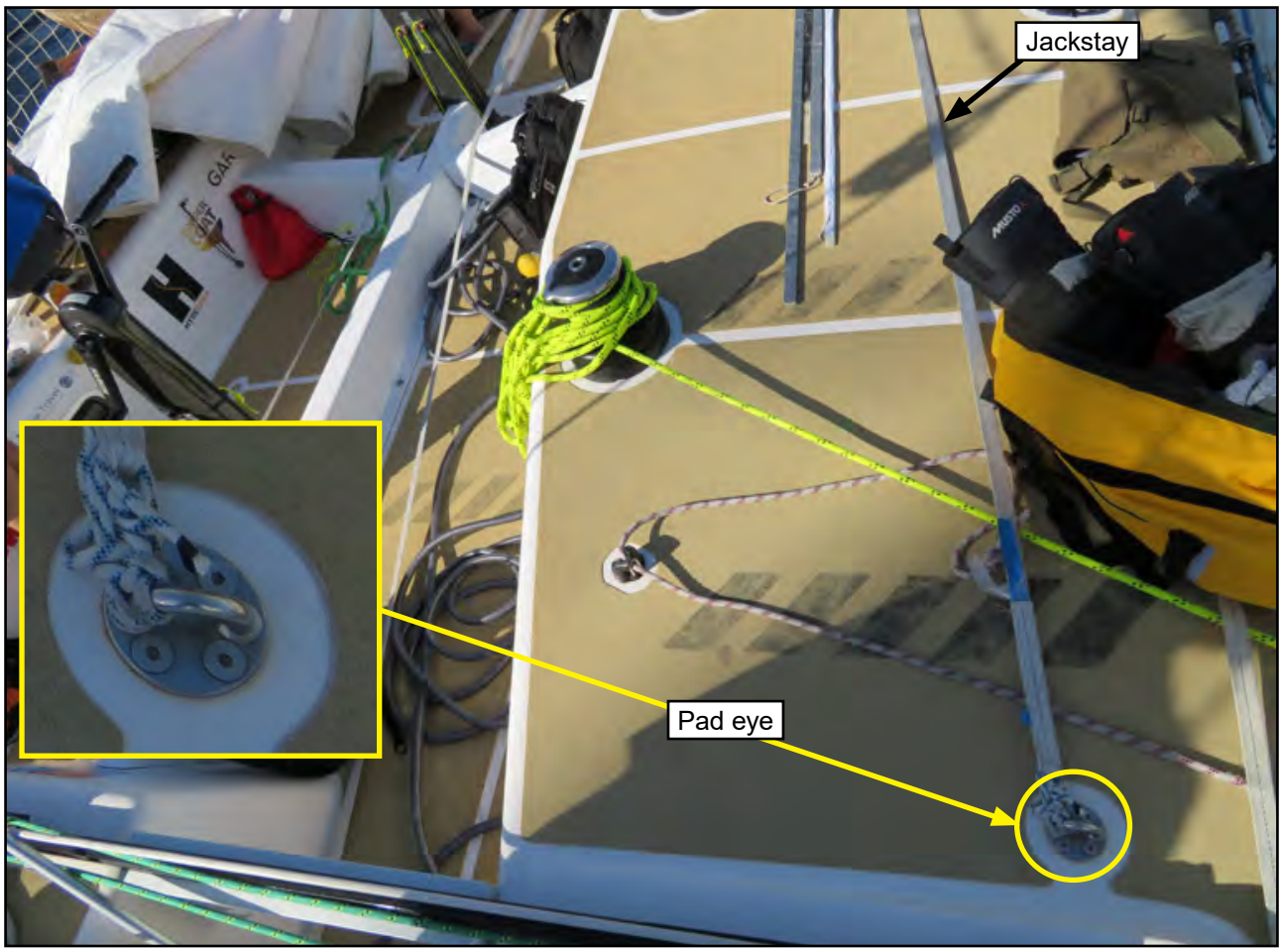

Figure 19: Jackstay termination at pad eye

Figure 20: Attachment of jackstays to bow cleats

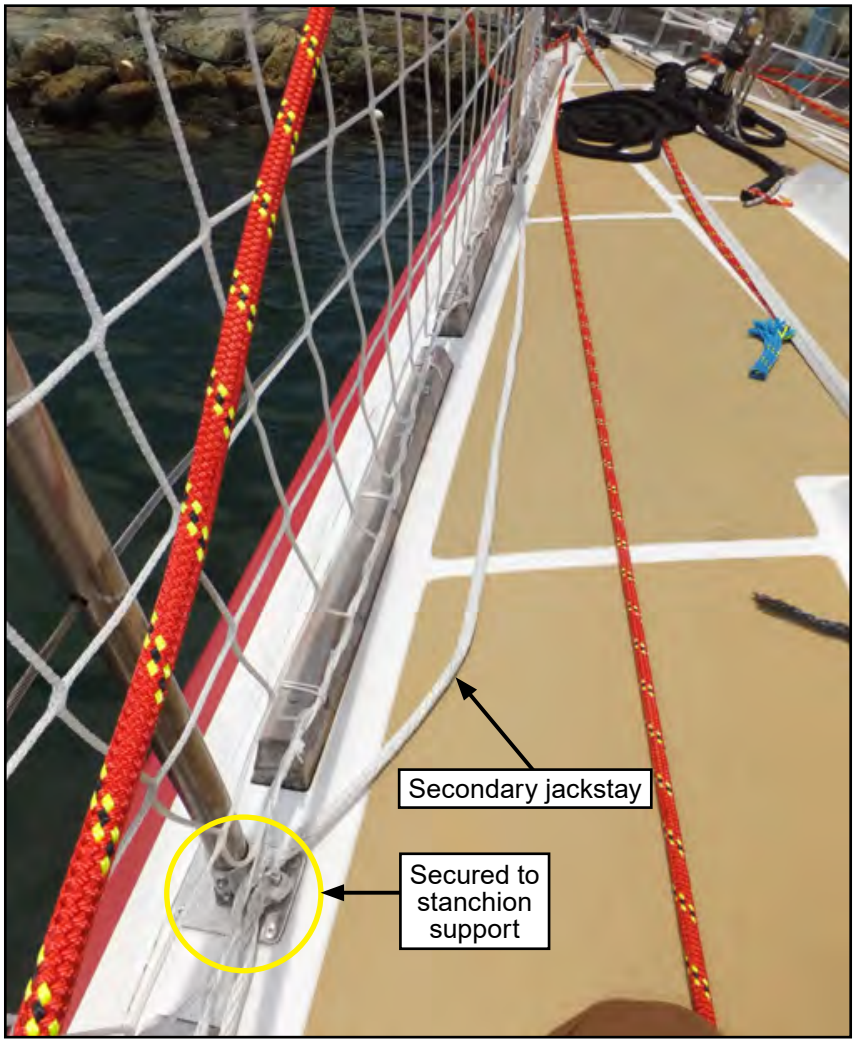

Figure 21: Port side secondary jackstay secured to stanchion base

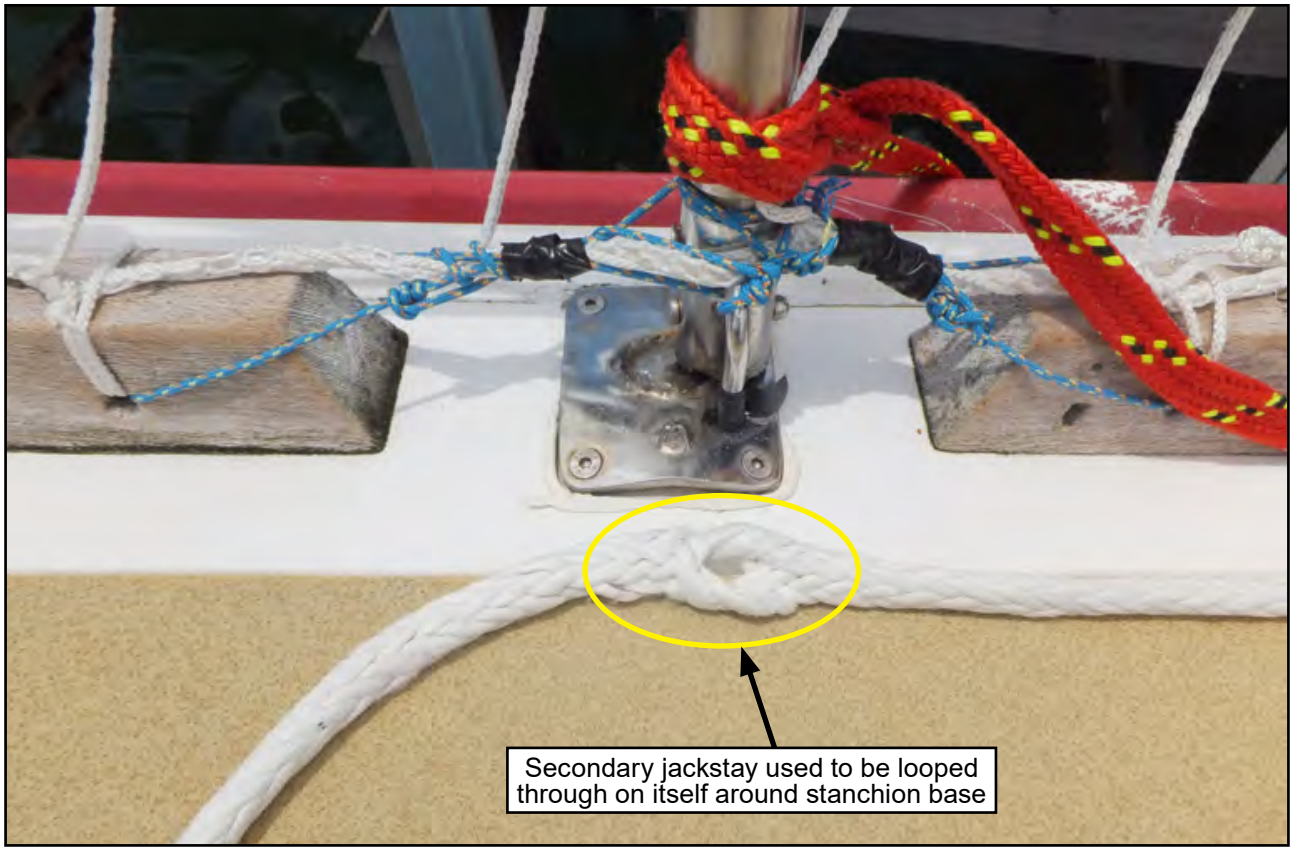

Figure 22: Starboard secondary jackstay free from stanchion base

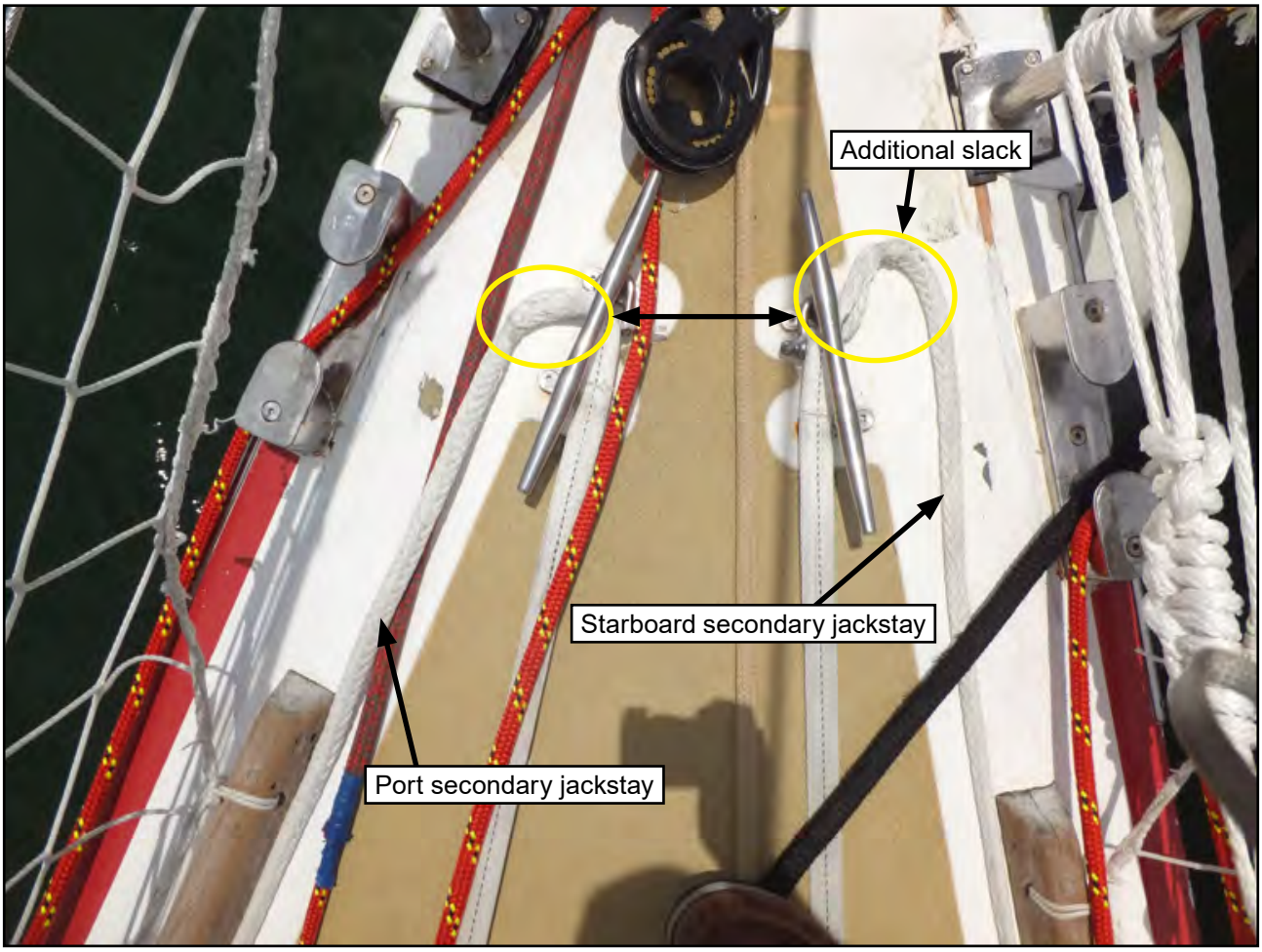

Figure 23: Starboard secondary jackstay showing additional slack compared with port secondary jackstay

1.6 THE SAFETY HARNESS TETHER

1.6.1 Safety harness tether in use on Clipper 70 yachts

Prior to the 2017-18 Race the safety harness tethers on board the Clipper 70 fleet were replaced with a similar model manufactured by Spinlock **(Figure 24)**. Spinlock's high specification safety line had been tested and certified against ISO 12401 Small craft- Deck safety harness and safety line- Safety requirements and test method, by Fleetwood Testing Laboratory in January 2015 **(Annex A)**.

The safety line consisted of a 0.9m short tether and a 1.8m long tether, the latter elasticated for ease of use. The tether was fitted with an overload indicator, which would show if the tether had been exposed to over 500kg loading and needed to be replaced. The instruction leaflet **(Annex B)** detailed that the tether should be attached to a jackstay or pad eye with the strength to withstand a minimum load of 1 tonne. The instructions detailed that the safety line was intended to prevent the user falling overboard, and did not provide protection against falls from height. The instruction leaflet also stated:

> *'Read this notice carefully before use. This technical notice illustrates ways of using this product. Many types of misuse exist, which are impossible to list or even imagine. Only the techniques shown in the diagrams and not crossed out are authorised…'*

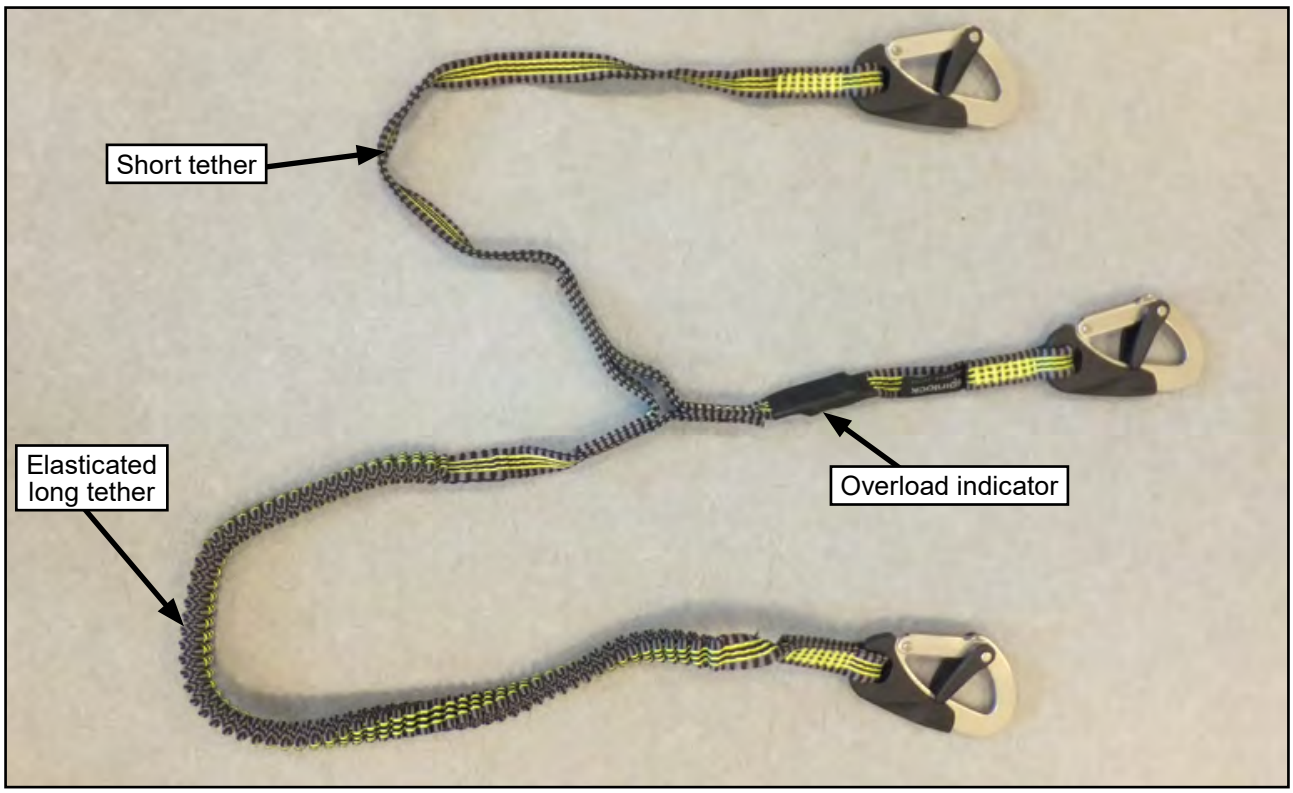

Figure 24: Spinlock high specification safety line

At the three ends of the tether were identical single-handed double action spring-loaded hooks **(Figure 25)**. Although the precise design was Spinlock's, the basic hook design (Gibb hook) was commonly used by many tether manufacturers and had been in existence for 30 years. The main structural element of the hook was pressed from non-magnetic stainless steel.

Spinlock tested to destruction a sample tether from each batch that was produced to ensure they met approval requirements. During these tests the tether webbing and stitching always failed prior to the tether hooks themselves.

Figure 25: Spinlock tether hook

1.6.2 Examination of tether and testing following the accident

Following the accident, the safety tether used by Simon was examined. Key observations were as follows:

Long tether hook-

- The hook had been distorted and bent over 90° **(Figure 26)**.
- The hook gate had 1-2mm of play compared with an undamaged gate.
- There was no sign of impression damage to the hook apart from one small indentation **(Figure 27)**.
- The spring of the gate still functioned.

Figure 26: Distorted tether hook

Figure 27: Distorted tether hook small indentation (circled)

Short tether hook-

- There was no sign of damage and the hook functioned correctly.

Lifejacket anchor point hook-

- The hook functioned correctly.
- There was a slight notch at the loading point of the hook **(Figure 28)**.

Figure 28: Tether hook secured to harness notching

Tether webbing-

- The elastic section of the long tether was frayed with elasticity lost but was still intact **(Figure 29)**.
- The overload indicator was exposed **(Figure 30)**.

Spinlock conducted tests shortly after the accident using its test rig. With the hook restrained to a 90 degree deflection from normal alignment it was possible to replicate similar distortion to that seen in the hook after the accident at loads of less than 500kg.

Figure 29: Frayed elasticated section of long tether

Figure 30: Safety tether overload indicator

1.6.3 Tether hook snagging mechanism

It is not known how Simon was clipped on to the yacht at the start of lowering the yankee 3. However, when the bowman saw Simon's safety tether hook snagged after the gybe, it appeared to be clipped to the starboard secondary jackstay but caught under the front of the starboard bow cleat. The gate of the hook was facing forward, and the long tether webbing was leading over the cleat and up and over the upper starboard guardrail **(Figure 31)**. As the tether hook came under load it would have tensioned the secondary jackstay under the cleat and the hook would have loaded itself laterally on the inside forward section of the cleat, essentially bending the hook over the cleat. The small impression observed on the hook after the accident is likely to have resulted from contact with the cleat.

When the same snagging mechanism was attempted by MAIB inspectors on the port secondary jackstay following the accident, it could not be repeated as there was insufficient slack in the secondary jackstay to enable the hook to pass round the front of the cleat **(Figure 23)**. This in turn was because the secondary jackstay on the port side was still looped through the port side stanchion bases, which were intact.

Further attempts were made to try to replicate a snagging mechanism that would load the hook laterally. With significant effort it was possible to wiggle the hook over the end stitching of the main jackstay webbing, where it was possible to jam the hook between the cleat securing points **(Figure 32)**. However, given the greater contact of the hook with the cleat and shackle attaching the jackstays, further marking of the tether hook would have been expected had it become snagged in this fashion, ruling this possibility out.

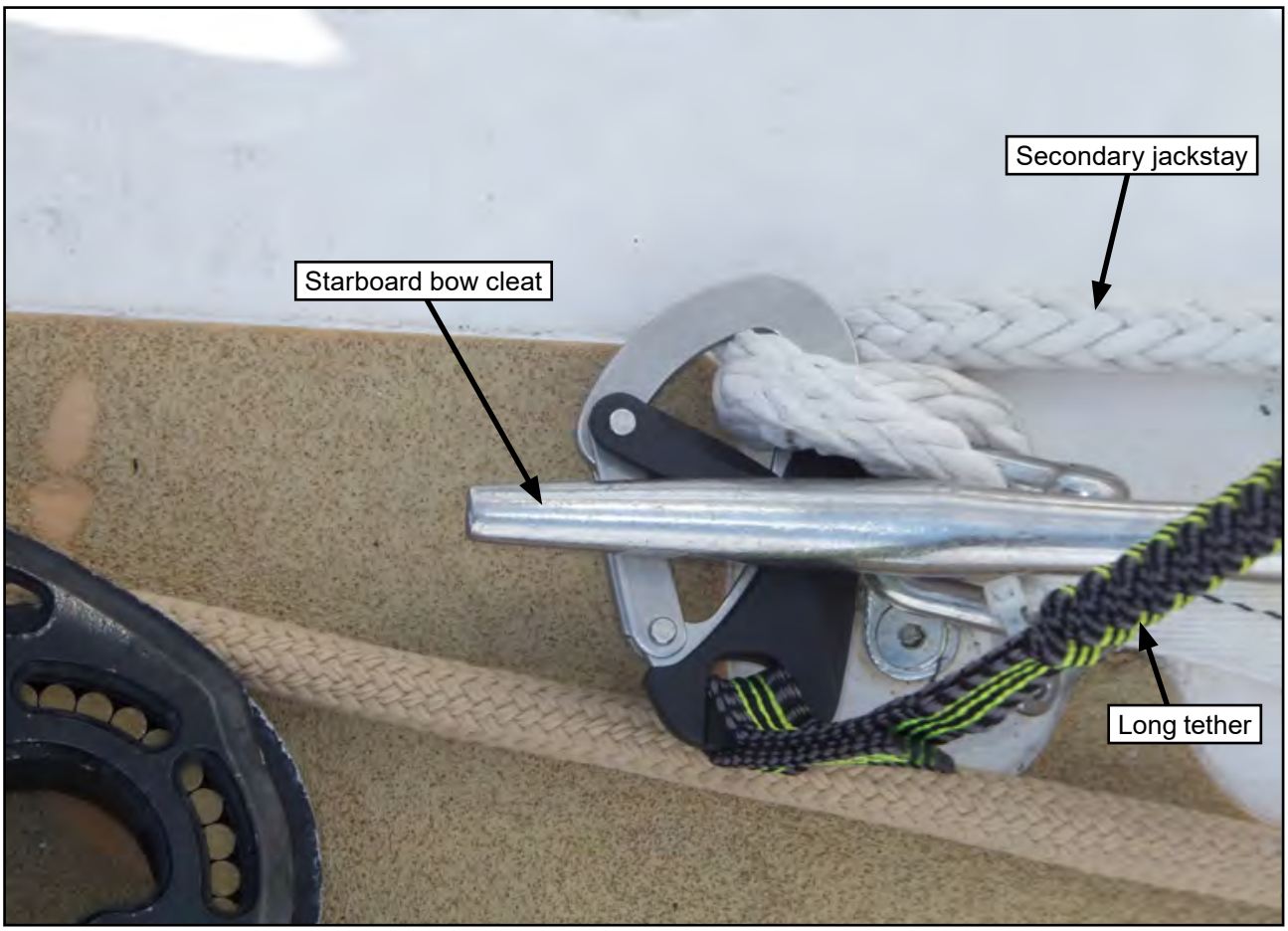

Figure 31: Reconstruction of tether hook caught under cleat attached to secondary jackstay

Figure 32: Tether hook caught under cleat attached to primary jackstay

1.6.4 Other safety harness tether arrangements

In 2016 a lifejacket with an integral harness, which allowed a tethered MOB to be towed on their back if they fell overboard, became available. The system was reliant on the wearer operating a handle that released the clip-on point from the front of the lifejacket, over the shoulder, resulting in the MOB being towed on their back from a secure point on the back of the lifejacket. This design was intended to keep the casualty's head clear of the water, reducing the risk of drowning.

1.7 MOB SAFETY EQUIPMENT AND PROCEDURE

1.7.1 Lifejackets

The auto-inflation lifejackets supplied to the crew by Clipper Ventures were fitted with an integral harness to which the tether was clipped via a 'D' ring positioned just below the chest **(Figure 33)**. The lifejacket also included a crotch strap with a metal buckle, and a spray hood that the wearer could pull down over their face, following lifejacket inflation, to prevent the inhalation of water. Once inflated, the lifejacket provided 150N of buoyancy to the wearer.

Lifejackets were assigned to individual crew and it was their responsibility to inspect and look after them. Clipper Ventures required all crew to wear their lifejackets at all times when on deck at sea.

Figure 33: Clipper lifejacket showing integral harness

1.7.2 AIS beacon

The lifejackets were supplied with an Ocean Signal MOB1 AIS beacon **(Figure 34)**. This personal AIS beacon was activated automatically when the lifejacket was inflated, by pulling on an arming tape that was wrapped around the bladder of the lifejacket. Once activated, the AIS beacon transmitted a DSC VHF signal with a GPS position that could be received by AIS equipment fitted to vessels nearby, enabling a range and bearing to the MOB to be derived. The equipment's range of reception varied depending on the sea conditions and the height of a vessel's receiving antenna above sea level, but it was typically up to 4nm.

Figure 34: Ocean signal MOB1 AIS beacon fitted to lifejacket

1.7.3 Dan buoy

CV30's dan buoy was secured to the starboard side of the aft gantry **(Figure 35)**, to be deployed by the nearest crew member as soon as possible following an MOB. A horseshoe life-ring and buoyant light were attached to the dan buoy. An MOB1 AIS beacon was also secured to the dan buoy and the arming tape was attached with twine to the gantry. When the dan buoy was thrown overboard the AIS beacon was intended to automatically activate as the arming tape was pulled.

During Simon Speirs' MOB recovery, although the dan buoy was thrown overboard there was no reception of the dan buoy's AIS beacon on *CV30*'s plotter.

Figure 35: Dan buoy and horseshoe life-ring showing AIS beacon

1.7.4 Scramble net

Clipper yachts carried one scramble net that could be attached on the port or starboard side in way of the guardrail entrance point. The race crew manual required the scramble net to be readied, following an MOB, to assist with a conscious MOB getting a hold of the yacht. On board *CV30*, the skipper required the scramble net to be rigged at all times ready for immediate use.

1.7.5 Clothing

Clipper Ventures supplied each crew member with a set of foul weather clothing. Crew could additionally purchase a dry-suit. Those crew completing only 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.

For the Southern Ocean leg, all but two of *CV30*'s crew had dry-suits, and the skipper encouraged those who had one to wear it. The skipper and other crew did not realise that Simon was not wearing his dry-suit at the time of the accident until after his recovery back on board.

1.7.6 Rescue swimmer

The Clipper Ventures' standard MOB procedure required a crew member to prepare to act as a rescue swimmer. The swimmer would don a climbing harness, helmet and manual inflation lifejacket, as well as retrieve a lifting hook and heli strop that was used to secure to the MOB. It was common practice on *CV30* for one of the on-watch crew to wear the harness, leaving a spare harness below in case the nominated swimmer fell overboard. During leg 3 the nominated swimmer normally wore a dry-suit.

A manual inflation lifejacket that was stored down below with the MOB kit was worn by the rescue swimmer so it would not inflate automatically during the MOB recovery process and hamper the movement of the rescue swimmer. On this occasion this was not used by the volunteer swimmer as he chose to don his own lifejacket. This resulted in him partially deflating his lifejacket following its activation after he had been lowered over the side for the first time.

1.7.7 MOB procedure

The MOB procedure was detailed in the race crew manual. The procedure was drilled regularly during Clipper training and prior to the start of each leg of the Race, using an MOB manikin, which was carried by all Clipper yachts for conducting MOB drills.

Once dressed and ready, the rescue swimmer would move to the port shrouds and another crew member would help with attaching one halyard to the swimmer and another halyard to the lifting hook and heli strop. The swimmer would step outside the guardrails with tension on the halyard, and a tether was wrapped around the shrouds and the halyard to prevent the swimmer swinging too far outboard. MOB retrieval was normally conducted on the port side, to enable the person helming to control the engine as the MOB was approached as there were no engine controls beside the starboard wheel.

The procedure for recovering a tethered MOB was detailed in Clipper Ventures' SOP **(Annex C)**. Recovering a tethered MOB was generally taught but not physically practised. The procedure was to stop the yacht, keep the casualty's head clear of the water, and hoist the MOB back on board by hand or using a halyard.

1.8 REPAIRS DURING THE RACE

1.8.1 General

Running repairs were expected to be conducted by the crew when the Race was underway. However, prior to the Race starting, Simon had raised some concerns with Clipper Ventures' race director that the crew were being relied upon to complete work that he considered should have been carried out during refit. This same issue was raised by the crew member who left *CV30* in Punta del Este in a letter he wrote to the skipper. Some of the maintenance issues encountered during the Race are detailed in the following sections.

1.8.2 Generator failure

CV30's generator failed 2 days into the first leg of the Race (22 August 2017) as the carbon brushes had worn out. The generator was recorded as serviced in May 2017 in Clipper Ventures' maintenance log. The spare carbon brushes for the Clipper fleet were carried on *CV24,* which was at the back of the fleet. A few days later *CV24* had to divert to Porto to evacuate the skipper, who had suffered a serious hand injury. Collecting the spare from *CV24* was therefore not a viable option.

Although the main engine was run to recharge batteries and supply power as required, the concern onboard was that the desire for electricity had to be balanced against the need to conserve fuel to motor through the doldrums later in leg 1. A week later, one of the crew on board managed to dismantle an old battery and used the carbon electrodes to fashion new brushes for the generator.

1.1.1 Water ingress

The forepeak space suffered from substantial water ingress in common with many other Clipper yachts during leg 1 and had to be emptied twice a day. Although the forepeak could be drained directly into the sail locker bilge, the bilge pumping system was ineffective at removing water from the sail locker bilge. It was therefore determined easier to remove the inspection hatch **(Figure 36)** to the forepeak space and use a portable manual bilge pump to pump the water overboard via the deck hatch. The lazerette also experienced water ingress in the vicinity of the rudder stock and had to be pumped out twice a day by a crew member using the portable bilge pump, who had to balance among stores, rubbish and the moving steering gear.

The lazerette leak was partially addressed by the Clipper Ventures maintenance team in Punta del Este. The forepeak space leak, however, could not be resolved, so a manual bilge pump was fitted in the sail locker with its own discharge overboard during the stopover in Cape Town to facilitate pumping out the forepeak space.

Figure 36: Access to forepeak via bolted hatch

On *CV30* the bilge pumping system was arranged with the suctions for the electrical bilge pump system located on the starboard side. This meant that while sailing on a starboard tack the electric bilge pumps were ineffective, leaving manual bilge pumping as the only option to clear water from the bilge. Pumping water from the bilges became a significant burden when racing necessitated staying on a starboard tack for a long period.

1.8.3 Watermaker

The Ventura Rowboat 150 watermaker was problematic during leg 1 as it failed to operate when sailing on a port tack. This was believed to be due to the watermaker pump not having sufficient suction to draw water from the bilge seacock when on a port tack. This was particularly significant on leg 1 as the wind had dictated the yacht remain on a port tack for over 3 weeks.

In order to prevent the rationing of water from the fresh water tanks, the skipper fashioned a solution using a rubbish bin as a reservoir and disassembling the fire hose to enable sea water to be pumped into the reservoir using the salvage/fire pump driven by the main engine. The flow of water had to be manually regulated using a diverter valve in the engine compartment to keep the reservoir at a constant level. The problem was eventually found to be a small air leak due to a fault in a suction-side fitting of the watermaker.

1.8.4 Starboard wheel

During leg 2 the starboard wheel developed a significant amount of play, and a socket wrench was placed next to it to enable the hub nut to be tightened at regular intervals **(Figure 37)**. There was a common issue of worn keyways in wheel bosses, which immerged during the early stages of the 17-18 Race. Clipper Ventures was aware of the issue and was completing repairs as parts became available at stopovers. Due to a lack of available parts, only a temporary repair was possible to *CV30*'s starboard wheel but as the port wheel was functional and the emergency steering backup was unaffected, *CV30* was considered safe by Clipper Ventures to

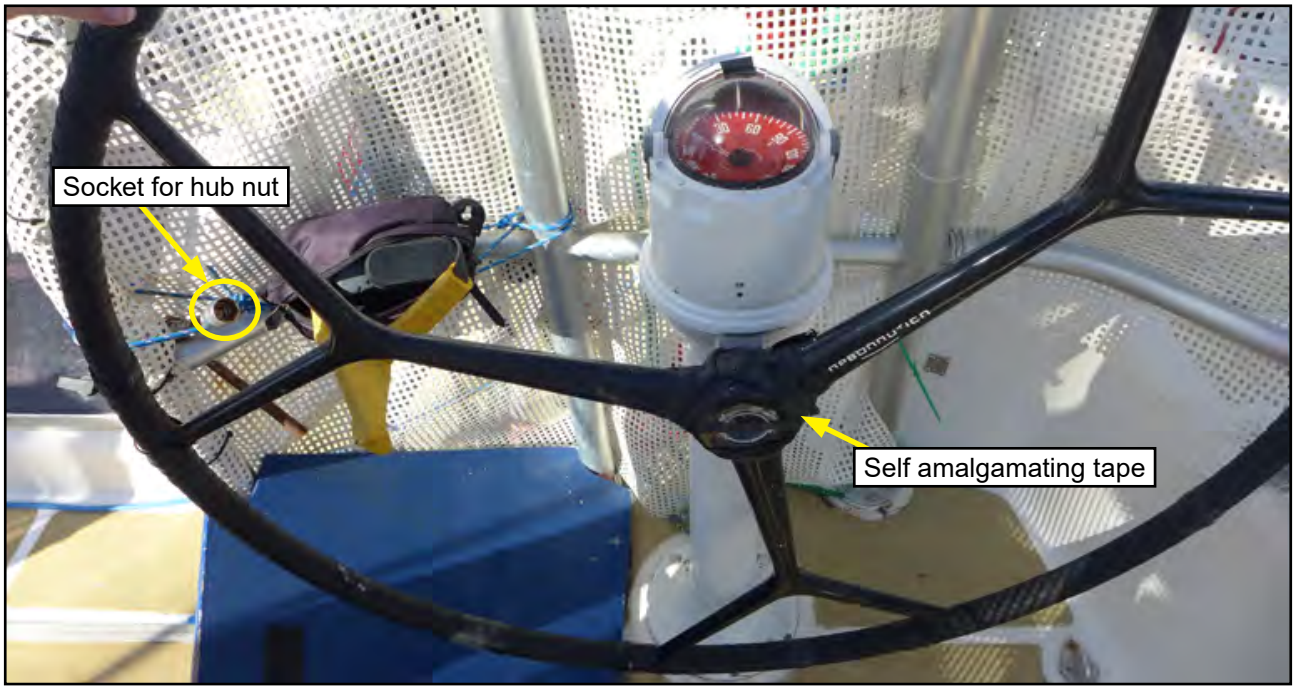

Figure 37: Starboard wheel temporary repair with socket spanner accessible to tighten hub nut

continue to race. A week or so into leg 3 the play in the starboard wheel was again significant, so although the crew made attempts to repair the wheel it was decided that all helming would be conducted from the port wheel. This imposed visibility restrictions on the person helming when the yacht was sailing on a starboard tack.

1.8.5 Spinnaker repair

Simon expressed in one of his blogs:

> *'Spinnakers are great fun and you will not win races without them but they are very high maintenance'*

After lowering a spinnaker it had to be laid on the floor down below, rolled up, and tied with wool ready for hoisting; a job that took up to an hour. A great deal of concentration was required when flying the spinnaker to prevent it flogging and wrapping around the forestay and potentially being torn.

On leg 1 Simon, as sail repairer, spent many hours down below with the sewing machine repairing the yacht's spinnakers, dropping out of the deck watch routine as he did so. On one occasion he reported spending 20 out of 24 hours in sweltering heat down below repairing holes in three of the spinnakers.

1.9 CERTIFICATION, SURVEY AND MANNING OF *CV30*

1.9.1 SCV Code

CV30 was certified under the Maritime and Coastguard Agency's (MCA) *Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats-Alternative Construction Standard* (SCV Code). The SCV Code set out the MCA's requirements, including:

- construction and structural strength
- weathertight integrity
- bilge pumping
- stability
- lifesaving appliances
- protection of personnel
- manning.

Section 1.23 stated that the owner/skipper was responsible for the health and safety of anyone working on the vessel. The SCV Code defined 'crew' as meaning:

> *'… a person employed or engaged in any capacity on-board a vessel on the business of the vessel.'*

The MCA delegated surveying of small commercial vessels to Certifying Authorities whom the MCA approved to survey on its behalf. In turn, Certifying Authorities maintained a network of yacht surveyors deemed suitably qualified to conduct

surveys under the SCV Code. A surveyor local to Clipper Ventures' UK base conducted surveys of the yachts under the authority of the International Institute of Marine Surveying (IIMS).

1.9.2 Survey of *CV30*

CV30 was surveyed by the IIMS surveyor on 10 August 2013 and issued with a certificate valid until 9 August 2018 **(Annex D)**. The certificate was reissued in April 2015 following an assessment of the Clipper 70 yachts against the Maritime Labour Convention 2006 (MLC). Prior to the Race, the most recent annual examination had been conducted by the IIMS surveyor on 3 August 2017.

CV30 was certified for both Category 2 operation: up to 60nm from a safe haven with 12 passengers and 12 crew; and Category 0 operation, unrestricted distance from safety, with 24 crew on board. This enabled Clipper Ventures to operate under Category 2 for training and corporate events and Category 0 for the Race.

The final page of the certification included a declaration by the owner **(Annex E)** that stated the owner/managing agent would undertake:

> *'1. To maintain the vessel in a sound and seaworthy condition.*
>
> *2. To report any changes to the details on this form.*
>
> *3. To notify the Certifying Authority of any collision or grounding, fire or other event causing major damage. (Any repairs must be approved by the IIMS)*
>
> *…*
>
> *9. That the manning and operation of the vessel complies with Annex 3 in MGN 280…'*

The *CV30* file maintained by IIMS included a 1-page summary of examinations by the surveyor in 2015 and 2017, an email report from Clipper Ventures of a potential light grounding in June 2017, and a further email reporting the fatal accident to Simon Speirs.

1.9.3 Manning

Section 26 of the SCV Code stated:

> *'26.1.1 A Vessel should be safely manned.*
>
> *…*
>
> *26.2.1 The qualifications of the skipper and, if appropriate, other members of the crew are given in Annex 3.*
>
> *26.2.1 The possession of a Certificate of Competency or Service should not, on its own, be regarded as evidence of the ability to serve in a particular rank on a specific vessel. The owner(s)/managing agent(s) must ensure that there are sufficient trained personnel on board to work the vessel having due regard for the nature and duration of the voyage.'*

Annex 3 of the SCV Code **(Annex F)** detailed the required manning for a vessel certified under the Code. Category 0 operation required a skipper to hold a commercially endorsed RYA Yachtmaster (Ocean) certificate of competency plus an additional crew member who must hold at least a commercially endorsed RYA Yachtmaster (Offshore) certificate of competency.

In 2013, an agreement was reached between the MCA and Clipper Ventures stating that during the Race, wherever possible, Clipper Ventures should have suitably qualified persons on board as required by the SCV Code. However, the MCA's letter to Clipper Ventures also stated:

> *'The Maritime and Coastguard Agency (MCA) agree that when a vessel owned and operated by Clipper Ventures PLC does not have a second qualified person onboard as required, that a second person must be onboard who has successfully completed the Clipper Coxwain's Course, in addition to the fully qualified skipper...'*

Since the agreement was made, Clipper Ventures had never employed a second commercially endorsed qualified person during the Race, relying on Clipper coxswains to fulfil this role. When the Clipper fleet arrived in Fremantle at the end of leg 3, the MCA revoked this agreement.

1.9.4 Skipper hours of work and rest

Both the SCV Code and the Maritime Labour Convention identify fatigue at sea as being a significant safety issue, requiring that employed crew be properly rested. The minimum hours of rest for crew should not be less than 10 hours in any 24-hour period; and not less than 77 hours in any 7-day period.

Details of hours of rest for the Clipper Race skippers recorded between August and November 2017 are at **Table 1**. Records for the skippers of *CV24* were lost when the vessel grounded on 31 October 2017. The number of days logged varies depending when a yacht finished the leg, and in the case of *CV30* only October and November records were available.

Yacht (CV)	Total days logged (Aug to Nov 2017) (days)	Skipper's average hours rest per 24 hrs (time to nearest 30 mins)	Total days where over 10 hrs rest recorded (days)	Percentage of days with sufficient recorded rest (%)
20	61	7h 00m	10	12
21	77	10h 00m	64	83
22	79	6h 30m	4	5
23	59	9h 30m	29	49
25	69	6h 30m	0	0
26	66	8h 00m	18	27
27	68	6h 30m	1	2
28	54	11h 30m	51	94
29	77	7h 30m	0	0
30	39	9h 00m	10	26
31	85	5h 00m	0	0

Table 1: Recorded hours of rest for Clipper Race skippers Aug-Nov 2017

1.10 RULES, REGULATIONS AND GUIDANCE

1.10.1 Merchant Shipping regulations and guidance

The Merchant Shipping (Vessels in Commercial Use for Sport or Pleasure) Regulations 1998, as amended, enabled the application of the SCV Code to CV30 as detailed in the previous section.

As a commercial vessel, CV30 was required to be operated in compliance with The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997. Marine Guidance Note (MGN) 20 (M+F) provided guidance on their application. These regulations stated:

> *'It is the duty of employers to protect the health and safety of workers and others affected by their activities so far as is reasonably practicable.'*

The regulations also placed a duty on every worker or seafarer on board a ship to take reasonable care for the health and safety of themselves and for any other person on board who may be affected by their acts and omissions. Annex 3 section 2.10.1 of the SCV Code referred to the health and safety requirements and stated:

> *'…employers are required to carry out "a suitable and sufficient assessment of the risks of the health and safety of workers arising in the normal course of their activities or duties". The concept of risk assessments is relatively simple, and follows these basic steps:*
>
> *.1 identify the hazards and personnel at risk;*
>
> *.2 assess the chances of a hazardous event occurring;*
>
> *.3 assess the severity or consequences; and*
>
> *.4 if the combined risk and severity is too great, some action must be taken to reduce the risk to as low a level as reasonably practical.'*

(MGN) 492 (M+F)- *'Health and Safety at Work: Protecting those not employed by the ship owner'* further refers to an employer's duty of care towards workers and other persons on board, and their obligations to take reasonable practical steps to avoid relevant risks.

1.10.2 ISO standards for tethers, jackstays and guardrails

ISO standards provide requirements and guidelines that, when applied, consistently ensure products are fit for their purpose. In this accident there are two standards of interest, ISO 12401 and ISO 15085.

ISO 12401 Small craft- Deck safety harness and safety line- Safety requirements and test method **(Annex G)** was issued as a second edition in August 2009. ISO 12401 is intended to serve as a guide to manufacturers, purchasers and users to ensure an effective standard of performance in preventing a wearer falling into the water and to assist in their recovery. However, the prevention of falling in the water is very dependent on the location of attachment and length of the safety line.

ISO 12401 details requirements for materials, resistance to the marine environment, dynamic loading and the tether hooks themselves. The dynamic test for a safety line consists of dropping an attached 100kg weight a distance equivalent to the length of the tether starting with both attachment points at the same level. After the test, the safety line must remain functional and operate as designed.

ISO 12401 also requires hooks to be self-closing and designed so that a deliberate action is required to release them. The hooks must satisfy an accidental hook opening test in which the hook does not release when moved by hand in specified directions while attached to one of three types of securing point. The test does not specify a force that has to be applied during the accidental opening test.

ISO 15085 Small craft- Man-overboard prevention and recovery, first issued in April 2003, provides construction and strength requirements for safety devices and arrangements intended to minimise the risk of falling overboard. It specifies various measures including slip resistant surfaces, foot-stops, hand holds, guardrails, hooking points and jack-line attachment points. The SCV Code under section 22.2, regarding guardrails suggests ISO 15085 can be referred to for guidance.

With regard to guardrails, the standard details the strength and spacing of rails and stanchion bases, and the diameter and strength of guardrail wire. Section 12.2.2 specifies that the stanchions themselves must withstand loads of:

- 280N exerted horizontally at their top with no deflection
- 560N exerted horizontally at their top without breaking.

This can be verified by calculation or testing. Sections 13 and 14 provide strength requirements for hooking points and jackstay attachment:

- Hooking point- 6000N horizontally
- Jackstay attachment point- 20000N horizontally and up to 30° from a line connecting two attachment points.

Again, this can be verified by calculation or testing.

The MAIB is unaware of any formal test or calculations having been conducted for the Clipper 70 stanchions or jackstay attachments or hooking-on points, although some of the pad eyes were rated at 7 tonnes (68670N). Jackstays were examined during annual inspections.

1.10.3 World Sailing Offshore Special Regulations

World Sailing is the world governing body for the sport of sailing. One of its roles is to develop racing rules of sailing and regulations for all sailing competitions. As a private race, the Clipper Race did not fall under the governance of World Sailing, although Clipper Ventures applied the Racing Rules of Sailing as part of its Notice to Race.

World Sailing has developed and annually reviewed its Offshore Special Regulations (OSR), which provide rules for various categories of offshore yacht races **(Annex H)**. OSR 2018, section 4, included requirements for jackstays and clipping points, with jackstays requiring a minimum breaking strength of 2040kg (20000N). Section 5.02 covered safety harnesses and tethers, stipulating they must meet ISO12401 standard and that all crew must have a short tether, no longer than 1m in length, or alternatively a long tether, being less than 2m in length, with an intermediate self-closing hook. Overload indicators were also stipulated, and tethers that had been overloaded replaced.

1.11 SAFETY MANAGEMENT

1.11.1 Safety instructions

The Clipper 2017-2018 Race, as stipulated in the Notice of Race, was governed by:

- '*The Racing Rules of Sailing for 2017-2020 (RRS). No amendments or changes to RRS by other National Authorities will apply;*
- *The International Regulations for Preventing Collisions at Sea (IRPCS);*
- *This Notice of Race dated 20 May 2017; and*
- *The Clipper 2017-18 Race Sailing Instructions (SIs) and subsequent amendments.'*

The Notice of Race also stipulated:

'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 Race Standard Operating Procedures for On Water Operations;*
- *Clipper 2017-18 Round the World Yacht Race Supplementary Standard Operating Procedures;*
- *Clipper 2017-18 Round the World Yacht Race Sailing Instructions;*
- *The Skipper and Crew Contracts; and*
- *Other special instructions that may be issued by the Clipper Race to control the running of the Clipper 2017-18 Race.'*

Race crews had access to the above documentation and more from the 'Crew Hub', an online web resource that also allowed crew to manage their Clipper training and assist them in preparing for the Race. Other safety information included the pre-departure safety brief that was provided by the skipper before each leg, and a further 'Clipper Race Crew Safety Brief' issued following the Race crew briefing in March 2017. Crew also had access to 'wet notes', which gave instructions for standard evolutions that crew were able to keep in a pocket for ease of reference.

Specific instructions regarding lowering a headsail were contained in Clipper Ventures' crew training manual and race training wet notes **(Annex I)**, where a standard procedure for a racing headsail change was explained. This enabled a new headsail to be prepared on the foredeck before the headsail in use was lowered and the new headsail hoisted. However, Clipper Ventures' SOP stipulated that due to the fine bow, this procedure was permitted only when changing from a smaller to larger headsail, otherwise the yacht was to be sailed 'bare headed' until the new headsail was on deck and hoisted to avoid overcrowding on the foredeck.

1.11.2 Risk assessments

Risk assessments had been produced for various on-water activities, broadly split as follows:

- Deck - clutches and jammers, deck surface, hatches and winches
- Rigging- boom, mast, poles, ropes
- Personal protection (hypothermia, exposure to sun, sea sickness and dehydration)
- Heads (hygiene)
- Navigation in coastal waters
- Use of dinghy
- Falling overboard **(Annex J)**.

The risk assessments were last reviewed by the head of training in February 2017.

1.11.3 Safety committee

Clipper Ventures established a safety committee for the 2017-2018 Race, which was formed from at least one Clipper coxswain from each yacht, the deputy race director and was chaired by the race director. The stated purpose of the safety committee was *'to uphold and improve the safety culture on board the Clipper Race Fleet.'*

The first meeting was held in Punta del Este on 30 September 2017. The meeting minutes concluded *'safety culture amongst the fleet is deemed to be very good across the board'* and included feedback on safety issues regarding: water ingress, watertight door seals, rope jammers not holding and lack of mobility/ability of some crew.

The second meeting was held in Sydney on 18 December 2017. Following the stopover in Fremantle, the tethers were all changed to another manufacturer and mates were appointed on each yacht following the removal of the Clipper Coxswain agreement by the MCA. The meeting minutes concluded that safety culture was very good. Other feedback included: discontent with the new tethers; personal AIS beacons not automatically activating; more clarity required for the role of mate on board; and, the lack of mobility/ability of some crew. The minutes did not include any record of actions taken following the safety issues raised previously.

1.12 PREVIOUS ACCIDENTS AND INCIDENTS

1.12.1 Clipper Ventures' tethered and untethered MOB incidents

In 2007, a crewman sailing on board *CV2* fell overboard while changing headsails. He was tethered to the yacht, but during the recovery process slipped out of his lifejacket. He was recovered successfully.

In 2012, a crew member fell overboard while tethered to *CV7* when lashing a headsail, and was recovered back on board.

Since 2013, when the Clipper 70 yacht was introduced, until July 2018, there were 15 reported tethered MOBs and two reported untethered MOBs (one successfully recovered on to *CV30* after 1hr and 45 minutes in the water in March 2014 and one fatality, from *CV21* in April 2016, recovered unconscious from the water after 1hr and 15 minutes, see section 1.12.2).

Reported tethered MOB incidents since the start of the 2017-2018 Race include:

10 September 2017, *CV29* - During a headsail change a crew member slipped and fell outside pulpit/guardrail. Instruction was given to heave to, but by the time the yacht was stopped the crew member had been recovered on board.

2 November 2017, *CV23* - MOB from the bow as a crew member stepped over pulpit and on to the bowsprit to retrieve the tack line for the spinnaker, while secured to the yacht with a long tether. The crewman was uninjured, but the tether required replacing as it had been overloaded.

3 November 2017, *CV21* - Tethered MOB from the foredeck while lowering a headsail. The crewman was recovered on board but had inhaled seawater and was treated on board.

And following the three tethered MOBs from *CV30* on 18 November 2017:

7 December 2017, *CV31* - While trying to clear a snagged sheet from below the bowsprit following a gybe a crewman fell overboard while secured with his long tether. He was lifted back on board with crew assistance and using the staysail halyard.

11 April 2018, *CV28* - The bowman went over the side while tethered as he was unhanking a sail from the forestay but was recovered quickly.

28 June 2018, *CV26* - While changing a headsail a crewman fell overboard with his tether wrapped around his leg. The yacht was hove to and the crewman was helped back on board, suffering bruising and swelling to his lower leg. He was monitored on board for signs of secondary drowning.

All except one of the tethered MOB accidents involved a crew member on the foredeck.

1.12.2 *CV21* fatal MOB in April 2016

MAIB Report 7/2017 describes the causes and circumstances of the two fatal accidents on board *CV21* during the 2015-2016 Race. The first accident resulted in the watch leader, Andrew Ashman, suffering fatal injuries when the yacht experienced two successive uncontrolled gybes. In the second accident, Sarah Young was lost overboard in heavy weather while the crew were in the process of preparing to lower two headsails. It was found that after she had left the cabin she did not immediately clip on once in the cockpit and was washed overboard.

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

The report concluded that while a single employee on board a commercial yacht might provide sufficient company oversight in many circumstances, the special nature of the Clipper Round the World Yacht Race placed a huge responsibility on one person to ensure the safety of the yacht and its crew at all times.

In its report, the MAIB recommended that Clipper Ventures review its onboard manning policy, taking into consideration the merits of manning each yacht with a second employee or contracted 'seafarer' in order to take reasonable care of the health and safety of all persons on board. Clipper Ventures' response to the MAIB recommendation was not to recruit a second employee for each yacht. Instead, the company stated that the crew members selected to complete the Clipper coxswain course would bring up matters of concern far more freely than a person who was dependent on the company for his/her job. Clipper Ventures also stated that the responsibility of the Clipper coxswain-trained crew would be expanded through the formation of a safety committee for future races.

The MAIB also recommended Clipper Ventures to complete its review of the risks associated with a Clipper yacht MOB and recovery and its development of appropriate control measures. The recommended review included having particular regard to providing its crew with methods and procedures for reducing sail quickly and safely in extreme weather conditions. Several actions were taken by Clipper Ventures in this regard, including:

- Fitting netting between the guardrails and deck.
- Fitting personal AIS beacons to every lifejacket issued to crew.
- Adding additional jackstays and securing points to Clipper 70 yachts.
- Clarifying the circumstances in which crew must be clipped on.
- Increasing the emphasis placed on clipping on during training.
- Conducting MOB drills before the start of each Race leg.

1.12.3 Grounding of *CV24* in October 2017

MAIB Report 12/2018 described the causes and circumstances of the grounding of *CV24* on Cape Peninsula, which occurred on the first day of leg 3 of the Race from Cape Town. The crew abandoned *CV24* and were rescued uninjured. The wreck was disposed of locally. The grounding occurred as the crew on deck had insufficient positional awareness. The skipper was the only person monitoring navigation, and he had become distracted while supervising the crew in preparing and completing a gybe that was intended to set the yacht on a course away from land.

Analysis of Clipper Ventures' safety management processes identified areas that would benefit from review and improvement. These included risk assessments and safety procedures but, in particular, ensuring that lessons were learned from previous groundings.

Safety recommendations were made to Clipper Ventures intended to improve its management of safety and navigation standards within its fleet[2]. At time of publication of this report, Clipper Ventures had not accepted these recommendations. A safety recommendation was also made to the MCA to provide Clipper Ventures with guidance and direction on safety management to ensure the safe operation of its fleet in accordance with the SCV Code[3]. The MCA accepted this recommendation and it remains open at the time of publication of this report.

1.12.4 Yacht *Lion* fatal MOB in June 2011

The skipper of the yacht *Lion* fell overboard during the hours of darkness while retrieving a headsail from the foredeck in rough seas. He was attached to the yacht by his long tether attached to his lifejacket harness. After some difficulty, the skipper was recovered on board, unconscious, and was unable to be resuscitated. MAIB Report No 4/2012 concluded that he had drowned while still attached to the yacht by his tether. If his short tether had been used, clipped to the high side of the yacht, the skipper would not have been able to slip into the water.

Following the *Lion* fatal MOB accident, Clipper Ventures conducted trials using one of its yachts and an MOB manikin. The trials graphically demonstrated the key hazards of being towed along by a tether in the water, namely:

- Water inhalation as waves break over the casualty's head or being towed face down in the water.
- Buffeting into the yacht's side.
- Inability to release the tether clip given the significant load caused by drag on the tether.

All of these hazards were exacerbated by speed, the key lesson being the importance of stopping the yacht in the event of a tethered MOB.

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[2] MAIB Recommendations 2017/151, 2018/117 and 2018/118

[3] MAIB Recommendation 2018/116

SECTION 2 - ANALYSIS

2.1 AIM

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

2.2 ACCIDENT OVERVIEW

Simon Speirs fell overboard from the foredeck of *CV30* while the crew were in the process of lowering the headsail, an essential task as the wind strength was increasing. However, the foredeck was a vulnerable place for the crew to be operating in the very rough sea conditions given:

- The labour intensive and difficult task of lowering a headsail in strong winds.
- The narrow foredeck and lack of suitable securing points for crews' short safety tethers.
- On this occasion, the compromised starboard guardrail that had been damaged 14 days earlier.

Recovering a tethered MOB should be a straightforward process in comparison to an untethered MOB, but the long tether with which Simon was secured to the yacht, and the difficulty of bringing the yacht under control and stopping it in the water, prevented the crew from being able to recover Simon quickly, leaving him suspended overboard at significant risk of inhaling water.

Simon's tether hook then detached from the yacht due to it having become snagged under the forward starboard mooring cleat, leading to it becoming laterally loaded, causing it to distort and release.

Once Simon was no longer secured to *CV30*, his survival was dependent on a swift recovery from the water. However, the difficulty of controlling *CV30* in the prevailing sea and wind conditions resulted in 32 minutes passing before he was recovered on board.

This accident raises issues concerning working on the foredeck of a Clipper 70 yacht in rough weather, the MOB recovery process, the use of safety tethers, and the overarching safety management process in assessing and managing these risks. There are many common issues with those raised in the investigation following the fatal MOB from *CV21* in April 2016.

2.3 FOREDECK OPERATIONS AND LOWERING HEADSAILS

2.3.1 Vulnerability of the crew on the foredeck

In rough weather the foredeck of a Clipper 70 was a demanding place to work, and placed crew at significant risk of falling overboard. Many of the reported tethered MOB accidents from Clipper yachts have occurred from the foredeck. Prior to the introduction of the Clipper 70 yacht there were only two reported tethered MOB incidents. Since the introduction of the Clipper 70, there have been 15 tethered

MOB incidents reported to the MAIB up until the finish of the 2017-2018 Race, including three during this accident alone. While this comparison may be affected by under-reporting of tethered MOBs prior to the introduction of the Clipper 70, the narrow bow and corresponding small foredeck area have almost certainly contributed to the increase in tethered MOB incidents. The relatively high number of MOB incidents that have occurred from the foredeck indicates this aspect of the Clipper 70 design was not optimal for amateur sailors. This should be taken into consideration in any future replacement design for the Clipper 70 yacht.

The sailing of any yacht will necessitate crew working on the foredeck to hoist and lower sails. While this task can present little risk in calm and moderate conditions, as wind and sea states worsen the risk of injury increases and further control measures are required.

2.3.2 Guardrail damage

Guardrails are fitted to help prevent crew falling overboard, but on *CV30* this barrier was compromised due to the fracture of two guardrail stanchion bases on the starboard side of the bow. Although a temporary repair of the guardrail was rigged following the failure, the lack of support of the two stanchion bases would have compromised the guardrail's effectiveness, potentially contributing to Simon falling overboard. Additionally, once overboard he would have been suspended further below deck level owing to the additional slack in the top guardrail as a result of the failed stanchion bases.

The stanchion base failures on Clipper 70 yachts were a recognised problem. *CV30*'s stanchion bases had failed in the 15-16 Race when a headsail had been washed up against the guardrails, and there were signs of a previous repair when the stanchion bases were inspected following this accident. How the stanchion bases, when constructed, measured up against a standard, such as ISO15085, is unknown. However, following repair, the stanchion would certainly have been weaker given the limitations of repeatedly rewelding a fractured metal component and difficulty of repairing a distorted and fractured small and relatively complex shaped item.

The loading exerted on a stanchion by a headsail washed up against it, with entrained water, can be considerable. Given the importance of guardrail integrity in keeping crew safe on board, it is essential that guardrail stanchions are designed to be robust, but the practice of lashing headsails to the guardrails has to be avoided in rough weather.

2.3.3 Difficulty lowering headsails

The skipper took the helm for all sail evolutions, and in this accident decided that, given the conditions, it was safer to bear away to try and place the yankee 3 in the lee of the mainsail so that the headsail was partially depowered and would be easier to haul down. However, running deeper downwind increased the risk of gybing. The only alternative option for lowering the headsail in the conditions experienced would have been for the skipper to head *CV30* up into the wind sufficiently to depower the headsail to lower it. However, in this scenario *CV30* would have then been heading into the waves, pitching heavily, the apparent wind would have increased, and the sails and sheets would have flogged, placing all crew on deck at greater risk of injury. Reefing the mainsail first would also have required heading into the wind

and waves, and would have reduced the lee in which the headsail could have been dropped. There was also the risk of the wind speed increasing while the mainsail was being reefed. The skipper's decision to bear away and run deep to lower the yankee 3 first was, therefore, understandable given the other options open to him.

The MAIB's investigation into the fatal MOB accident on *CV21* highlighted the difficulties of lowering hanked-on headsails in strong winds as they tend to fill and self-hoist. The MAIB's *CV21* investigation report recommended that Clipper Ventures review the risks and develop methods and procedures for reducing sail quickly and safely in extreme weather conditions (section 1.12.3). Clipper Ventures did not make any changes to equipment or amend its procedures for reducing sail prior to the 2017-2018 Race.

Once the fleet of yachts arrived in Fremantle, Clipper Ventures instructed skippers to fit a downhaul to the head of the sail when hoisting the yankee 3 so that during the lowering process the sail could be prevented from self-hoisting. It is disappointing that Clipper Ventures was not proactive in adopting this or an alternative approach from the start of the 2017-2018 Race as recommended following the MAIB's *CV21* investigation. It should also be remembered that the yankee 1 was still hoisted on *CV21* at the time of the MOB, and it took 32 minutes to lower the headsails in the strong winds encountered. Further consideration of how sail area can be reduced quickly and safely is required if similar accidents are to be avoided in the future.

2.3.4 Oversight and supervision

The following task list for lowering a headsail has been derived from Clipper Ventures' training manual and wet notes:

- A crew member in the pulpit to flake and guide the sail (and unhank the headsail from the forestay if hoisting another headsail).
- A further crew member, close to the tack of sail, to gather and control the sail and help flake it down.
- Three to four crew, positioned on the leeward side of foredeck ready to gather the sail and secure it with prepositioned sail ties.
- One crew ready to ease the headsail halyard on instruction from bowman.
- One crew tending the headsail sheet, easing sufficiently to depower headsail but avoiding the headsail flogging excessively.
- One crew on the windward sheet to ensure it was not flogging or snagging.
- One crew on the mainsheet or mainsheet traveller ready to trim the mainsail as required.
- One crew on the helm.
- One crew in the role of watchleader coordinating and overseeing deck operations.

The total number of 11-12 crew identified as required for this operation represents a significant proportion of the crew, and demonstrates why *CV30*'s skipper wanted to complete the evolution at the watch changeover. Even so, with five crew on the foredeck and five in the cockpit it left himself in the dual role of helming and also overseeing the operation, since Simon, the watch leader, was fully involved in the task of lowering the headsail.

Evidence from numerous MAIB investigations shows the importance of the individual-in-charge of an evolution being kept free from other tasks and able to devote their entire attention to supervision. In this accident the skipper's ability to supervise effectively was compromised as he was also the helmsman, a task that was safety critical in itself due to the need to keep the yacht on a steady course to avoid unintentional gybing. Having a qualified mate on board would have provided the option of delegating his supervisory role during more difficult evolutions.

The large wave encountered on the yacht's port quarter caused alterations of heading and resulted in an accidental gybe. Although the preventers held, the kicker parted, making the mainsail more difficult to control later. The crew remaining in the cockpit lacked the resources to take in the slack in the mainsheet since they were busy with other tasks.

While it is not always possible to have sufficient crew permanently on deck to cover all eventualities, this accident demonstrates how critical having trained crew in the right place can be in preventing a situation from escalating. This includes having an individual standing back and overseeing the operation to provide direction. Skippers would benefit from having improved guidance on the crew numbers required to conduct sail change evolutions for a variety of wind and sea conditions to ensure sufficient crew are on deck.

2.4 MOB RECOVERY

2.4.1 Yacht control in rough weather

When an incident occurs on a yacht under sail it is imperative that it can be brought under control quickly to stabilise the situation and prevent escalation. A common theme emerging from this accident, the *CV21* fatal MOB in April 2016 (section 1.12.3), and the *CV30* MOB in March 2014 (section 1.12.1) is the difficulty in manoeuvring a Clipper 70 yacht in very rough seas and strong winds to recover an MOB. The time taken to recover an MOB is critical to their survival, especially in cold waters, emphasising the need to have procedures by which a yacht can be brought under control quickly. MOBs are more likely to occur in challenging weather conditions, and more consideration is needed regarding the methods to be employed to quickly take way off, and bring the yacht under control for close manoeuvring in the event of an MOB emergency situation.

2.4.2 Tethered MOB

While the SOP for recovering an untethered MOB was well documented and drilled in Clipper Ventures' operation, tethered MOB recovery received less attention. Tethered MOB recovery was generally only talked through, rather than drilled. Only one crew member from *CV30* recalled ever conducting a practical tethered MOB drill during his training.

Although not included in the race crew manual or wet notes, a tethered MOB procedure was detailed in the SOP **(Annex C)**. However, in this particular accident several of the steps detailed in the procedure were not possible. The crew could not reach Simon, the yacht could not be stopped, and although a halyard was passed to him, Simon was unable to attach it to his lifejacket harness.

Following the MAIB's *Lion* investigation, Clipper Ventures demonstrated in its own trials the importance of stopping the yacht to prevent an MOB from drowning while still tethered. Some yachtsmen would argue they would rather be free from the yacht than be dragged along on a tether, but as soon as a crew member is separated from a yacht, neither recovery nor survival can be guaranteed.

Another potential solution for the issues associated with a tethered MOB could include the lifejacket that can tow a casualty on their back (see section 1.6.4). The towing lifejacket offers the benefit of keeping the tethered MOB's head above water and reducing the risk of drowning. However, the design available at the time of the accident was reliant on the wearer manually releasing the clipping point from the front to the back, and can result in the casualty potentially being further away from rescuers.

Acknowledging there is no one simple solution, further consideration of additional measures for recovering a tethered MOB is needed, taking account of when a yacht cannot be stopped quickly, or the MOB is out of reach. Subsequently, practical drills with tethered MOBs would also ensure crew are better prepared for this scenario.

2.4.3 Untethered MOB

The procedure for recovering an MOB was well documented in the race crew manual. It was regularly drilled during the crew's 4-week training programme and was practised at the start of each leg of the Race.

Following the previous MOB fatality on *CV21,* Clipper Ventures fitted a personal AIS beacon to each lifejacket that was issued to the crew. The AIS was fitted to activate automatically when the lifejacket inflated. While regrettably not facilitating Simon's survival, his personal AIS beacon activating was an important contributor in locating and recovering him after his tether released. In common with the previous fatal MOB on *CV21*, the AIS attached to the dan buoy failed to operate as intended. Therefore, this system requires further review.

That Simon did not deploy his sprayhood indicates he was probably unconscious shortly after the tether hook released. With the sea water temperature estimated at 12º-13º, cold-water shock[4] might have contributed to Simon's death. However, having been dragged along in the water by his safety tether prior to his immersion, the shock of entering the water might have had less effect. Inhalation of water was likely, especially as Simon was unable to deploy his sprayhood. The extent to which Simon not wearing his dry-suit might have adversely affected his survival is unknown.

[4] Cold-water shock - On immersion in water less than 15ºC, the sudden cooling of the skin by cold water causes an involuntary gasp for breath, increasing the chance of inhaling water directly into the lungs. Cold-water shock also causes the blood vessels in the skin to close, which increases the resistance of blood flow and the heart rate to increase. As a result of the raised heart rate, blood pressure goes up and can cause a heart attack.

The skipper's skill and the effectiveness of the crew's training were apparent during the recovery of Simon in challenging conditions and with restricted control of the sails. However, the evidence of both this accident and the fatal *CV21* MOB accident indicates that in strong wind conditions any inability to reduce or control sails will severely compromise a skipper's ability to manoeuvre effectively to recover an MOB quickly.

2.5 THE USE OF SAFETY TETHERS

2.5.1 Tether and jackstay standards and guidance

Safety tethers form an important element in ensuring the safety of crew on board a yacht. They do this by preventing separation from the yacht and potentially reducing fall distance. ISO 12401 provides a minimum standard and an assurance that the tether and hooks will survive a dynamic fall when loaded in the line of the tether.

This investigation has concluded that Simon's tether hook became caught under the starboard forward mooring cleat, resulting in the hook being loaded laterally, distorting and finally releasing. This type of loading was not envisaged in the ISO standard. The instructions for the Spinlock tether acknowledge the numerous potential ways a tether can be misused, but the importance of the tether hook orientating itself to load the tether longitudinally, as identified following tests conducted by Spinlock shortly after the accident (section 1.6.1), was specified neither in ISO 12401 nor in Spinlock's instructions. Additionally, while the World Sailing OSR 2018 included a requirement for an overload indicator in the tether webbing, ISO 12401 did not.

The accidental hook opening test specified in ISO 12401 gives some assurance that the hook will not open unless the wearer operates it. However, the standard does not specify the force to be applied during the test. The normal interpretation by test houses is to manoeuvre the hook by hand and ensure the hook does not accidentally unclip. It is possible for tether hooks, such as the Gibb hook, to open if sufficient force is applied at the right angle and if a hook is restrained.

It would be difficult to develop a standard for safety tethers that ensured hooks could not be opened accidentally and would withstand all possible loading scenarios. The design of a safety hook inevitably will be a balance between strength, weight and ease of operation using one hand to ensure the safety tether is a benefit and not an encumbrance. Various designs of tether hooks are available in the marine sector, each with their advantages and disadvantages. All must be considered in the context of their intended use.

On 9 January 2018, the MAIB issued Safety Bulletin 1/2018 **(Annex K)** regarding the dangers of lateral loading of safety harness tether hooks. The bulletin contained the following safety lesson:

> *'To prevent the strength of a safety harness tether becoming compromised in-service due to lateral loading on the tether hook, the method used to anchor the end of the tether to the vessel should be arranged to ensure that the tether hook cannot become entangled with deck fittings or other equipment.'*

Given the difficulty of developing a standard to cover all possible loading and failure mechanisms, there is a need to improve the guidance provided in ISO 12401 and for the tether manufacturer's instructions to detail the limitations and precautions in the practical use of tethers.

2.5.2 Tether lengths

The tethers provided by Clipper Ventures met the requirements of ISO 12401 and World Sailing's OSRs, incorporating both a long and short tether and also an overload indicator. The principle behind having two lengths of tether was to enable crew to transit from one location to another while remaining attached to the yacht by their long tether. Once in their desired location the crew could then use the short tether to secure themselves, to limit the extent to which they would fall or slide if they lost their footing or hold on the yacht.

The Clipper Ventures' race crew manual provided no explicit instructions as to which tether to use, although during training crew were instructed on when to use the short and long tethers respectively. The manual explained that crew should clip to the windward (high) side of the yacht to prevent falling overboard and to think about where any fall would take them given the length of tether being used. Unfortunately, for the task of hauling down the luff of the headsail, Simon had no option other than to be secured by his long tether as he needed to stand up. He could have attached his short tether to the pulpit but this was forbidden in the race crew manual.

Following a fall overboard, the length of tether and its attachment point will determine whether an MOB's head is clear of the water and whether they can be reached by the crew. The other two tethered MOBs from *CV30* in this accident were secured by their short tethers, and were able to climb back on board. However, Simon was attached by his long tether, and the combined effect of the hooking point location and his tether length resulted in him being dragged alongside the yacht, hindering his recovery.

2.5.3 Jackstay and securing point strength

The Clipper race crew manual stated that crew must only clip on to jackstays and fixed eyes designed for this purpose. Pushpits, pulpits, standing rigging, steering pedestals, guardrails and stanchions were specified as items that were not to be used as tether securing points. Following the *CV21* fatal MOB accident the jackstays and other hooking points were reviewed and additional lines and securing points were added **(Figure 18)**, but this did not include the foredeck area.

The arrangement of jackstays on the foredeck left no opportunities to clip on except to the port and starboard jackstays, which terminated at the two forward bow cleats. Crew secured with their short tether to the jackstays could potentially slip up to 2m, so the skipper decided during preparation week to rig an additional secondary jackstay along the deck edge, fastened to the stanchion bases. The instruction provided by the skipper to his crew was that this jackstay was only an additional hooking point for a short tether, with the assumption that the crew's long tether would still be attached to one of the main jackstays.

ISO 15085 specifies the strength of hooking points and jackstay securing points. Although visually examined, there is no evidence that the hooking points and jackstay securing points had ever been formally tested or rated on Clipper 70s. Although there was no requirement for the Clipper 70s to comply with ISO 15085, and while the strength of the tether securing system was not a contributing factor to this accident, establishing a minimum strength of the system would be beneficial in providing assurance of its capability.

While ISO 15085 provides strength requirements for jackstay securing points and hooking points, it does not provide precautions for the securing point itself or clearance of the jackstay from snagging hazards. Deck cleats are commonly used to terminate jackstays as they are strong and remove the need to add further strong points to the deck. However, as this accident has demonstrated, their design provides an opportunity for tether hooks to become caught, with the result that they can be loaded in a manner for which they are not designed. One simple solution, which was employed by Clipper Ventures following the accident, is to wrap rope around the cleat to act as a cleat boot and prevent the hook from snagging. ISO 15085 needs to provide further guidance on the termination of jackstay securing points and the line of the jackstays to minimise snagging hazards.

2.6 FATIGUE AND OTHER FACTORS AFFECTING PERFORMANCE

2.6.1 Crew

Ocean sailing is an adventurous and often unpredictable activity. Clipper Ventures' crew regularly posted in their diaries and online blogs the highlights of their experience; they also commented on some of the difficulties they encountered during the Race. Simon Speirs kept a detailed blog documenting his time in the Race which, combined with other crew members' accounts, provided a picture of life on board *CV30*.

Sailing in a watch system and having disrupted sleep can lead to crew becoming fatigued during race legs. Although the watch routine used on *CV30* and many of the other Clipper yachts shortened the watches at night, it did mean that the crew were unable to rest at a similar time each day. Disrupted sleep patterns can be particularly debilitating, leading to fatigue, which in turn impairs performance. Fatigued crews need closer supervision to ensure everyone continues to operate safely. In this case, the mistake of grinding on the vang rather than the mainsail outhaul was a potential example of this.

Throughout the Race, one or two of *CV30*'s crew were often confined below with illness or injury, potentially placing further workload on others. At the time of the accident two out of the sixteen crew were unable to stand watches on deck due to injury. The crew demographic, as demonstrated in leg 2 of the race, also had an influence on workload as many physical tasks could only be carried out by the physically capable, often younger and fitter members of the crew. Simon acknowledged in his blog that, at the age of 60 years, he did not have the strength and stamina he had when he was younger. Despite this, he was considered to be one of the more capable crew, and so was providing his assistance on the foredeck during the challenging evolution that led to this accident.

While a level of fatigue will inevitably be present during the Race, it is important that every effort is made to ensure crew do not become 'critically' fatigued. The skipper had an unenviable task of balancing the ability to race his yacht, sail it safely and not exhaust his crew. Simon's blog recorded on several occasions where he had worked long hours repairing spinnakers, the watch crew were continuously bailing out water, and crew were spending hours working around problems, such as those with the generator and watermaker. Equipment wear and tear, and breakages, are part of ocean racing, but keeping these to a minimum by effective pre-race maintenance and effective repair processes during stopovers will assist in ensuring crew do not become 'critically' fatigued to the extent that safety and morale are compromised.

It is unknown why Simon was only secured by his long tether to the secondary jackstay at the time of the accident. It is possible that he was in the process of transferring his tether clips, and had momentarily unclipped his short tether to reposition himself and assist the bowman, who had fallen overboard.

The crew regarded Simon as being very safety conscious, and his blog reflected the importance he placed in staying clipped on. That he was not wearing his dry-suit on this day, and was found to have been secured only by his long tether to the secondary jackstay, were not reflective of his normal behaviour and perhaps were contributed to by fatigue. Simon's blog, in the days shortly before the accident, also recorded that he was 'feeling lousy' and 'developing a hacking cough'. At the same time, he had taken on the role as watch leader, a role he had hoped to have a break from on leg 3. These factors might have had an adverse effect on Simon's performance at the time of the accident.

2.6.2 Skipper

A skipper has a pivotal role on board, being responsible for the safety of the yacht, his crew and himself. At the time of the accident, *CV30*'s skipper was the only contracted 'seafarer' employed on board and, therefore, solely responsible 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 work and rest requirements to ensure he did not become unduly fatigued and remained able to fulfil his duties.

Analysis of the hours of work and rest records provided for August to November 2017 for all the Clipper 70 yachts **(Table 1)** demonstrates the difficulty skippers had in achieving sufficient rest. From the records of *CV30*'s skipper, it was estimated he achieved the required rest only 26% of the time in October and November. Simon's blog recorded his concern that the skipper was unable to adequately rest during certain periods. He also explained the difficulty he had in deciding whether to leave the skipper to rest or wake him to make a decision or seek advice.

Following the two fatal accidents on board *CV21* in the 2015/16 Race, the MAIB recommended that Clipper Ventures should consider the merits of manning each yacht with a second employed or contracted 'seafarer'. After due consideration, Clipper Ventures decided that this was not warranted, relying on the safety committee formed from the Clipper coxswains to feed back on the safety culture on board their respective yachts. However, once the yachts arrived in Fremantle, the MCA revoked the agreement that permitted a Clipper coxswain to act as the second qualified person required under the SCV Code.

As discussed in the MAIB's *CV21* investigation report, and as confirmed in this case by the inability of skippers to obtain adequate rest, it is vital that Clipper Ventures provides 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. This will enable yacht skippers to be effectively supported, have the opportunity to take adequate rest and for the crew to be supervised by a qualified professional seafarer more regularly.

2.7 SAFETY MANAGEMENT

2.7.1 General

The chief inspector's foreword to the MAIB's *CV21* investigation report stated:

> *'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 MAIB investigation report into the grounding of *CV24* concluded that Clipper Ventures' safety management system was not providing sufficient supervision and assurance to ensure safe operations, and recommended the MCA to provide safety management guidance to Clipper Ventures.

Although improvements have been made following the *CV21* fatal accidents, the MAIB investigation into the grounding of *CV24* on 31 October 2017, and this accident, demonstrate that further improvement to Clipper Ventures' safety management system is required.

2.7.2 Oversight of yacht modifications and maintenance

Clipper Ventures' management team were unaware that a secondary jackstay had been fitted on *CV30,* or for what purpose, until the end of leg 3 after the accident. The secondary jackstay and its purpose had not been readily apparent during the annual examination conducted on 3 August 2017 in the presence of the IIMS surveyor prior to the yachts sailing from Liverpool.

Crew were encouraged to assist during preparation week, which enabled personalisation of the yacht. However, the safety implications of some of the modifications were not always considered. Clipper 70 yachts are complex, and even small modifications can have an impact on crew safety. This necessitates closer oversight of the yachts to ensure additional hazards are not introduced and that safety is not compromised.

Maintaining a fleet of ocean racing yachts is a challenging task. A significant amount of repair fell to the crew of *CV30* to conduct while at sea and racing, and some workarounds had to be derived. While many systems on board Clipper 70 yachts had a backup, all too often on *CV30* the backup had to be utilised.

There were several examples that indicate that preventative maintenance or pre-race inspection could have been improved: *CV30*'s generator failed 2 days out of Liverpool; the forepeak space and lazarette constantly suffered water ingress and had to be bailed out by the crew; the starboard wheel developed significant play to the extent of becoming unusable; and the watermaker did not work while sailing on a port tack. These problems, while capable of being managed at sea by the crew, could have been avoided had a more thorough planned maintenance system been in place or consideration been given to improving design. The cumulative effect of the defects was to create further work for the crew, contributing to their fatigue, lowering morale and detracting from training and gaining sailing experience.

Some of the issues were defects that could have been considered ‘major damage’ or affecting the ‘seaworthiness’ of the vessel, and these should have been reported to the certifying authority, IIMS, by Clipper Ventures as stated in the certificate’s declaration section **(Annex E)**. Continuous water ingress in the forepeak, a leak into the lazarette, forestay shackle failures and guardrail stanchion base failures were all examples of potential major defects. A clearer picture of the defects across the fleet and the repairs being conducted by the crew during the Race would have enabled specific problem areas to be targeted during the annual yacht examinations and for solutions to be derived. IIMS was reliant on Clipper Ventures to report defects, as many would not have been apparent at yacht examinations. A more comprehensive picture of the repair work being conducted by Clipper Ventures would have enabled IIMS to discharge its responsibility as a certifying authority more effectively and improve the material condition of the yachts.

2.7.3 Risk assessments

Operating procedures and other control measures should ideally evolve from a thorough consideration of all the operational hazards. Clipper Ventures’ procedures were developed through experience of running ocean racing events; the risk assessments were created later. As a result, with the exception of ‘navigation in coastal waters’ and ‘falling overboard’, the risk assessments were largely broken down to consider specific material themes (e.g. boom, ropes, etc.) rather than operational activities. A task analysis for common operations on board would enable a thorough understanding of the potential risks involved in conducting evolutions, and also help guide the number of crew required to complete them safely in various sea and weather conditions.

In exercising his duty of care, *CV30*’s skipper had judged that additional measures beyond those identified in Clipper Ventures’ risk assessments and procedures were required. This was evidenced by his decision to sail conservatively during leg 2 in view of the overall experience and demographic of the crew, and his obtaining a loud speaker and additional monitor for the Timezero navigation computer to assist in navigating the yacht. It was also evidenced by the skipper’s decision to fit a secondary jackstay on each side of the yacht to prevent the crew from falling a significant distance when attached to the high side of the yacht. By providing an additional hooking point, it also potentially reduced the risk of crew entering the water through falling overboard. However, the skipper did not believe it necessary to share his initiatives with Clipper Ventures’ management as he was aware other skippers had made the same or similar modifications. Consequently, while aimed at improving safety, his well-intended unilateral actions had been neither formally risk assessed nor challenged given that clipping on to the secondary jackstay had the effect of indirectly clipping on to the guardrail stanchion bases, which was contrary to instructions in the race crew manual.

While there is some merit in addressing the hazards posed by equipment, it is the operational use of that equipment that really needs to be examined. A more holistic approach to considering operational tasks would enable more hazards to be identified and appropriate mitigation derived.

2.7.4 MOB risk control considerations

This accident and the *CV21* fatal MOB accident demonstrate that, even if training and practical drills have been carried out, there remains a high risk in recovering an untethered MOB in very rough sea conditions. This accident and the *Lion* fatal MOB demonstrate that even a tethered MOB carries a high risk if the MOB is allowed to enter the water and be dragged alongside the yacht. The reported number of tethered MOBs potentially indicates an acceptance of such events without full consideration of the consequences.

Minimising the time crew are only secured with their long tether is significant in preventing the opportunity for crew to end up in the water if they fall overboard. Ideally, the long tether should be used only to move around the yacht and in locations from which it would be impossible to reach the water. Clipper Ventures' crews were trained and briefed to clip on to the high side of the yacht and, whenever practical, with their short tether. However, some tasks could only be completed using a long tether and, if working on the foredeck, with the current jackstay arrangement, the risk of crew entering the water while tethered was potentially high.

A shortage of tether securing points on the foredeck was evidenced not only by the use of the secondary jackstay but also by crew attaching themselves by their short tether to the pulpit and forestay. These actions were contrary to the instructions in the race crew manual, but were considered by the crew to be necessary in the absence of alternative options.

Although developing improved recovery methods, increasing the frequency of tethered MOB drills, and fitting downhauls to headsails are likely to reduce the risks associated with recovering an MOB, the most effective means of reducing the overall risk would be to focus control measures on further reducing the risk of an MOB in the first place. A practical, cost-effective approach to achieving this would be to increase the number of strategically located strong points for crew to clip on to while carrying out necessary tasks.

In summary, this accident highlights a number of limitations and regular breaches of procedures with respect to the risk control measures included in Clipper Ventures' 'falling overboard' risk assessment. This demonstrates the need for its further revision and for appropriate mitigation measures to be derived to reduce the risk to as low as is reasonably practicable.

2.7.5 Instructions and procedures

Safety management best practice requires clear instructions and procedures with which skippers and crew are familiar. Clipper Ventures' procedures have evolved significantly since the first Race in 1996 through experience and as the Clipper fleet of yachts developed.

However, the instructions and procedures were contained in several documents: the race crew manual, wet notes, SOPs, supplementary SOPs and crew safety briefings. The crew were expected to focus on the race crew manual, wet notes and crew safety briefing, but not all relevant procedures were included in these documents.

The procedure for a tethered MOB was only included in the SOP and was generally taught rather than drilled. Considering that recorded tethered MOB incidents were more common than untethered ones, crew would have benefited from the tethered MOB procedure being included in the crew race manual and wet notes. Equally, both the race crew manual and wet notes refer to racing headsail changes, but the SOP stipulated that due to the fine bow, this procedure was only permitted when changing from a smaller to a larger headsail. The crew training manual and wet notes ideally should be consistent with the SOP to avoid confusion.

As part of Clipper Ventures' review of its safety management system a review of all training material and some form of version control would be beneficial to ensure consistency across all published procedures.

2.7.6 Summary

While acknowledging actions taken by Clipper Ventures, the safety issues identified in this investigation provide an opportunity for Clipper Ventures to apply the principles of safety management best practice with the aim of preventing a similar accident in the future. Those principles include collaboration with its yacht skippers in reviewing and reducing the risks of crew working on the foredeck, and particularly the risks associated with crew members falling overboard.

SECTION 3 - CONCLUSIONS

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

1. Simon Speirs fell overboard from the foredeck of *CV30* while the crew were in the process of lowering the headsail, an essential task as the wind strength was increasing. However, the foredeck was a vulnerable place for the crew to be operating in the very rough sea conditions given:

    - The labour intensive and difficult task of lowering a headsail in strong winds.
    - The narrow foredeck and lack of suitable securing points for crews' short safety tethers.
    - On this occasion, the compromised starboard guardrail that had been damaged 14 days earlier. [2.2]

2. Since the introduction of the Clipper 70 in 2013, there have been 15 tethered MOB incidents reported to the MAIB up until July 2018, including three during this accident alone. While this comparison may be affected by under-reporting of tethered MOBs prior to 2014, the Clipper 70's narrow bow and small foredeck area have almost certainly contributed to the increase in the number of tethered MOB incidents. [2.3.1]

3. Although a temporary repair of *CV30*'s guardrail was rigged following the stanchion base fracture, the lack of support from the two stanchion bases would have compromised the guardrail's effectiveness, potentially contributing to Simon falling overboard and hampering his recovery. [2.3.2]

4. Given the importance of guardrail integrity in keeping crew safe on board, it is essential that guardrail stanchions on Clipper 70s are designed to be robust, but the practice of lashing headsails to the guardrails has to be avoided in rough weather. [2.3.2]

5. The MAIB's investigations into the fatal MOB accident on *CV21* highlighted the difficulties of lowering hanked-on headsails in strong winds, and recommended improvement. Clipper Ventures did not make any changes to equipment or amend its procedures for reducing sail prior to the 2017-2018 Race. Consideration of how sail area can be reduced quickly and safely is required if similar accidents are to be avoided in the future. [2.3.3]

6. The skipper's ability to supervise effectively was compromised as he was also the helmsman, a task that was safety critical in itself due to the need to keep the yacht on a steady course to avoid unintentional gybing. Consequently, skippers would benefit from having improved guidance on the crew numbers required to conduct sail change evolutions for a variety of wind and sea conditions to ensure sufficient crew are on deck. [2.3.4]

7. A common theme emerging from this accident, the *CV21* fatal MOB in April 2016, and the *CV30* MOB in March 2014 is the difficulty in manoeuvring a Clipper 70 yacht in very rough seas and strong winds to recover an MOB. More consideration

is needed regarding the methods to be employed to quickly take way off, and bring the yacht under control for close manoeuvring in the event of an MOB emergency situation. [2.4.1]

8. The required procedure for a tethered MOB was only included in Clipper Ventures' standard operating procedure, was not included in the race crew manual or wet notes and was generally only talked through, rather than drilled. [2.4.2]

9. Further consideration of additional measures for recovering a tethered MOB is needed, taking account of when a yacht cannot be stopped quickly, or the MOB is out of reach. [2.4.2]

10. That Simon did not deploy his sprayhood indicates he was probably unconscious shortly after the tether hook released. [2.4.3]

11. The evidence of both this accident and the fatal *CV21* MOB accident indicates that in strong wind conditions any inability to reduce or control sails will severely compromise a skipper's ability to manoeuvre effectively to recover an MOB quickly. [2.4.3]

12. This investigation has concluded that Simon's tether hook became caught under the starboard forward mooring cleat, resulting in the hook being loaded laterally, distorting and releasing. The importance of the tether hook orientating itself to load the tether longitudinally is specified neither in the tether standard, ISO 12401, nor in the tether's instructions. [2.5.1]

13. Simon was attached by his long tether, and the combined effect of the hooking point location and his tether length resulted in him being dragged alongside the yacht, hindering his recovery. [2.5.2]

14. While ISO 15085 provides strength requirements for jackstays and hooking points, it does not provide precautions for the securing point itself or clearance of the jackstay from snagging hazards. [2.5.3]

15. Simon's performance at the time of the accident might have been adversely affected by fatigue and other factors. [2.6.1]

16. Analysis of hours of work and rest records demonstrates the difficulty skippers had in achieving sufficient rest in compliance with health and safety requirements. [2.6.2]

17. Although improvements have been made following the *CV21* fatal accidents, the MAIB investigation into the grounding of *CV24* on 31 October 2017, and this accident, demonstrate that further improvement to Clipper Ventures' safety management system is required. [2.7.1]

18. Clipper Ventures' management were unaware of the secondary jackstay fitted on *CV30,* or its purpose, until the end of leg 3, after the accident. [2.7.2]

19. There were several examples that indicate that preventative maintenance or pre-race inspection could have been improved. The resulting issues, while able to be managed at sea by the crew, were unnecessary, and could have been avoided had a more thorough planned maintenance system been in place or some of the issues

been solved through improved design. The cumulative effect of the defects was to increase workload for the crew, contributing to their fatigue, lowering morale and detracting from sailing and gaining sailing experience. [2.7.2]

20. *CV30*'s skipper had taken action to improve safety because he had judged that additional measures beyond those identified in Clipper Ventures' risk assessments and procedures were required. However, while aimed at improving safety, his well-intended unilateral action had not been formally risk assessed. [2.7.3]

21. While there is some merit in addressing the hazards posed by equipment, it is the operational use of that equipment that really needs to be examined. A more holistic approach to considering operational tasks would enable more hazards to be identified and appropriate mitigation derived. [2.7.3]

22. This accident and the *Lion* fatal MOB demonstrate that even a tethered MOB carries a high risk if the MOB is allowed to enter the water and be dragged alongside the yacht. The reported number of tethered MOBs potentially indicates an acceptance of such events without full consideration of the consequences. [2.7.4]

23. Minimising the time crew are secured with their long tether is significant in preventing the opportunity for crew to end up in the water if they fall overboard. A shortage of tether securing points on the foredeck was evidenced not only by the use of the secondary jackstay but also by crew attaching themselves by their short tether to the pulpit and forestay. [2.7.4]

24. This accident highlights a number of limitations and regular breaches of procedures with respect to the risk control measures included in Clipper Ventures' 'falling overboard' risk assessment. This demonstrates the need for its further revision and for appropriate mitigation measures to be derived to reduce the risk to as low as is reasonably practicable. [2.7.4]

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

1. ISO 12401 does not specify the force to be applied during an accidental hook opening test. [2.5.1]

2. While the World Sailing OSR 2018 includes a requirement for an overload indicator in a tether webbing, ISO 12401 does not. [2.5.1]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT[5]

1. A more comprehensive picture of the repair work being conducted by Clipper Ventures would have enabled IIMS to discharge its responsibility as a certifying authority more effectively and improve the material condition of the yachts. [2.7.2]

2. As part of Clipper Ventures' review of its safety management system a review of all training material and some form of version control would be beneficial to ensure consistency across all published procedures. [2.7.5]

[5] 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 4 - ACTION TAKEN

4.1 MAIB

On 9 January 2018, the MAIB issued a Safety Bulletin **(Annex K)** regarding the dangers of lateral loading of safety harness tether hooks.

As a result of the MAIB investigation into the grounding and loss of *CV24*, Clipper Ventures was recommended to:

2017/151 Take urgent action designed to improve the ability of its skippers to maintain positional awareness while on deck in pilotage and coastal waters. Consideration should be given to:

- The provision of a navigation/chart display on deck by the helm position;
- More effective use of onboard navigational equipment to avoid danger, including a means for rapid communication between the navigation station and the helm;
- More clearly defining duties of the watch navigator.

2018/117 Review and improve company safety management procedures in co-operation with the Maritime and Coastguard Agency and align with guidance proposed in MAIB recommendation 2018/116- Provide guidance and direction on safety management to Clipper Ventures plc in order to assure the safe operation of the company's yachts in accordance with the Small Commercial Vessel Code. This review should ensure that:

- Risk assessments for on-water operations identify all hazards and set out appropriate mitigation measures.
- Accidents and incidents are thoroughly investigated so that causal factors and lessons are identified in order that, where necessary, changes are made to company procedures to minimise the risk of recurrence.
- There is guidance and terms of reference for members of staff with responsibility for safety management.

2018/118 Update procedures for the safe navigation of its vessels at all times when underway, including:

- Defining the role, responsibility, training and experience necessary of a nominated navigator.
- Ensuring that thorough passage plans are prepared, taking into account guidance provided in this report [*CV24 report*].
- Ensuring that procedures include instructions when the nav station should be manned and navigation reporting policies between the nav and helm stations.

- Provision of training and guidance for all crew who may have navigation duties in the use of electronic navigation systems and how to identify hazards ahead within the determined fixed interval.

At time of publication of this report, Clipper Ventures had not accepted these recommendations.

4.2 MCA

During the stopover in Fremantle following the accident, the MCA directed that Clipper Ventures' yachts were to be manned at all times as required by the SCV Code.

4.3 RYA

The RYA has taken the following steps since the accident:

- Communicated MAIB's safety bulletin when it was issued.
- Included guidance on safety tethers in its Safety Advisory Notice in May 2018.
- Enhanced descriptions and illustrations in the latest edition of the RYA Sea Survival handbook.
- Raised this incident as a case study with relevant RYA instructors.

4.4 CLIPPER VENTURES

Following the accident, Clipper Ventures:

- Responded to the MCA's direction (see 4.2 above) by appointing a qualified mate for each yacht in the Race.
- Created an internal company safety audit role to investigate accidents and promulgate the lessons learned.
- Replaced all tethers with those of a different manufacturer during the stopover in Fremantle. (Subsequently, the Spinlock tethers were reissued.)
- Instructed that rope be wrapped around mooring cleats used for securing jackstays to prevent accidental snagging of tether hooks.
- Required the fitting of downhauls when hoisting yankee 3 headsails to assist crew in lowering them in strong winds.
- Ensured the removal of secondary jackstays from Clipper 70 yachts.
- Made practical training on tethered MOB recovery compulsory on all training courses and prior to the start of each Race leg.

SECTION 5 - RECOMMENDATIONS

The **British Standards Institute Committee** is recommended to:

2019/110 Review and amend ISO 12401 and ISO 15085 at the earliest opportunity in light of lessons learned from this accident to:

- Ensure the danger of snagging of tether hooks is highlighted and suitable precautions are taken for terminating jackstays.
- Clarify that the ISO 12401 standard test assumes that the tether is loaded longitudinally and that the hook must be free to rotate to align with the load, and lateral loading of the hook must be avoided.
- Clarify what force should be applied during an accidental hook opening test.
- Consider including a requirement for a tether overload indicator.

World Sailing is recommended to:

2019/111 Raise awareness of the dangers of laterally loading safety tether hooks, including consideration of suitable amendments to World Sailing's Offshore Special Regulations.

Spinlock is recommended to:

2019/112 Review and amend its user instructions for safety tethers to emphasise the dangers of tether hooks snagging and becoming laterally loaded.

Clipper Ventures is recommended to:

2019/113 Taking account of any safety management guidance and direction provided by the MCA in response to MAIB Recommendation 2018/116, review and, as appropriate, modify its risk assessments and standard operating procedures, with particular regard to foredeck operations, for reducing sail in rough weather and the methods for recovery of both tethered and untethered MOBs.

2019/114 Review and amend Clipper 70 yacht maintenance and repair processes to minimise additional workload on crew during the Race, such that:

- Prior to the start of the Race, yachts are free from significant material defects and equipment has been suitably maintained or replaced.
- During stopovers, to the greatest extent practicable, all outstanding repair work and maintenance is completed before a yacht starts the next leg.

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