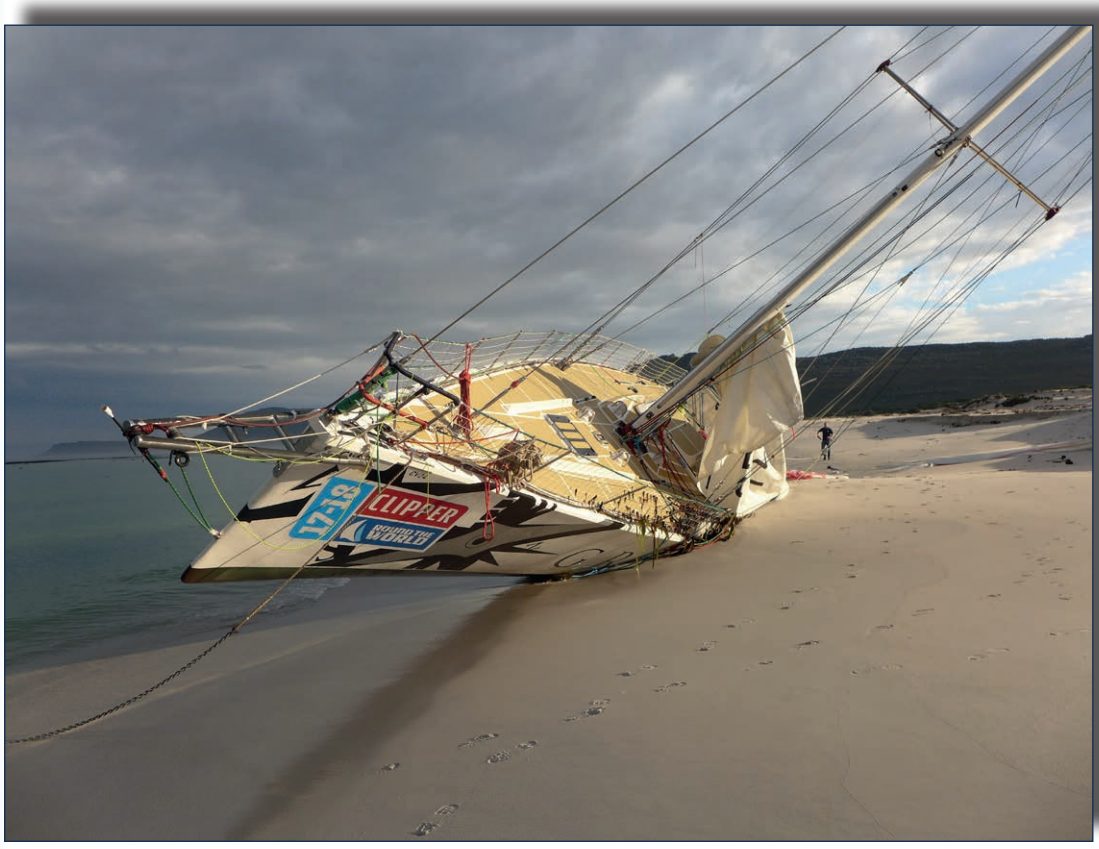
ACCIDENT REPORT

Report on the investigation of the grounding and loss of the UK registered yacht *CV24* at Cape Peninsula, South Africa, on 31 October 2017



MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 12/2018 JUNE 2018

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
DSC	-	Digital Selective Calling
GPS	-	Global Positioning System
GRIB	-	Gridded Binary
IIMS	-	International Institute of Marine Surveying
IMO	-	International Maritime Organization
kts	-	knots
m	-	metre
MCA	-	Maritime and Coastguard Agency
MFD	-	Multi Function Display
MLC	-	International Maritime Organization's Maritime Labour Convention, 2006, as amended
MRCC	-	Maritime Rescue Co-ordination Centre
nm	-	Nautical miles
NSRI	-	National Sea Rescue Institute
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
SOG	-	Speed over the Ground
SOLAS	-	International Convention for the Safety of Life at Sea 1974, as amended
SOP	-	Standard Operating Procedures
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

VMG - Velocity Made Good

SAILING TERMINOLOGY USED IN THIS REPORT

Apparent wind - The wind as it is experienced over the deck of a moving vessel, the result of the combined effect of the true wind and the vessel's heading and speed

Backing wind - When the direction of the wind changes in an anti-clockwise direction, opposed to a veering wind that changes in a clockwise direction

Boom - The pole connected to the mast and rigged horizontally along the foot of the mainsail

Broach - Temporary loss of control of a yacht when the wind forces overcome the righting moment of the keel, resulting in a high angle of heel and an uncontrolled turn into wind

Code 1, 2, 3 - Asymmetric spinnaker head sails used when sailing downwind. Unlike traditional spinnakers, these sails did not have a spinnaker pole. The Code 1 was the lightest sail, the Code 2 was the medium weight sail and Code 3 was the heaviest material for use in stronger winds

Course - The yacht's true course over the ground; information derived from GPS data and displayed as a digital readout

Foot - The lower edge of a sail

Gybing - When under sail, to alter course 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

Heading - The compass direction in which the yacht's bow is pointing

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 boat 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 beam (beam reach) or the quarter (broad reach)

Running backstay - Two lines rigged from each side of the mast at different heights to securing points at the stern; only the running backstay opposite the mainsail is tensioned; the other is slack. When tacking or gybing a yacht, the running backstays need to be changed over

Sheet - A rope used to control the trim of a sail by determining its angle to the wind and its shape

Staysail	-	A small headsail rigged on the inner forestay
Tack	-	The foremost lower point of a sail
Tacking	-	When under sail, to alter course so that the bow of the yacht goes through the wind, resulting in the sails setting on the opposite side
Traveller	-	A device, usually a rail, which allows for adjusting the 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
VMG	-	Velocity made good (VMG) is the component of a yacht's velocity that is against the direction of the true wind when sailing upwind, or with the direction of the true wind when sailing downwind
Yankee 1, 2, 3	-	High cut headsails graded for wind strengths 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 suitable for stronger winds

TIMES: all times used in this report are UTC + 2 except where otherwise stated.

Image courtesy of Clipper Ventures plc

SYNOPSIS

At 2125 on 31 October 2017 the UK registered and commercially operated yacht *CV24* ran aground on Cape Peninsula, South Africa. *CV24* was abandoned and the crew rescued uninjured; there was no pollution and the wreck was subsequently disposed of locally.

An hour and a half before grounding *CV24* was sailing on a southerly course towards the open sea under its full mainsail and medium weight asymmetric spinnaker; it was dark and visibility was moderate in hazy conditions. The true wind then started backing from a north-easterly to a north-north-westerly direction and increased in strength. As this happened the crew made a succession of small alterations of course to port to maintain the same apparent wind direction and prevent an unwanted gybe or spinnaker collapse. However, these alterations resulted in the yacht being sailed close inshore. The skipper had realised that a gybe would be necessary to head away from danger but, soon after this turn was made, *CV24* grounded and could not be freed.

The grounding happened because the crew on deck had insufficient positional awareness to recognise the imminent risk of grounding. The skipper was the only person monitoring navigation and had become distracted by the requirement to supervise the crew on deck. There was insufficent planning for the coastal passage: no crew member had been assigned to the navigation station, depth information was not being displayed at the helm and there were no safe cross track distances or safety depths plotted on paper or electronic charts. The dark and hazy conditions also meant that visual references to indicate the close proximity of land were poor. Seven of the 11 other yachts in the race followed courses similar to *CV24*'s towards the shore and *CV31* almost certainly also grounded.

Analysis of the safety management processes of Clipper Ventures plc, *CV24*'s owner and manager, identified areas that would benefit from review and improvement. These included risk assessments and safety procedures but, in particular, ensuring that lessons are learnt from previous groundings.

A safety recommendation has been made to the Maritime and Coastguard Agency to provide safety management guidance to Clipper Ventures plc. Safety recommendations have also been made to Clipper Ventures plc intended to improve the management of safety and navigation standards within its fleet.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *CV24* AND THE ACCIDENT

VESSEL PARTICULARS	
Vessel's name	*CV24*
Flag	United Kingdom
Classification Society	Not applicable – certified under the Small Commercial Vessel Code
International Callsign	2GVF2
Type	Clipper 70 sloop
Registered owner	Clipper Ventures plc
Manager(s)	Clipper Ventures plc
Construction	Foam reinforced plastic
Year of build	2013
Length overall	21.15m
Length and waterline	20.70m
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 event
Cargo information	None
Manning	18
MARINE CASUALTY INFORMATION	
Date and time	31 October 2017, 2125 (UTC+2)
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	34º14.27'S - 018º22.34'E
Place on board	Hull
Injuries/fatalities	Nil
Damage/environmental impact	Total constructive loss No environmental impact
Ship operation	Under sail
Voyage segment	Mid-water
External & internal environment	Wind: north-north-west at 20 – 25 knots Sea/swell: 0.5m Visibility: moderate in darkness and haze

1.2 BACKGROUND

CV24 was one of 12 identical ocean racing yachts that participated in the 2017 - 2018 Clipper Ventures' round the world race, which was divided into a series of legs between stopover ports. The fleet left Liverpool, UK on 20 August 2017 and completed leg 1 to Punta del Este, Uruguay. Leg 2 was from Punta del Este to Cape Town, South Africa and leg 3 was from Cape Town to Fremantle, Australia.

When *CV24* sailed from Cape Town, there were 18 people on board; the professional skipper and 17 crew who had paid to be part of the race and who were divided into two watches: crime watch and bay watch. All the crew had a nominated role in the watchkeeping system[1] including a watch leader, assistant watch leader and watch navigator.

1.3 NARRATIVE

1.3.1 Previous legs and Cape Town stopover

During leg 1, the skipper of *CV24* had suffered a hand injury and was evacuated ashore; a relief skipper joined the yacht in Portugal to complete the passage to Punta del Este. Despite being the last yacht to arrive in Punta del Este, *CV24* was declared the winner of leg 1 following the application of a time correction to allow for the original skipper's evacuation. A second relief skipper joined in Punta del Este to take charge of the yacht for legs 2 and 3[2]. The fleet departed from Punta del Este on 4 October and 2 weeks later, during the evening of 18 October, *CV24* crossed the line first as the winner of leg 2.

During the stopover in Cape Town, *CV24* was taken to sea on two occasions. On 28 October, *CV24* was at sea for the day with the skipper, five crew and eight corporate visitors. On 29 October, *CV24* went to sea for a training day with 11 new crew who had arrived in Cape Town and were due to join *CV24* and *CV25*; the skipper of *CV25* was also on board.

The instructions for the race to Fremantle **(Annex A)** were issued during the Cape Town stopover, and at 1330 on 30 October there was a safety brief for leg 3 during which the yachts' logs were issued to all skippers.

1.3.2 Departure and inshore race course

The skipper of *CV24* woke at 0545 on 31 October; the other members of the crew were up at about the same time and all proceeded from their accommodation ashore to the marina, where the yacht was berthed. At 0630 the crew were taken by bus to the local immigration office to process departure paperwork before returning to prepare the yacht for departure. At 1100 the skipper gave a safety briefing on board that covered the plan for the race ahead.

CV24 got underway at 1218 and motored out of the marina into Table Bay **(Figure 1)**, where the mainsail was hoisted; between 1245 and 1305 *CV24* participated in a Parade of Sail in front of the Cape Town waterfront.

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[1] The roles assigned in the watchbill [see Section 1.6.3 and **Figure 14**] are used where necessary in this report when describing the actions of the crew

[2] The relief skipper contracted to command *CV24* for legs 2 and 3 is referred to as the "skipper" for the remainder of this report

Reproduced from Admiralty Chart 4150 and 4151 by permission of HMSO and the UK Hydrographic Office

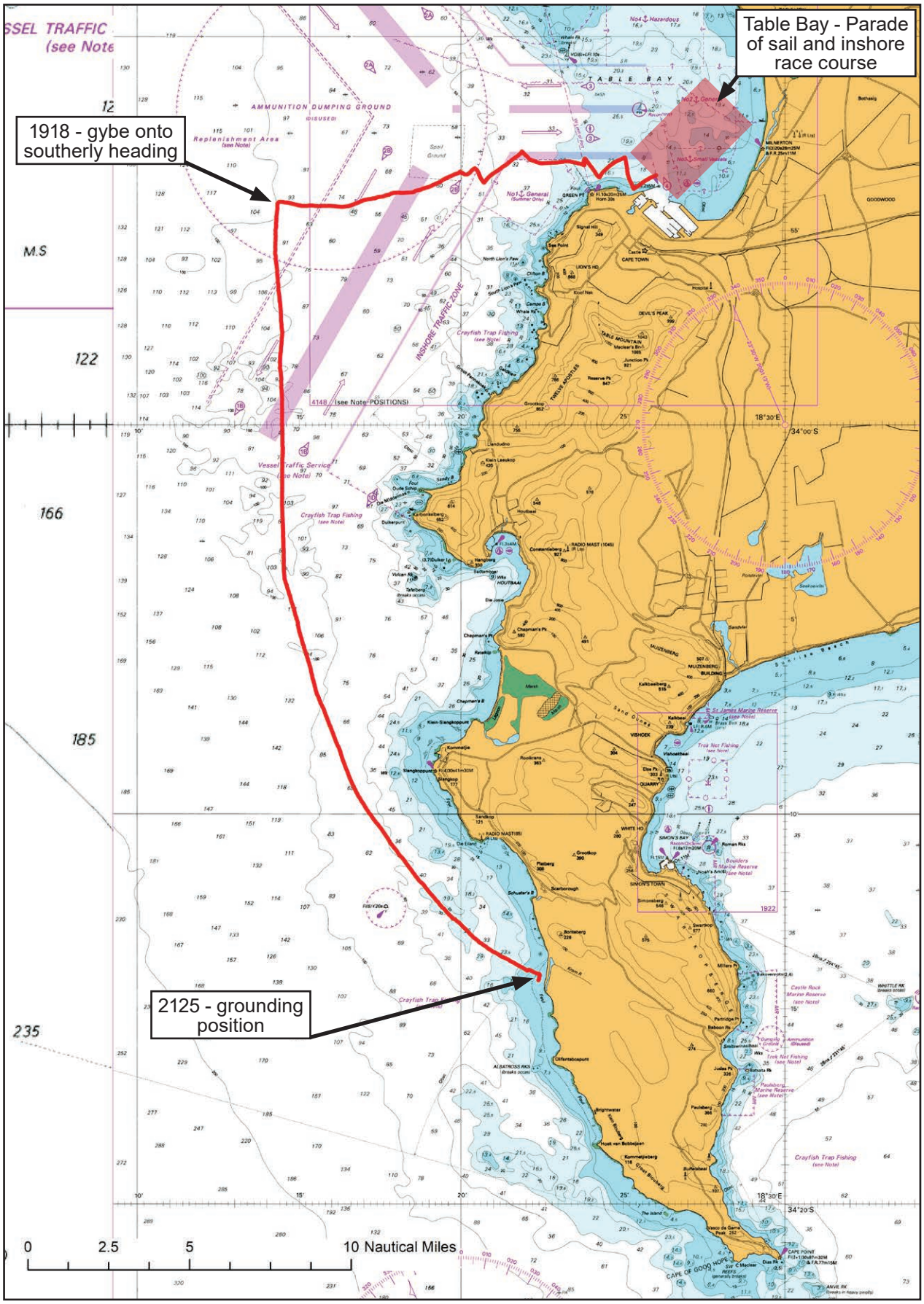

Figure 1: Chart showing Table Bay, *CV24*'s coastal passage and the grounding position

Between 1305 and 1345, the crew of *CV24* completed a manoverboard drill then hoisted the staysail and yankee 2 headsail. The leg 3 race started at 1400 and all 12 yachts initially raced around an inshore course in Table Bay. The wind conditions were light and variable, requiring *CV24*'s crew to complete several sail changes during the inshore course.

Once the inshore course was complete, *CV24* made slow progress out of Table Bay, tacking frequently in the light winds. By 1700, *CV24* was clear of the bay and heading west at about 5 knots (kts) in the light airs. The skipper briefed the crew that the plan was to head west and offshore to keep away from land and then south to pass clear of the Cape of Good Hope.

1.3.3 Coastal passage

At 1918, *CV24* was gybed on to a southerly course **(Figure 1)**; by this time the wind had increased to about 10kts and was from the north-east. *CV24* was sailing with its full mainsail and code 2 medium weight asymmetric spinnaker raised; the staysail and the yankee 1 headsail were secured on the foredeck and a preventer was rigged as the yacht was sailing downwind **(Figure 2)**.

Once *CV24* was settled after the gybe, the helmsman reported to the skipper that the course over the ground (COG) was 205º. The skipper went below to the navigation and communications station (nav station) to review this information on the Timezero[3] display. The skipper assessed that the course being steered would keep *CV24* clear of land and into the Southern Ocean.

Between 1930 and about 1945, members of crime watch (who were due to be on watch until 2300) went below, ate a meal and then came back on deck to take over. The skipper remained on deck while crime watch took over, then he went below to eat a meal. By this time, the true wind had increased to about 20kts and started backing; the yacht's speed had also increased to about 10kts. The course of 205º was reported by the crew to the skipper as being difficult to maintain as the apparent wind was too far aft, creating the risk of the spinnaker collapsing or an unwanted gybe.

Having eaten, the skipper came back on deck and observed that the wind had backed and the COG was about 175º; by that time it was also dark and hazy. The skipper went back to the nav station to assess the navigation situation. From the Timezero display, he observed that the course being steered would still keep *CV24* clear of land.

At 2000 the watch navigator took the helm and reported to the watch leader that it was not possible to maintain a consistent course. At about 2030, aware of the steering difficulties being reported, the skipper took the helm himself for a few minutes to determine the optimum course to steer. He settled the yacht on a course of 168º and told the team on deck to maintain a heading of between 160º and 168º.

At 2100, the watch leader directed the team on deck to rotate through allocated positions and, as part of this evolution, took over the helm himself, steering from the port helming position. The safety officer was allocated the role of trimming the spinnaker sheet and the watch navigator was assigned the check helm role, monitoring the helmsman. Other crew members on deck were working winches

[3] Timezero was the main navigation and tactical computer system, see Section 1.5.4

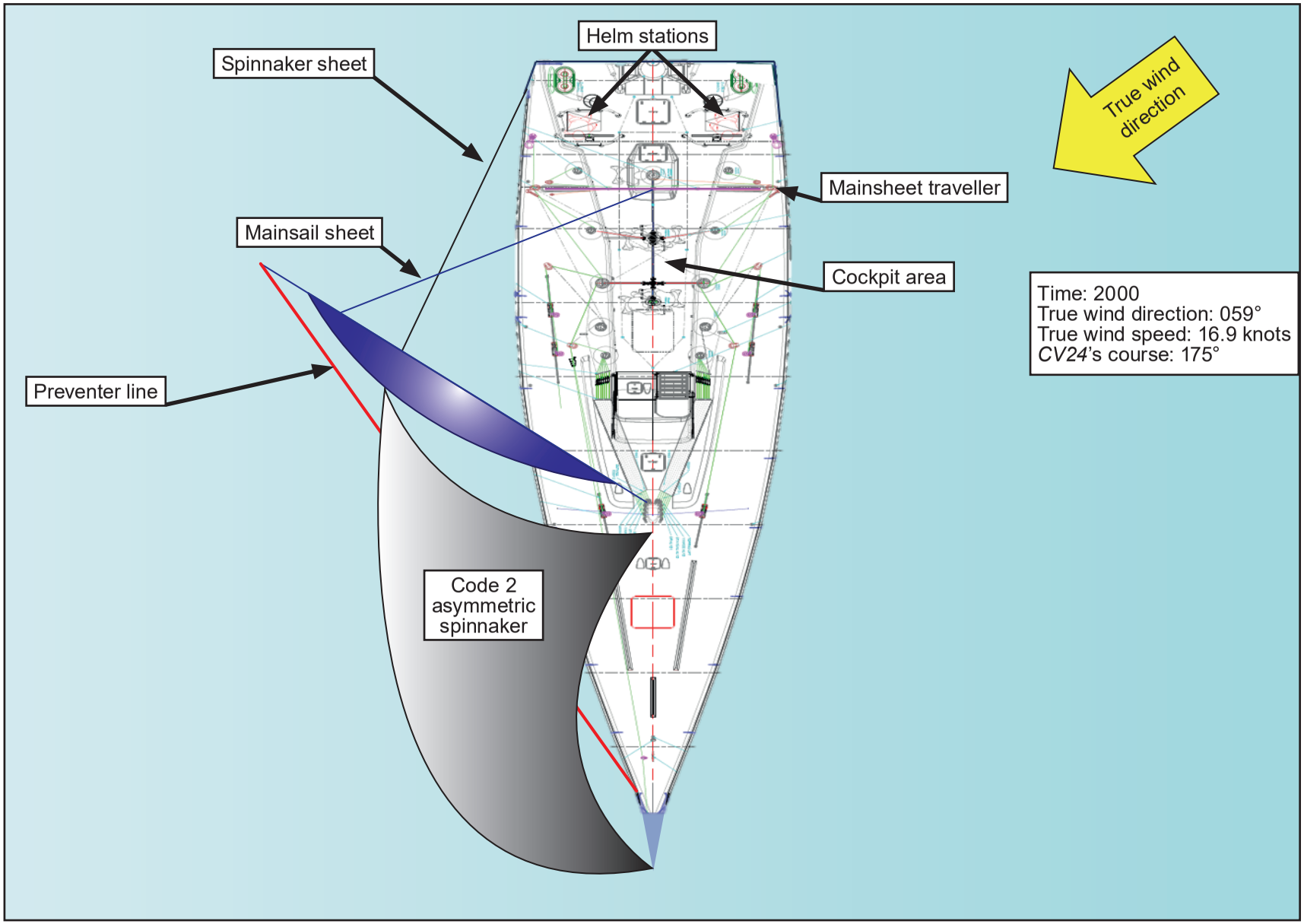

Figure 2: Diagram showing *CV24*'s heading, sail configuration and the true wind direction, after the gybe at 1918

and sheets as directed by the watch leader. By then, the true wind had increased to about 23kts and had continued backing round to a northerly direction; *CV24* had also increased speed to about 12kts.

Also at about 2100, the skipper observed from the Timezero display that *CV24*'s ship's head marker[4] was heading towards distant land. Realising that *CV24* was no longer on a course that would clear the Cape safely, the skipper told the crew on deck that a gybe was going to be necessary to head away from land. The skipper then went back to the nav station to continue assessing the navigation situation.

On the helm, the watch leader was struggling to maintain a steady course and the spinnaker had collapsed on a couple of occasions. This was reported to the skipper at about 2110, prompting him to return back on deck, where he observed the changes in the wind speed and direction and the fact that the crew were unable to maintain the desired course. The skipper told the watch on deck to get ready to gybe as quickly as possible, then went back to the nav station to check the navigation situation again before returning to the deck a couple of minutes later to take charge of the gybe.

At 2115, a member of the crew went below to the nav station to make a log entry **(Annex B)**. The crew member wrote the time *1915*[5] in the first column of the log then left the nav station to check the freezer temperature and secure some loose provisions. On returning to the nav station to complete the log entry, the crew member saw on the Timezero display that *CV24* was very close to land, so decided to go on deck and inform the skipper.

1.3.4 The grounding

While preparing to gybe, the assistant watch leader went to the fore deck to check the spinnaker sheet rigging arrangements; when there, he saw a beach ahead and felt anxious, but was not sure of its proximity in the hazy conditions.

At 2121, *CV24* was hit by a gust of wind that caused it to broach, heeling heavily to starboard and veering off course to port **(Figure 3)**. After about a minute, the crew had *CV24* back under control on a course of about 120º; the skipper was in the cockpit taking firm charge of the crew on deck to expedite the gybe.

The skipper had derigged the preventer and heaved in the mainsail himself in preparation for the gybe. At 2123, when directed by the skipper, the watch leader turned *CV24* to starboard, and it gybed **(Figure 3)**; meanwhile, other crew members changed over the running backstays and worked together to rig the spinnaker sheet on the opposite side of the yacht. The skipper and other crew members on deck had seen kelp weed in the sea nearby. At this time, three members of crime watch were below decks: one on mother watch[6], one undertaking bilge pumping duties and one in the nav station.

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[4] The ship's head marker is an arrow line shown on the Timezero display projecting the vessel's course ahead. This shows the operator where the vessel will go if the current helm and environmental conditions remain unchanged.

[5] Log times were entered in UTC in the first column

[6] Mother watch was a duty undertaken by an on watch crew member required to work below, cooking and cleaning

Image courtesy of Esri, DigitalGlobe

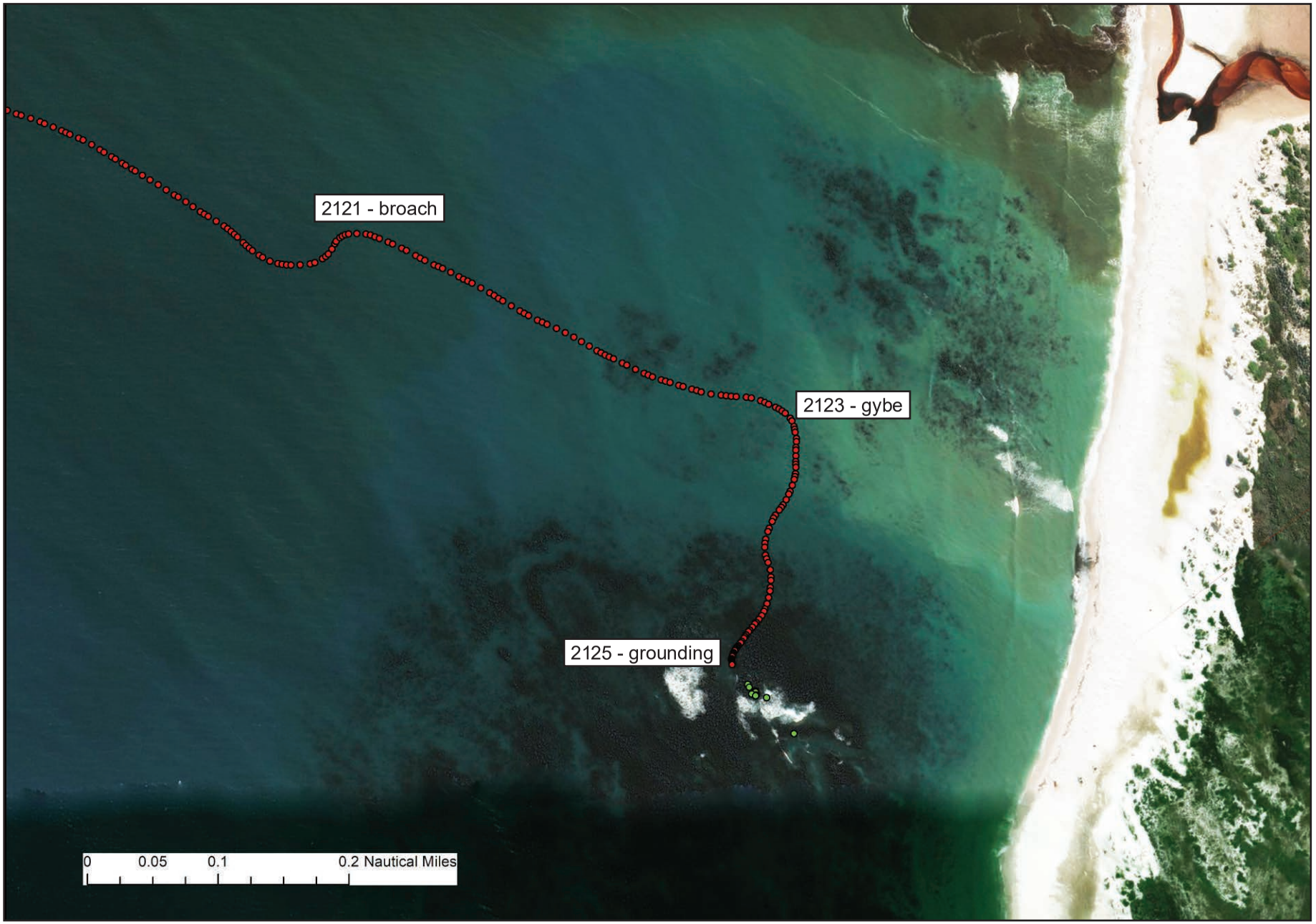


Figure 3: *CV24*'s Timezero track data superimposed on earth satellite imagery

At 2125, *CV24* grounded softly, the speed reduced, then it came to a very abrupt stop when evidently striking solid ground **(Figure 3)**. Just after grounding, the crew member who had filled in the log came back on deck but realised that it was too late to pass on the observation made a few moments earlier at the nav station.

1.3.5 Post-grounding

When *CV24* came to a halt it was heeling to port and everyone on board had felt the jolt; the skipper called all the crew to the deck and started considering options to re-float. The spinnaker was still filling, so the crew freed it by releasing its tack and halyard then hauling it into the cockpit using its sheet. Down below, members of bay watch started dressing and making their way on deck. As directed by the skipper, the bay watch watch navigator went to the nav station and started the engine.

Once the spinnaker had been recovered, the staysail was hoisted, to increase the angle of heel in an attempt to free *CV24,* but this was unsuccessful even with the engine operating at full power. The watch navigator of bay watch went on deck and assessed that the crew there were coping, so returned below to the nav station and monitored the engine temperatures in the shallow water. He also suggested to the skipper that a “Mayday” or “Pan Pan” call be made on very high frequency (VHF) radio, but was told by the skipper to wait.

At 2148, the skipper used the satellite phone to call the race director and report that *CV24* was aground, all crew were safe but attempts to re-float had not worked. At 2215, the race director made phone contact with the South African Maritime Rescue Co-ordination Centre (MRCC) in Cape Town and reported the situation. The MRCC then directed the launch of South African National Sea Rescue Institute (NSRI) lifeboats from three local stations. The race director also phoned *CV21,* which was the closest yacht to *CV24*, and directed it to stop racing and proceed to assist.

As all attempts to free *CV24* had failed, the skipper made the decision to cease this effort and directed the crew to lower the sails and prepare for abandonment; a kedge anchor was laid out astern at about this time. There was about 0.5 metre (m) of swell in the grounding position and the port side of *CV24*’s hull was repeatedly impacting the seabed. All crew were on deck, but were permitted by the skipper to go below in small numbers for short periods to collect grab bags and personal belongings.

The first NSRI lifeboat was on scene at 2309 but was unable to get alongside *CV24* due to the very shallow water; instead, a rescue swimmer swam across to assess the situation **(Figure 4)**. Based on this assessment, the MRCC took a decision that all the crew of *CV24* were to be evacuated ashore. The crew then abandoned into two liferafts that were towed away by the NSRI lifeboats.

CV24’s skipper was last to leave the yacht; before abandoning, he shut the watertight doors and all the hull valves, then switched off all electrical equipment with the exception of the masthead anchor light. *CV24*’s crew were then transferred ashore in the lifeboats to the NSRI station at Hout Bay, where they were met by Clipper Ventures’ staff before being taken to overnight accommodation in Cape Town.

Image courtesy of www.theraceofmylife.com

Figure 4: NSRI rescue swimmer on board *CV24* with an inflated liferaft tethered astern

1.3.6 Disposal

On 1 November 2017, Clipper Ventures' staff gained access to *CV24* by a small boat to retrieve the hard drive from the Timezero navigation computer and assess the possibility of recovering the yacht. It was apparent that *CV24*'s port side was badly damaged, with uncontrolled water ingress through widespread hull damage.

The grounding position was 450m from the beach and, over the subsequent 2 days, *CV24* was washed ashore and became accessible by foot **(Figure 5)**. After defueling and an assessment by salvors, *CV24* was cut up on the beach and disposed of locally **(Figure 6)**.

1.3.7 Other Clipper yachts

CV20, *CV22*, *CV26*, *CV27*, *CV29*, *CV30* and *CV31* all followed tracks similar to *CV24*'s, towards the shore **(Figure 7)**.

Between about 2030 and 2045 on 31 October 2017, the skipper of *CV31* had observed that the backing wind had caused the crew to start steering the yacht on a south-easterly heading towards land. *CV31* was sailing with its full mainsail and code 1 asymmetric spinnaker hoisted. The skipper directed the crew to prepare for a gybe, and during the gybe preparations one of the spinnaker lines was dropped into the sea, delaying the evolution. At about 2115, the crew of *CV31* heard and felt several impacts on the hull or keel. The skipper told the helmsman to gybe immediately and *CV31* was then turned on to a south-westerly heading **(Figure 7)**. *CV31*'s spinnaker was held on the wrong side of the yacht after the gybe, and was subsequently damaged when lowered. Once clear of the danger, the crew of *CV31* checked internally for damage and also used an underwater camera to inspect the hull and keel; no damage was observed. After the event, *CV31*'s skipper submitted

Image courtesy of the South African Maritime Safety Authority

Figure 5: *CV24* washed up on the beach 2 days after the accident

Image courtesy of the South African Maritime Safety Authority

Figure 6: Disposal of *CV24* by cutting into sections and removal from the beach

Reproduced from Admiralty Chart 4150 by permission of HMSO and the UK Hydrographic Office

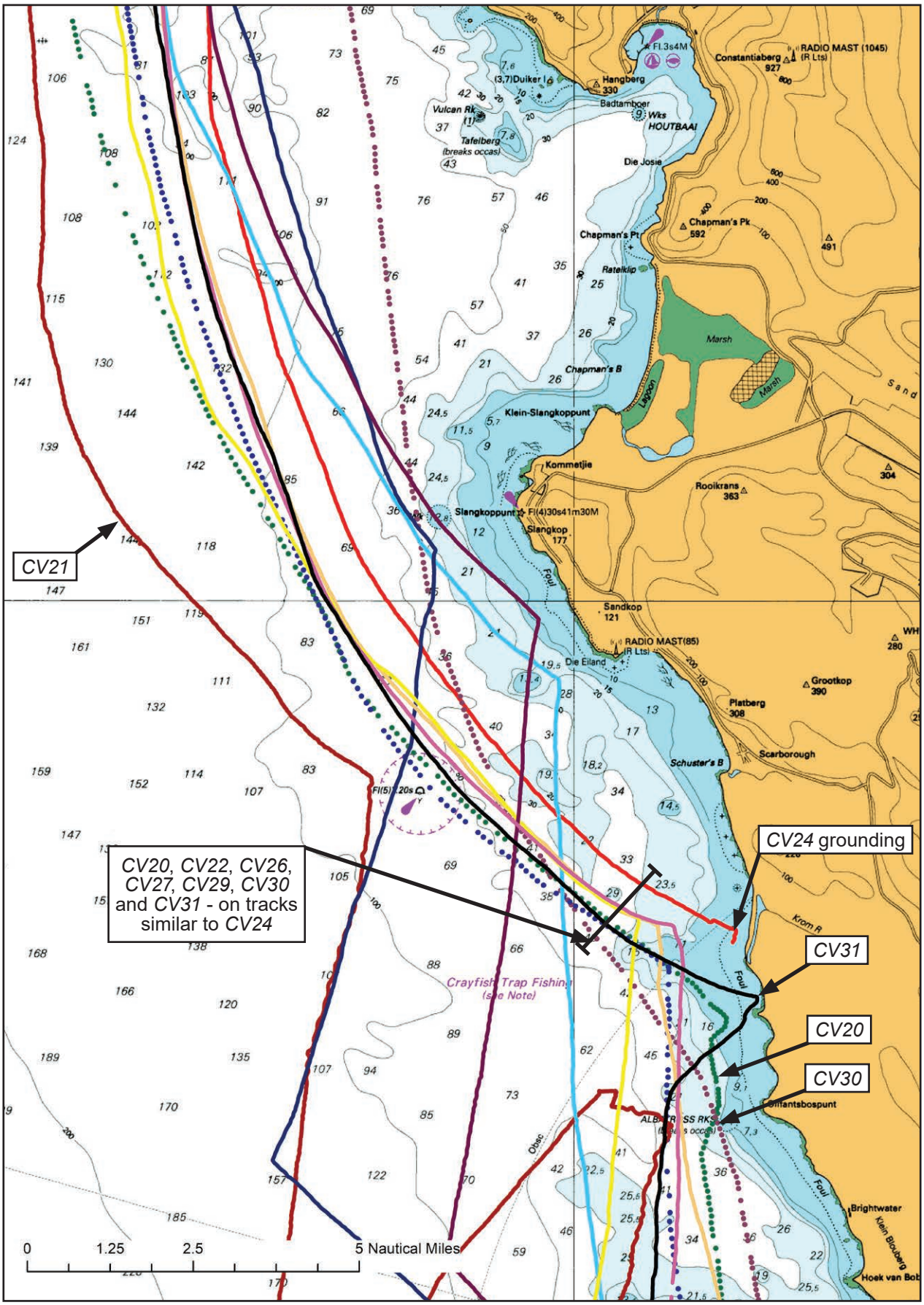


Figure 7: Chart showing the tracks of all 12 Clipper Ventures' yachts

a report to Clipper Ventures that stated the cause of the impacts on the hull to be *unknown, but suspect contact with an object floating/trapped in seaweed visible nearby or bottom.*

At about 2130, *CV30,* which did not have a spinnaker hoisted, passed over the Albatross Rocks shoal about 2.5 nautical miles (nm) south of *CV24*'s grounding position **(Figure 7)**.

1.4 ENVIRONMENT

CV24's logbook recorded the true wind at 2000 from 059º at 16.9kts and at 2115 from 351º at 23.9kts **(Annex B)**. In the grounding location, the sea state was slight with about 0.5m of swell. Sunset was at 1914; after darkness, there was moonlight and a clear sky but visibility at sea level was moderate in a low-lying haze.

1.5 *CV24*

1.5.1 General description

CV24's hull was constructed by the Mazarin Shipyard in Qingdao, China in 2013; it was then shipped to the UK for keel attachment, fitting out, rigging and race preparation. *CV24* was registered in the UK and had a length overall of 21.15m and draught of 3m. The displacement was 34.7 tonnes and it was motor-powered by a 93.2 kilowatt Perkins M130 diesel engine. *CV24* had 24 bunks, two toilets, a galley, nav station, sail storage area, twin rudders and twin steering wheels. *CV24* carried a wardrobe of sails to permit sailing in a range of wind conditions; this included a mainsail, staysail, three yankee headsails and three asymmetric spinnakers.

1.5.2 Survey and inspection

CV24 was operated as a small commercial vessel and subject to the Maritime and Coastguard Agency's (MCA) *Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards*[7] (the SCV Code).

The SCV Code set out the MCA's requirements for construction standards including stability, lifesaving equipment, navigation equipment and protection of personnel. The SCV Code required vessel owners and skippers to take responsibility for the health and safety of anyone working on the vessel.

Surveys of small commercial vessels to assess compliance with the SCV Code were conducted on behalf of the MCA by authorised Certifying Authorities. For Clipper Ventures' yachts, the Certifying Authority was the International Institute of Marine Surveying (IIMS).

CV24 was surveyed on 27 June 2013 by a marine surveyor from the IIMS and found to be fully compliant with the requirements of the SCV Code, and certification was issued, valid until 26 June 2018. On 10 March 2015, *CV24* was inspected by the same IIMS surveyor to assess compliance with the Maritime Labour Convention,

[7] For sailing vessels, use of the alternative construction standards was enabled by Regulation 6 of the Merchant Shipping (Vessels in Commercial Use of Sport or Pleasure) Regulations, 1998, as amended

2006, as amended (MLC). This inspection resulted in a reissue of *CV24*'s SCV Code certification **(Annex C)** stating that the yacht was in full compliance with the SCV Code and MLC; the certificate was also valid until 26 June 2018.

CV24 was certified for both Category 2 operations up to 60 miles from a safe haven and Category 0 operations, unrestricted in distance from safety. Clipper Ventures' yachts were operated as Category 2 vessels for training and corporate events, and Category 0 when undertaking the round the world race.

1.5.3 Manning and safe operation

Annex 3 of the SCV Code provided details of the required manning and safe operation of small commercial vessels. Category 0 operations required two crew both holding a commercially endorsed[8] Royal Yachting Association (RYA) Yachtmaster qualification. The skipper was required to hold an RYA Yachtmaster (Ocean) certificate of competence and, as a minimum, the second crew was required to hold an RYA Yachtmaster (Offshore) certificate of competence.

After a negotiation directly between the MCA and Clipper Ventures, the MCA issued a letter **(Annex D)** stating that *whenever possible, Clipper Ventures plc should have suitably qualified persons onboard as required by the SCV Code*. The letter went on to state that, when a Clipper Ventures yacht did not have a second Yachtmaster qualified person on board, *that a second person must be onboard who has successfully completed the Clipper Coxswain's Course.* Given the content of the MCA's letter, Clipper Ventures' manning policy was for yachts on the round the world race (Category 0 operations) to have the skipper as the sole professionally qualified employee and a Clipper coxswain as the second person.

Para 2.9.1 of Annex 3 to the SCV Code, titled *Hours of Work Provisions* required that the minimum hours of rest for anyone employed on board should be not less than 10 hours in any 24-hour period and not less than 77 hours in any 7-day period.

Para 9 of Annex 3 to the SCV Code, titled *Keeping a Safe Navigational Watch* required the skipper of a small commercial vessel to *ensure that there is, at all times, a person with adequate experience in charge of the navigational watch.* It also stated factors affecting the safety of the vessel, including: the environmental conditions, proximity of hazards and density of shipping traffic.

1.5.4 Navigation equipment

The Clipper 70 nav station **(Figure 8)** was on the centreline near the stern of the vessel and directly underneath the helm station. *CV24* was fitted with radar, automatic identification system (AIS), echo sounder, global position system (GPS) receivers, log speed, masthead wind instrument and a flux gate compass. An outfit of paper charts was also carried on board. Communications equipment included two VHF radios incorporating digital selective calling (DSC), an Inmarsat C satellite communications system with distress alert button and an Iridium satellite phone.

[8] See SCV Code Annex 3, para 2.2

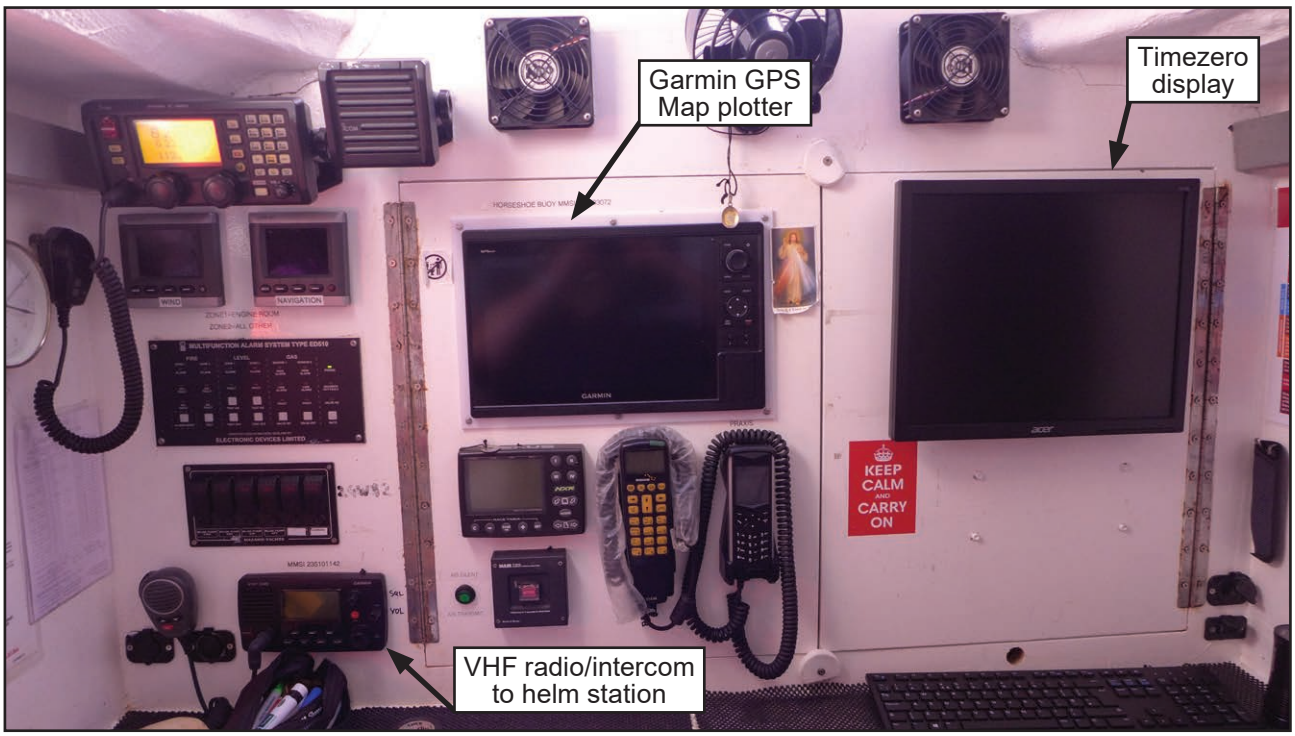


Figure 8: Clipper 70 navigation and communications station

The electronic navigation systems were a Garmin plotter[9] and a separate computer installed with Timezero navigation software **(Figure 8)**. The Garmin plotter in the nav station was not loaded with electronic charts other than a factory setting chart of the world. This plotter was used for situational awareness of other yachts' positions from AIS data and accessing digital information for log entries. The Timezero computer was loaded with C-Map electronic vector charts and received GPS data, AIS data and daily e-mailed weather maps (in the form of GRIB[10] files). The Timezero software had an extensive range of navigation and tactical planning software tools including planned track, cross track safety distances, danger areas and look ahead safety zones. The Timezero system was used for electronic navigation and tactical decision-making. Timezero data could only be accessed at the computer in the nav station.

Digitised data from the yacht's GPS, log, echo sounder and wind instruments was also available for display at remote Garmin units at each helm station **(Figure 9)**. These remote displays could not be used as chart plotters but had multi-function capability to show any of this digital navigation data in different formats, including split screens and plan displays for wind information. The remote displays had a shallow depth feature that included an audible alarm when crossing over the selected alarm depth setting. This feature was tested by MAIB staff on board *CV23* on 27 November 2017 **(Figure 10)**. The helm remote displays were operated by crew aft of the mainsheet traveller, and could not be seen by crew in the cockpit **(Figure 2)**.

[9] During the stopover in Cape Town, all 12 Clipper 70 yachts had the Garmin GPS Map plotters replaced with an upgraded unit, including different software for functions such as alarms and manoverboard procedure. No additional training was provided to skippers or crew for the new software. The installation of the flux gate compass was part of this upgrade

[10] GRIB (gridded binary) is the name for the World Meteorological Organisation's internationally agreed standard for electronic formatting and transmission of meteorological data

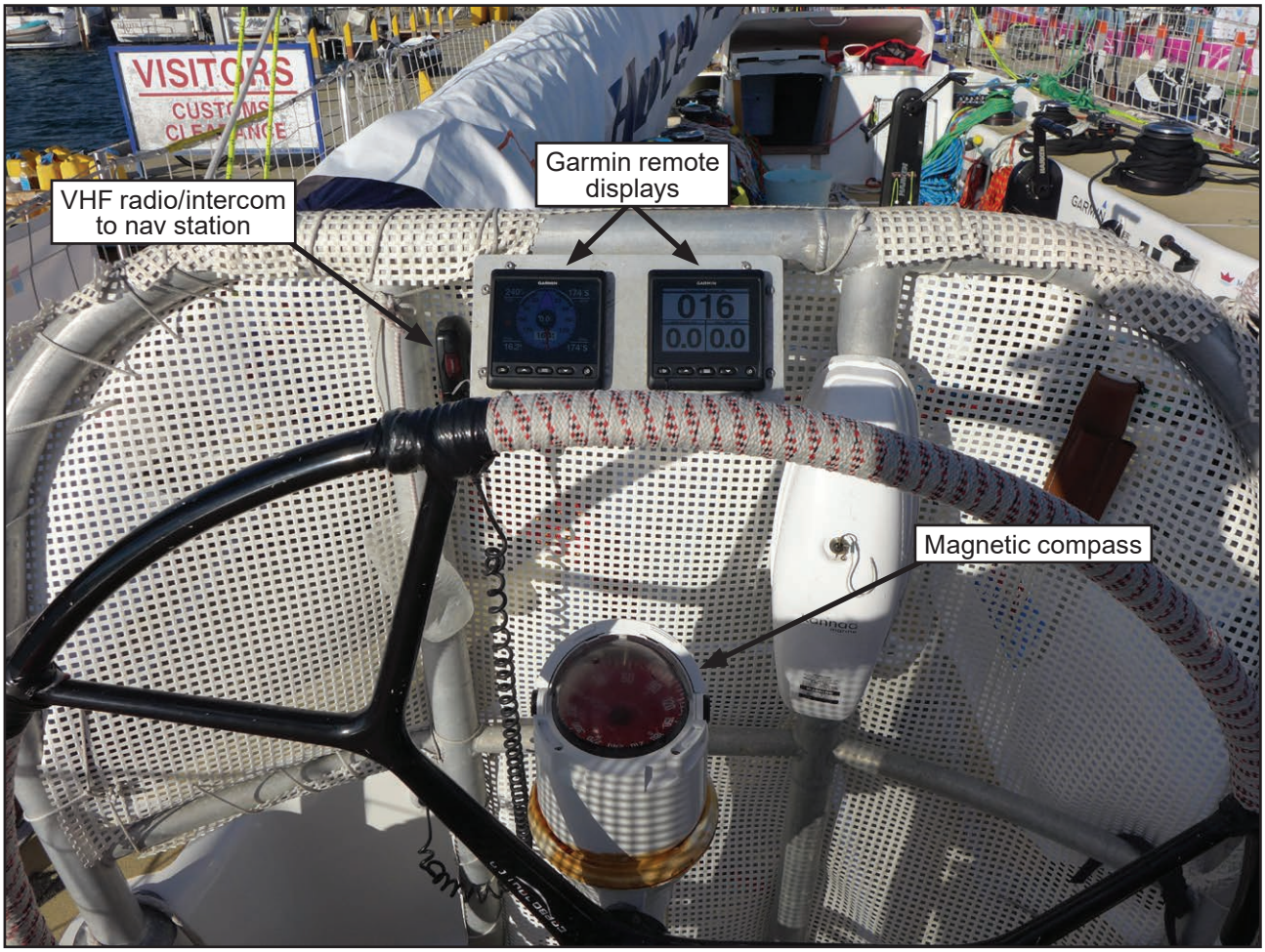


Figure 9: Clipper 70 - port helm station instrumentation

Figure 10: Clipper 70 - shallow depth alarm capability

1.5.5 Internal navigation communications

The primary means of communications between the nav station and the helm station was via an intercom link. The intercom was integral with the VHF radio handset at the port helm position **(Figure 9)** and the lower VHF radio in the nav station **(Figure 8)**. When the port helm station VHF handset was being used as an intercom, it could not be used for external VHF radio conversations. The intercom system did not have a loudspeaker, which meant that it could not be easily heard by crew at the starboard helm position or during noisy wind conditions.

When describing the design of the Clipper 70 yacht, the Race Crew Manual[11] **(Annex E)** stated that *the navigation station is placed towards the stern, providing a closer link between the navigator and the helmsman.* Between the port and starboard helm positions, there was a hatch that led directly to the nav station **(Figure 11)**. Prior to the 2017 - 2018 race, crews of Clipper 70s would sometimes open this hatch when at sea to permit direct dialogue between crew at the helm and nav stations **(Figure 12)**. As a result of incidents of water ingress through this hatch when open, for the 2017 - 2018 race the yachts' crews were permitted to open it only for an actual emergency. Clipper Ventures had also fitted the nav station hatches with an anti-tamper device that would show the company's staff if it had been opened.

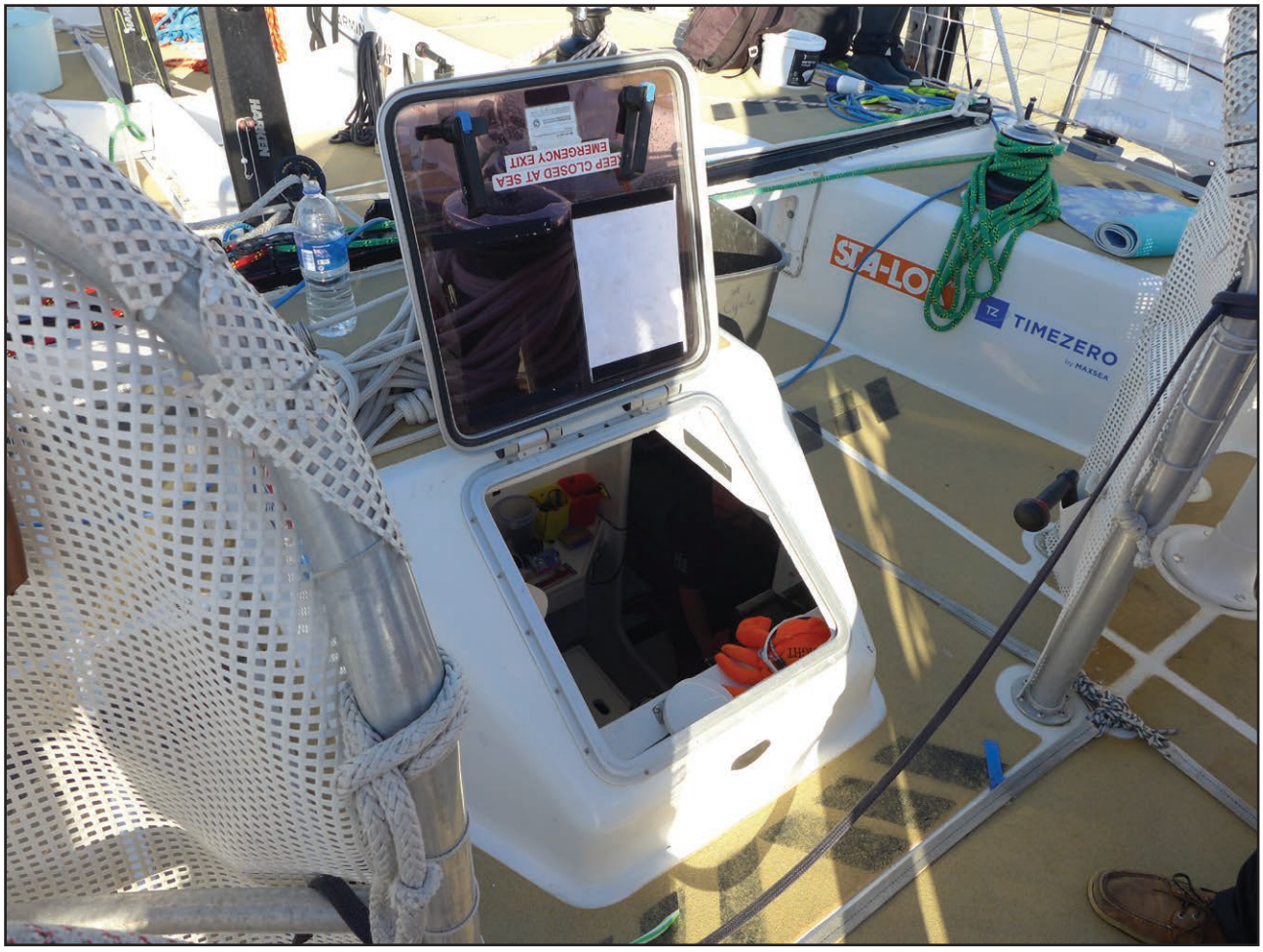


Figure 11: Clipper 70 - watertight hatch between the helm and nav stations

[11] The Race Crew Manual was Clipper Ventures' reference document for use by crew during training and the round the world race – See Section 1.10.8

Figure 12: Clipper 70 - nav station hatch open at sea during the previous round the world race

1.5.6 Forecast weather

Daily GRIB files were transmitted to all yachts in the race; this data was automatically plotted in the Timezero system, and displayed the forecast weather conditions for up to 5 days ahead. On the morning of the race start, *CV24* had received the GRIB files, and this information was available on board. This data was recovered from *CV24*'s Timezero computer hard drive after the accident; the forecast wind data for the time of the accident is at **Figure 13**.

1.6 CREW

1.6.1 Skipper

CV24's skipper had joined the yacht in Punta del Este to take command for legs 2 and 3 in the absence through injury of the original skipper. The skipper was already an employee of Clipper Ventures and had been working as a training skipper for over a year prior to joining *CV24*. He had also skippered a Clipper 68 yacht in the 2017 Fastnet Race.

CV24's skipper had 23 years' professional yachting experience in a range of yacht types, including racing yachts and large super-yachts, primarily working in the Caribbean and Mediterranean seas. He held a commercially endorsed RYA Yachtmaster (Ocean) qualification.

The skipper was employed by Clipper Ventures under the terms of a contract of employment that required him to take full responsibility for the preparation and operation of the yacht and its crew in a safe and seamanlike manner.

Figure 13: Predicted wind data recovered from *CV24*'s Timezero navigation computer showing forecast north-north-westerly winds

1.6.2 Crew recruitment and allocation

Clipper Ventures attracted prospective crew through advertising campaigns in a range of media publications and posters in locations such as the London Underground. Applicants for a place on the race submitted personal details to Clipper Ventures and were then invited to an interview before being offered a place on pre-race training.

All paying crew were required to enter into a crew agreement with Clipper Ventures. This agreement required crew to accept the authority and instructions of the skipper, and take an *active and equal share in all duties connected with the running of the yacht*.

Prior to the round the world race, Clipper Ventures allocated skippers and crew to each yacht. Crew allocation to yachts was arranged to ensure an even distribution of skills across the fleet, taking into account crew members' age, gender, sailing ability, vocational skills and, where possible, personal preferences.

1.6.3 Crew roles on board

Onboard roles were described in the Race Crew Manual and allocated to the crew by the skipper. Crew roles on deck included bow, trimmer, foredeck, cockpit and watch leader. The Race Crew Manual also listed 11 additional roles for crew to fulfil away from the deck including medic, engineer, team co-ordinator and safety officer **(Annex E)**.

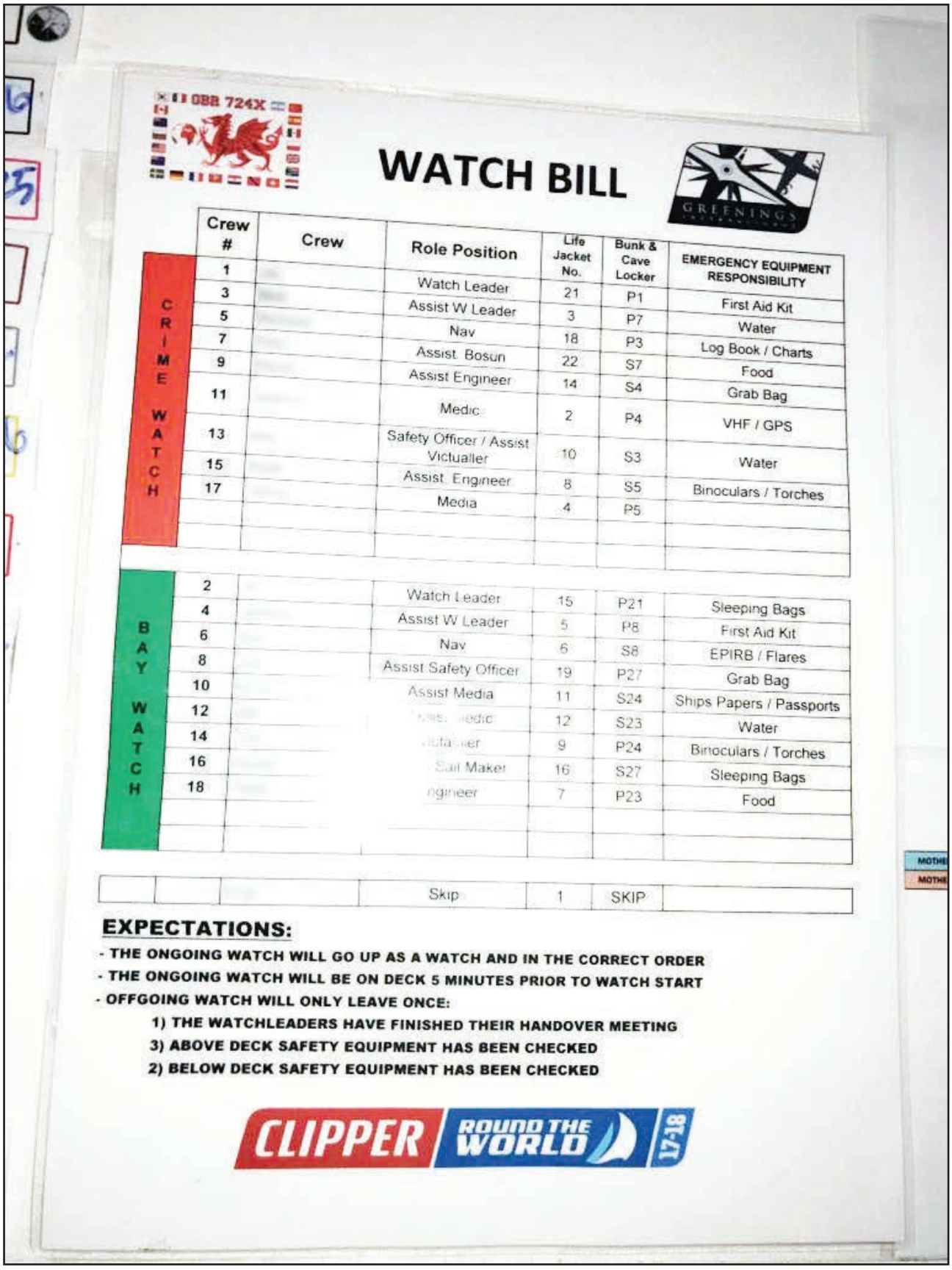
A key role for the crew to fulfil was the watch leader. Guidance for this role was provided in the Race Crew Manual **(Annex E)**, which stated that the role needed *outstanding leadership, communication and decision making skills* in order to make *appropriate decisions concerning the performance and safety of the yacht within the boundaries set by the skipper.* The specific list of a watch leader's responsibilities included *sailing the yacht, her safety and the safety of the crew.* The Race Crew Manual did not include responsibilities for a navigator.

Before departing from Liverpool, the original skipper of *CV24* prepared plans for his team, producing an overall manning plan for the race **(Annex F)**. This manpower plan did not include a navigator, either for the overall race or for individual legs.

Prior to each leg, race skippers were required to submit a pre-race declaration form to Clipper Ventures; this included a requirement for skippers to designate a navigator and Clipper coxswain. *CV24*'s pre-race declaration for leg 3 is at **Annex G**. On this form, the skipper of *CV24* named two crew members as navigator.

Prior to departing Cape Town, the crew of *CV24* agreed the watchbill for leg 3 **(Figure 14)**. The watchbill designated a member of each watch as 'nav'; this role was referred to on board as the watch navigator. Both the navigators named on the pre-race declaration form **(Annex G)** were in bay watch. The skipper had not named the watch navigator of crime watch as a navigator on the pre-race declaration form.

Image courtesy of David Watkins



	Crew #	Crew	Role Position	Life Jacket No.	Bunk & Cave Locker	EMERGENCY EQUIPMENT RESPONSIBILITY
CRIME WATCH	1		Watch Leader	21	P1	First Aid Kit
	3		Assist W Leader	3	P7	Water
	5		Nav	18	P3	Log Book / Charts
	7		Assist Bosun	22	S7	Food
	9		Assist Engineer	14	S4	Grab Bag
	11		Medic	2	P4	VHF / GPS
	13		Safety Officer / Assist Victualler	10	S3	Water
	15		Assist Engineer	8	S5	Binoculars / Torches
	17		Media	4	P5	
BAY WATCH	2		Watch Leader	15	P21	Sleeping Bags
	4		Assist W Leader	5	P8	First Aid Kit
	6		Nav	6	S8	EPIRB / Flares
	8		Assist Safety Officer	19	P27	Grab Bag
	10		Assist Media	11	S24	Ships Papers / Passports
	12		[illegible] Medic	12	S23	Water
	14		[illegible]ctualler	9	P24	Binoculars / Torches
	16		Sail Maker	16	S27	Sleeping Bags
	18		[illegible]gineer	7	P23	Food
			Skip	1	SKIP	

Figure 14: *CV24*'s leg 3 watchbill

1.6.4 Crime watch

Crime watch consisted of nine crew and was the duty watch at the time of the grounding. The watch leader had no sailing qualification or previous sailing experience prior to applying to Clipper Ventures. He had joined *CV24* in Punta del Este and planned to complete legs 2 and 3. During leg 2, he had been the watch leader of the opposite watch. The assistant watch leader was a round the world crew, who held a Swiss sailing licence. He had sailed most of his life on a variety of boat types, and his experience included a transatlantic crossing.

The watch navigator held an RYA coastal skipper's qualification and had sailed dinghies and yachts recreationally. The safety officer was a round the world crew who had completed the Clipper coxswain course. Of the five remaining members of crime watch, two had joined *CV24* in Cape Town.

1.6.5 Bay watch

Bay watch consisted of eight crew[12] and was off watch and below deck at the time of the grounding. Bay watch's watch leader had no previous sailing experience before applying to Clipper Ventures. Bay watch's assistant watch leader was a round the world crew and experienced yachtsman, who held an RYA Yachtmaster (Offshore) qualification; he was also the designated Clipper coxswain **(Annex G)**. He had extensive yacht sailing experience including ocean passages in tall ships and sailing yachts. When the original skipper was injured on leg 1, he had taken temporary command of *CV24* until the first relief skipper joined.

Bay watch's watch navigator was also a round the world crew with extensive yachting experience, including a transatlantic crossing. He held American Sailing Association qualifications in coastal navigation and advanced coastal cruising. He also held the role of team co-ordinator.

1.7 RACE CREW PREPARATION

1.7.1 Pre-race training

Irrespective of any previous sailing experience, all potential crew had to successfully complete levels 1 to 4 of Clipper Ventures' training scheme before participating in the round the world race. Level 1 training covered basic sailing skills, the principles of sailing, seamanship and personal safety. It took a week, and was primarily conducted during day sailing sessions, with evening classroom lectures. On successful completion of level 1 training, trainees were awarded an RYA Competent Crew certificate.

Level 2 training introduced crew to offshore sailing and life on board an ocean racing yacht. This level comprised 5 days at sea developing skills in watchkeeping, sail changes, safety on deck and managing emergencies, including manoverboard drills. Level 2 training also included a 1-day sea survival course.

[12] *CV24*'s leg 3 watchbill **(Figure 14)** lists nine crew in bay watch, but the crew member assigned victualler duties was not on board when the yacht departed Cape Town

The focus of level 3 training was spinnaker handling and racing techniques; further safety drills were also conducted and crews were introduced to practice race starts and racing rules. Level 3 training also included a 1-day offshore safety and survival course approved by World Sailing[13].

Level 4 training comprised 7 days at sea, consolidating all previous training and entering into the spirit of competitive yacht racing. Level 4 training took place after Clipper Ventures had allocated skippers and crew to each yacht in order for the crews to work with their allocated race skipper and start to bond as a team.

Levels 1, 2 and 3 training could be conducted on either Clipper 68 or Clipper 70 yachts in the UK or Australia, where two yachts were based for training. Level 4 training was primarily conducted on Clipper 70s in the UK. During training, Clipper Ventures' staff monitored and assessed crew at each stage and provided feedback to ensure maximum training benefit for trainees. The syllabus for training levels 1 to 4 did not contain any specific requirement for crew to be trained in navigation techniques or the duties of the watch leader.

During training, each of Clipper Ventures' yachts was manned by a professional skipper and mate who took full responsibility for its safe conduct. Much of the training took place in the Solent, where the professional crew faced challenges of collision avoidance, navigation and keeping a watchful eye on the trainees. When navigating in the Solent, Clipper training staff sometimes used personal, portable electronic devices such as smartphones or tablet computers to provide them with navigational situational awareness when on deck.

1.7.2 Clipper coxswain training

During pre-race training, the Clipper training staff assessed crew for their suitability to complete the Clipper coxswain course. The course was developed to provide a cadre of crew who would be capable of taking command in the event of a skipper's incapacitation on the round the world race. There was a strong emphasis on navigation in the course; candidates were required to complete a 7-day shore-based course covering RYA Yachtmaster offshore theory and ocean navigation training. This was followed by a 5-day sea phase covering safety systems, passage planning, coastal navigation and emergency management.

Clipper Ventures planned for each yacht to have a minimum of two Clipper coxswains on board throughout the race, with one officially designated to take over in the event of the skipper's incapacitation. There were two Clipper coxswain qualified crew on board *CV24*; the designated coxswain was off watch and the other Clipper coxswain was the safety officer who was trimming the spinnaker at the time of the grounding.

[13] 'World Sailing' is the global governing body for the sport of sailing

1.8 PASSAGE PLANNING

1.8.1 International requirement and Flag State guidance

Regulation 34 of SOLAS[14] Chapter V applied to all vessels and required that intended voyages were planned using the appropriate nautical charts and publications, taking into account the guidelines and recommendations contained in the International Maritime Organization's (IMO) Resolution A.893(21) - *Guidelines for Voyage Planning*. These guidelines explain that the development of a passage plan before departure and the subsequent monitoring of that plan at sea *are of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment.*

The IMO Resolution discussed the four key components necessary to ensure the effective planning and achievement of a safe passage. The initial voyage planning appraisal stage involved the gathering of all information relevant to the intended voyage. The next stage required the detailed planning of the whole voyage from berth-to-berth. The third and fourth stages were the effective execution of the plan and monitoring the progress of the vessel during the voyage.

MCA guidance[15] for UK registered small vessels stated that *the degree of voyage planning will depend upon the size of vessel, its crew and the length of the voyage. The MCA expects all mariners to make a careful assessment of any proposed voyage taking into account all dangers to navigation, weather forecasts, tidal predictions and other relevant factors including the competence of the crew.*

1.8.2 Company guidance

Section 9 of Clipper Ventures' standard operating procedures (SOPs) **(Annex H)** required skippers to produce a passage plan for all voyages outside the Solent. The passage plan was required to be written in the template that formed part of the logbook. Annex G of the SOPs was a checklist for passage planning.

The race director's instructions for the conduct of leg 3 **(Annex A)** contained detailed guidance on the race course, warnings and conduct of the leg. The race instructions also stated that the *safe navigation of the yacht is the sole responsibility of the Skipper and as such the Skipper shall ensure that when deciding on routing and selecting route waypoints consideration is given to all navigational hazards, crew strength, visibility and whether it is day or night. As a rule of thumb and depending upon circumstances, during daylight a 5nm separation from a known navigation hazard should be considered and at night this should be significantly more, up to 10nm.* This was a standard paragraph, which appeared in the race instructions for every leg of the race.

Section 10 of the SOPs **(Annex H)** was titled *Navigation in Coastal Waters* and provided additional guidance for operations in *high density traffic/buoyage areas*. This section advised skippers to keep a good lookout at all times and for crew to report any concerns about traffic or other hazards.

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[14] The IMO's Convention for the Safety of Life at Sea, 1974, as amended

[15] http://solasv.mcga.gov.uk/

Section 8 of the SOPs **(Annex H)** was titled *Log Books and Position Fixing*, and stated that a *fix should be plotted on an appropriate paper chart at least once every hour, this fix should be confirmed by more than one method. When navigating in the vicinity of navigational hazards it may be necessary to increase the frequency of these fixes.*

Under the heading *Watch Changeover*, the Race Crew Manual stated *that the watch leader (or anyone who navigates on his/her behalf) should carefully study the chart with the navigator they are relieving before going on deck.*

1.8.3 *CV24*'s passage plan

During the Cape Town stopover, *CV24*'s skipper reviewed the overall plan for leg 3 using electronic planning tools in Timezero. This involved highlighting potential hazards on the ocean passage and researching weather patterns and routing options.

After receipt of the logbook for leg 3 at the pre-race brief on 30 October 2017, the skipper filled in the passage planning template **(Annex I)**. In the weather forecast section of the passage plan, the skipper noted *NW*[16] *3 – 5 for start of race.* In the section titled *Detailed Narative Plan* [sic], it stated:

Race course in Table Bay

SA[17] *to port*

Rottnest Island Stbd

Freemantle via fairway [sic]

1.8.4 Passage monitoring on board *CV24*

The skipper had sole responsibility for the navigation of *CV24*. Paper charts were not in use and navigation of the yacht was managed using the Timezero system. There were no tracks, waypoints or danger areas set in the Timezero system and no depth sounder alarm set on any of the Garmin displays.

Prior to the grounding, the two remote Garmin displays at the port helm position were set up as follows:

- The left-hand display was set to a plan view with cursors showing the direction of the true and apparent wind. It also displayed digital values for: true wind speed, true wind direction, apparent wind speed and apparent wind direction.

- The right-hand display had a three-way split screen option with digital values of COG, Speed over the Ground (SOG) and the velocity made good (VMG) downwind.

The radar was off and the depth information was not on display at the port helm station. These settings were reconstructed by MAIB staff on board *CV23* on 27 November 2017 **(Figure 15)**.

[16] Abbreviation for north-west

[17] Abbreviation for South Africa

Figure 15: Reconstruction of *CV24*'s port helm instrumentation on board *CV23*

Heading control of *CV24* was managed by the skipper by either giving the helmsman a specific course to steer or a cone of suitable courses that would permit steering adjustments for maximum speed. The COG from the Garmin system was used when referring to *CV24*'s course.

1.9 GYBING

Gybing is a procedure for altering course when under sail so that the stern of the yacht goes through the wind resulting in the mainsail setting on the opposite side. Maximum speed when racing downwind in a Clipper 70 is normally achieved on a broad reach. This means that Clipper 70 yachts are not sailed directly downwind, and gybing is used tactically for fast downwind sailing or when the wind shifts and a course change is required with the sails on the opposite side.

The procedure for gybing a Clipper 70 with a spinnaker raised was described in the Race Crew Manual **(Annex E)**. This was a complex multi-stage process that required *timing, excellent communication and coordinated team work* for the *gybe to run smoothly.*

1.10 CLIPPER VENTURES PLC

1.10.1 History and evolution of the yacht fleets

Clipper Ventures was founded in 1995 with the aim of providing ocean sailing experiences for amateur sailors. Since its inception, Clipper Ventures has delivered and managed 11 editions of its round the world race, taking thousands of amateur sailors to sea.

The company has evolved and grown through three fleets of yachts. The original Clipper 60s were used for the races starting in 1996, 1998, 2000 and 2002. All the Clipper 60 races routed west around the world, avoiding the Southern Ocean.

A larger fleet of 10 Clipper 68 yachts, named *CV1* to *CV10,* was used for the races starting in 2005, 2007, 2009 and 2011. The Clipper 68s were built in China and the design was faster than its predecessor and optimised for downwind sailing. An eleventh yacht (*CV11*) was built to replace *CV4,* which had been abandoned in the Java Sea in 2010 [Section 1.11.2]. The Clipper 68 races routed eastward around the world to maximise downwind sailing opportunities and to introduce the challenge of crossing the Southern Ocean from South Africa to Australia. After their final race in 2011 - 2012, the Clipper 68 yachts were used in the UK and Australia for race crew training and corporate events.

In 2013, Clipper Ventures built and introduced its third fleet of yachts, the 12 Clipper 70s, named *CV20* to *CV31*. The Clipper 70 design was intended to have the look and feel of a modern ocean racing yacht. It was similar in size and displacement to the Clipper 68 but featured a wide, flat stern for stability downwind and was capable of speeds in excess of 30kts.

1.10.2 Board of directors

Clipper Ventures had three members on its board of directors, two of whom founded the company. The executive chair and co-founder was responsible for the company's primary output - the round the world race.

The chief executive officer was the principal shareholder and other co-founder of Clipper Ventures. He was a businessman who focused on the strategic management of the company: future plans, business structure and liaison with sponsors.

The chief operating officer (COO) was a management accountant and marine surveyor. The COO was based in the UK and focused on finance, personnel and project management including supervision of the design and build of new yachts. In accordance with the company's policy statement **(Annex J)**, the COO held board level responsibility for health and safety.

Board members of Clipper Ventures did not meet regularly or on a formal basis, instead they stayed closely in touch with one another to develop strategy and manage the business. The board members did not have formal terms of reference for their roles. Clipper Ventures' safety management processes had never been audited or assessed by an external authority.

1.10.3 The race director

Clipper Ventures' race director was an experienced professional yachtsman and former Clipper round the world skipper who had previously served as the deputy race director. The race director was responsible for running all aspects of the round the world race including: recruitment and training of race skippers, preparation and maintenance of the race fleet and planning and delivery of each race leg.

Throughout the 11-month race, the race director was the first point of contact for race skippers on any issues ranging from accident reporting, safety concerns, defects, welfare and personnel issues. Historically, some of this task was delegated to the deputy race director. At the time of the accident, the deputy race director was new in post and learning the role; as a result, the race director was routinely taking calls from the race skippers. The race director did not have formal terms of reference and reported directly to Clipper Ventures' executive chair.

1.10.4 The head of training

Clipper Ventures' head of training was an experienced professional yachtsman and former Clipper round the world skipper. The head of training was based in the UK and primarily responsible for delivery of crew pre-race training. He was also responsible for the completion of on-water risk assessments [Section 1.10.6]. The head of training was qualified as an RYA Yachtmaster instructor, and Clipper Ventures was accredited by the RYA as a training centre for the delivery of RYA training schemes and award of RYA certificates.

1.10.5 Company obligation for health and safety

Clipper Ventures' obligations for health and safety at sea were set out in the Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997. Further detail was provided in Annex 3 of the SCV Code Section 2.10.1, which stated that:

> *…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.

For on-water activities, the company's health and safety policy statement **(Annex J)** deferred to the SOPs, with an action on company staff to ensure that these procedures were followed in order to ensure *the maximum possible level of safety*.

1.10.6 Risk assessment for navigation in coastal waters

Clipper Ventures' risk assessment for navigation in coastal waters **(Annex K)** applied to all sailing operations, including training and racing. The risk assessment identified three hazard areas: *proximity of navigational hazards, density of traffic* and *specific navigational zones*. These were categorised as 'harmful' but 'unlikely', generating an overall assessment of a 'moderate risk'. Mitigation of the identified hazards included the provision of up to date charts and publications, keeping a good lookout, and a requirement for skippers to produce a formal passage plan when outside the Solent area.

1.10.7 Standard operating procedures

Clipper Ventures' SOPs provided guidance for skippers and crew on evolutions, safety equipment, deck safety and personal conduct. The SOPs list of contents is at **Annex H**; guidance on navigation in coastal waters was included in Section 10; there was no emergency procedure for grounding.

The SOPs were supplemented on board *CV24* by the original skipper's standing orders **(Annex L)**. These standing orders highlighted critical safety requirements for the crew on board as well as the skipper's specific requirements, including the circumstances in which he was to be called.

1.10.8 Race Crew Manual

Clipper Ventures' Race Crew Manual was the primary reference document for round the world race crew. The document covered all aspects of training, personal administration, operations, roles on board, personal conduct and safety on board. The Race Crew Manual did not contain guidance on the conduct of navigation. An extract of the Race Crew Manual is at **Annex E**.

1.10.9 Safety committee

Clipper Ventures established a safety committee for the 2017 - 2018 race. The committee was chaired by the race director with the deputy race director and a Clipper coxswain from each crew present. The stated purpose of the safety committee was *to uphold and improve the safety culture on board the Clipper Race Fleet.*

The inaugural meeting was held on 30 September 2017 in Punta del Este. This meeting primarily consisted of feedback on safety issues from Clipper coxswains to Clipper Ventures' staff. Issues raised at the meeting included concerns over: water ingress, failing rope jammers and the lack of mobility of some crew. The meeting closed by concluding that safety culture was *very good across the board*.

The second safety committee meeting was held in Sydney on 18 December 2017. Key issues raised at this meeting included concerns over new tethers that had been issued, and the requirement for clarity on the role of the mate on board [Section 4.3]. The minutes of the meeting did not include any concern or discussion on navigational safety. This meeting concluded that *the safety culture amongst the fleet is deemed to be very good across the board with a high level of effort made from all crew*. There were no specific safety related actions in the minutes from the first two safety committee meetings.

1.10.10 Accident and incident reporting

Clipper Ventures SOPs Section 11 titled *Accident and Incident Reporting* **(Annex H)** required skippers to inform company staff of all accidents and injuries, including minor events such as *successfully recovered MOB*[18] *or accidental/crash gybes*. Accidents occurring during race training were to be reported to the company's head of training, those occurring during corporate events were to be reported to the event manager, and accidents during the round the world race were to be reported to the race office. The SOPs discouraged skippers from reporting accidents directly to the MAIB, instead stating that this action would be undertaken by the company's staff.

Clipper Ventures maintained a spreadsheet of all reported accidents or incidents. Between the period 7 September 2015 and 31 October 2017, the database contained 107 reported incidents or accidents. In this reporting period, Clipper Ventures submitted 12 accident reports of groundings to the MAIB. Of these, eight groundings occurred during the round the world race and four occurred during training in the Solent area. Only five of the groundings reported to the MAIB also appeared in the company's accident spreadsheet.

The database included a column titled *Avoid Similar Incidents*. Comments in this column included:

- *Less aggressive tacking* (grounding on 17 May 2016)
- *Have lookout on foredeck* (grounding on 23 August 2016)
- *Set clear parameters, depth, transits, for tacking. Have better overall view as skipper* (grounding on 5 March 2017).

[18] Man overboard

1.11 PREVIOUS OR SIMILAR ACCIDENTS AND SAFETY RECOMMENDATION

1.11.1 *CV21* fatalities – MAIB Report 7/2017

MAIB Report 7/2017 described the causes and circumstances of the two fatal accidents on board *CV21* during the 2015 - 2016 Clipper round the world race. The Chief Inspector of Marine Accidents' foreword to the report stated that *a mature safety management system monitors and challenges itself. It challenges the sufficiency and suitability of its risk controls, not just to ensure compliance with regulations but also to ensure they are fit for purpose. It then monitors their implementation and effectively identifies and challenges any non-conformities. The investigations have identified deviations from the company's existing procedures that contributed to both accidents. The effectiveness of some risk controls, such as pre-race training, can be monitored effectively ashore. However, shore-based company oversight is limited and difficult once the race has started and is largely reliant on the expertise and supervision provided by the professional skipper, who is the sole company representative on board.*

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

The report made a recommendation to Clipper Ventures to 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, which was approved by the MCA, would *bring up matters of concern far more freely than a person who is 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[19].

1.11.2 Grounding of *CV4* in the Java Sea

At about 0400 local time on 14 January 2010, the Clipper 68 yacht *CV4* ran aground on the Gosong Mampango reef in the Java Sea, Indonesia. The reef was a waypoint for the race and the crew approached it in dark, windy and rough conditions. Despite the crew's efforts to free the yacht, it could not be moved. Later that day and in daylight, the crew abandoned the yacht **(Figure 16)** and were rescued by another Clipper Ventures' yacht; some of the crew suffered minor injuries.

The grounding of *CV4* was investigated by Maritime Claims and Services Limited on behalf of the Register of Shipping, Jersey, the yacht's Flag State at the time. This investigation identified that the reef was almost a mile to the east of its charted position and its navigation light and racon beacon were not working. On board *CV4*, there was a total reliance on electronic navigation, and printed warnings regarding inaccuracy of GPS positions were disregarded. *CV4*'s skipper was the only person

[19] A safety committee was established for the 2017 - 2018 round the world race, see Section 1.10.9

Image courtesy of Clipper Ventures plc

Figure 16: *CV4* aground on the Gosong Mampango reef in 2010

actively engaged in the navigation, and when the reef's light and racon beacon were not seen visually or detected by radar when approaching, no precautions were taken.

The report also highlighted that *CV5,* which was about 5nm astern of *CV4*, had also been at risk of grounding. Although acknowledged as supposition, the report stated that *it would appear that a number of yachts were heading towards an out of position reef, all relying on GPS*.

The report recommended that Clipper Ventures' standing orders should be amended to include a requirement that *if an electronic position cannot be cross-checked by other means then extreme caution must be exercised in the vicinity of land or shoals and they should not be approached within 10 nautical miles during the hours of darkness.*

The report also recommended that consideration be given to nominating a dedicated navigator for each yacht. It was not envisaged that this would restrict the skipper in his navigation of the yacht but would involve a second party in the making of passage plans, relieving some of the skipper's workload.

1.11.3 Grounding of *Vestas Wind* on the Cargados Carajos Shoals

At 1915 on 29 November 2014, the Volvo 65 ocean racing yacht *Vestas Wind* ran aground and became stranded on the Cargados Carajos Shoals, 240nm north-east of Mauritius. All nine crew members were safely evacuated with only minor injuries and *Vestas Wind* was eventually recovered and repaired. *Vestas Wind*'s crew included a very experienced professional yachtsman assigned the role of navigator.

The official report[20] into the grounding identified that the primary cause of the accident was that the crew was unaware of the presence of any navigational danger in the vicinity. Other significant causal factors included: deficient use of electronic charts, late formation of the crew, a short preparation time at Cape Town and the taxing sea routine for the skipper and navigator.

Vestas Wind's navigational equipment included two multi-function displays (MFD): one was at the nav station and the other was situated inside the main hatch (or 'tunnel') where it could be viewed from the cockpit. Although capable of being used as chart plotters, neither MFD was being used for navigation and only had the standard default worldwide chart installed. The main use of the MFDs was to monitor shipping using AIS data. The *Vestas Wind* report identified that, had the tunnel MFD been set up for navigation, it could have provided warning of the danger ahead to the crew on deck.

Vestas Wind's navigator had prepared for the leg by *doing a large amount of pre-planning during the previous stopover*. Nevertheless, one of the report's recommendations was that the navigators of Volvo Ocean Race yachts should be allowed *to stand down from the 'in port' race in order to continue preparation for the next leg*.

The *Vestas Wind* independent investigation team also published suggested passage planning guidelines for ocean racing yachts **(Annex M)**. This guidance offered 12 preparatory steps including gathering information, testing equipment and discussing how navigation will be managed on board. The guidelines then suggested 14 steps of detailed planning, including identifying hazards, preparing a range of potential routes and marking depth limits and guard sectors in navigation systems. For passage monitoring during the race, the guidance proposed 11 planning ideas to consider.

1.11.4 Other Clipper Ventures' yacht groundings

In addition to the grounding and loss of *CV4* and *CV24*, the MAIB holds records of 17 other groundings of Clipper yachts in the 5 years prior to this accident, and one since:

- *CV27*. On 23 August 2013, prior to the start of the 2013 – 2014 race, *CV27* ran aground in the Thames Estuary while conducting crew drills on deck. Depth information was not being displayed at the helm and the skipper was distracted from navigation by the drills. *CV27* grounded again on 6 September 2013 at Rade du Brest, France. It made light contact with the ground where insufficient care was being taken navigationally in unfamiliar waters.

[20] Available at: http://www.volvooceanrace.com/static/assets/content_v2/media/files/m36616_team-vestas-wind-inquiry-report-released-on-9-march-2015.pdf

- *CV29*. On 14 July 2014, *CV29* ran aground on Goodwin Sands in the Dover Strait; although slowed down by the event, it did not stop, and continued the voyage. The crew had been focused on keeping the yacht's sails filled, rather than maintaining a safe navigational course. Clipper Ventures' report to MAIB of the grounding stated that the navigation station should have been manned continuously when in shallow waters.

- *CV24*. On 17 June 2015 when conducting crew training, *CV24* ran aground on Ryde Sands in the Solent. The skipper was on deck briefing the crew on procedures and had not checked the navigational situation sufficiently frequently to appreciate the risk of grounding. The yacht's engine was used to drive off the sandbank, and Clipper Ventures' report of the grounding to the MAIB stated that its skippers had been briefed to pay more attention to the safe navigation of their vessels.

- *CV24* and *CV28*. At 0012 local time on 30 September 2015, *CV24* ran aground when motoring on an inshore night passage between Rio de Janeiro and Angra dos Reis, Brazil **(Figure 17)**. *CV24* was being moved in preparation for some work to be undertaken the following day; visibility was good, sea state slight and light winds. There was a reduced crew of four on board and the helmsman, who was alone on deck, became disorientated, resulting in the grounding. There was no water ingress or injuries, but the yacht's starboard rudder was broken off. Clipper Ventures' report to the MAIB of the grounding stated that all crew had been re-briefed on the importance of following a navigation plan. At about 1815 local time on 2 October 2015, *CV28* ran aground when motoring to assist the grounded *CV24. CV28* caught a line around its propeller and, soon after losing propulsion, drifted ashore; there were no injuries but *CV28*'s port rudder was broken. *CV24* and *CV28* were both towed off the beach and lifted out of the water for inspection and repairs.

- *CV30*. On 18 February 2016, in the approaches to Da Nang, Vietnam, *CV30* grounded twice in a newly dredged channel. After the second grounding, *CV30* was refloated when towed off by a local tug.

Figure 17: *CV24* aground in Brazil in 2015

- *CV23*. On 12 March 2016 in calm, clear daylight conditions, *CV23* ran aground at the entrance to the Olympic Sailing Harbour, Qingdao, China; there was minor damage in the form of scrapes and scratches to the keel. As *CV23* approached the harbour, all the crew were on deck to prepare the yacht for berthing and pre-arranged arrival photographs. This meant that the navigation station was unmanned when *CV23* struck a charted obstruction in the channel. Clipper Ventures' report to the MAIB identified that keeping a member of the crew in the navigation station when in pilotage waters would have helped prevent the grounding.

- *CV6*. On 17 May 2016, *CV6* was preparing to tack in the Solent during a training sail. The crew had to deal with a rigging issue, which delayed the tack, and the yacht grounded and stopped. An additional headsail was raised to increase the angle of heel, and aided the yacht back into deeper water. Clipper Ventures' report to the MAIB identified that the skipper had not allowed sufficient time for the inexperienced crew to tack the yacht when sea room was restricted.

- *CV26*. On 14 July 2016, *CV26* was motoring between Greencastle and Derry-Londonderry in Northern Ireland when it ran aground outside the buoyed channel. The skipper freed *CV26* from the grounding position using astern power on the engine. Clipper Ventures' report to the MAIB did not offer any explanation for the grounding or actions taken as a result.

- *CV21*. On 17 July 2016, *CV21* grounded when motoring out from Derry-Londonderry to the open sea. The yacht was inside the buoyed channel at slow speed and grounded briefly; the whole crew moved to the port side to generate an angle of heel, and the skipper manoeuvred the yacht free using full astern power. The reported position of the grounding should have had sufficient depth of water for the yacht, and the position of the unexpectedly shallow water was reported to the local harbourmaster.

- *CV31*. On 30 July 2016, *CV31* grounded on a sandbank near Southend Pier. The mainsail was raised, the engine was running and the skipper instructed the watch leader to drive the yacht around the vicinity of the Pier while keeping watch on the navigational situation. The skipper then went to his bunk, but was awoken 10 minutes later when *CV31* had grounded. Despite generating an angle of heel and applying full power astern, the yacht could not be freed and was later towed off the sand. Clipper Ventures' report to the MAIB highlighted that there had been no passage plan or areas to avoid marked on the chart.

- *CV8*. On 23 August 2016, *CV8* ran aground when preparing to pick up a buoy outside Yarmouth Harbour in the western Solent. The skipper had lost sight of the Black Rock Buoy as it was obscured by crew members standing on deck. As a result, the vessel inadvertently passed inside the buoy and grounded. It was identified that a dedicated lookout on the foredeck when a working party was also there could have aided the skipper's situational awareness.

- *CV20*. On 5 March 2017, *CV20* grounded in the eastern Solent during a training sail. The skipper had become distracted by evolutions on deck and had not briefed the helmsman on the depth to start the tack evolution. When the helmsman saw the depth shelving rapidly, the yacht was put into a tack, but this was too late to avoid grounding; *CV20* refloated about 2 hours later.

- *CV9*. On 30 April 2017, *CV9* grounded in the Medina River, Isle of Wight. It was low water at the time and, despite the depth sounder being monitored, the skipper misjudged the depth of water available. *CV9* was refloated using its own engine power after about 5 minutes.

- *CV30*. On 20 August 2017, the first day of the 2017 – 2018 round the world race, *CV30* grounded when exiting Liverpool. It was daylight, good visibility and *CV30* was proceeding along the Liverpool buoyed channel. The skipper briefed the crew on deck to remain in the channel then went below to assist with stowage. A few minutes later, a judder was felt as *CV30* ran aground on Taylor's Spit, outside the buoyed channel. *CV30*'s speed reduced but it did not stop and was headed back into the main channel. Clipper Ventures' report of the grounding to the MAIB recommended that skippers' navigation briefs for crews should be more detailed.

- *CV6*. At 1000 on 22 November 2017[21], *CV6* ran aground on Southsea beach, Portsmouth. *CV6* was motoring out of Portsmouth Harbour when the engine stopped unexpectedly. The crew hoisted the storm jib but could not bring *CV6* under control before being blown onto the lee shore. Two police rigid hulled inflatable boats, a windfarm support vessel, dockyard tug and the Bembridge lifeboat were soon in attendance. *CV6* was hauled off the beach by the windfarm vessel, then towed back into the harbour by the tug before being aided alongside by the lifeboat.

1.11.5 Urgent safety recommendation

Based on the initial analysis of evidence from the grounding of *CV24*, the MAIB issued safety recommendation 2017/151 to Clipper Ventures on 17 November 2017 [Section 4]. Clipper Ventures was recommended to take urgent action to improve the ability of its skippers and watch leaders to maintain positional awareness while on deck in pilotage and coastal waters. The recommendation also suggested that consideration should be given to: provision of a chart display on deck, more effective use of onboard navigational equipment and more clearly defining the duties of the watch navigator.

[21] This accident occurred after the grounding of *CV24* in South Africa

SECTION 2 - ANALYSIS

2.1 AIM

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

2.2 OVERVIEW

The ocean racing yacht *CV24* ran aground on Cape Peninsula during the first night of leg 3 of the Clipper round the world race. The grounding occurred soon after the yacht had been gybed in an attempt to steer it away from land.

This section of the report will explore the circumstances of the coastal passage from Table Bay to the grounding position, in particular: onboard decision-making, conduct of navigation and environmental effects. The actions of other yachts in the race have also been considered as context for *CV24*'s grounding. The investigation also considered pre-conditions that were contributory, including passage planning, onboard manning arrangements and company level safety management.

2.3 THE GROUNDING

2.3.1 The backing wind

After *CV24* had gybed at 1918, the COG was reported as 205º. However, the crew at the helm were finding it difficult to maintain a steady heading and *CV24* was actually making good a course of about 175°. At 2016 there was a clearly defined alteration of course to port **(Figure 18)**; this event does not correlate with any change of helmsman or new course ordered by the skipper. At about 2030 the skipper had directed that a course between 160º to 168º should be maintained; however, this did not happen and, instead, *CV24* continued to turn slowly to port.

Between 2000 and 2115, the true wind was recorded in *CV24*'s log as backing from 059º to 351º. The latter wind direction was predictable from the GRIB data **(Figure 13)** and as recorded in the written passage plan **(Annex I)**. During this time, *CV24* was sailing with its full mainsail and code 2 spinnaker raised. In this configuration, the apparent wind direction was critical to the safety of the yacht. If the apparent wind moved too far aft there was a risk of the spinnaker collapsing or an accidental gybe.

As the true wind backed, the crew focused on maintaining a safe apparent wind, which resulted in a loss of heading control from 2016 until the grounding **(Figure 19)**.

2.3.2 Managing the gybe

By about 2000, crime watch were on deck and bay watch were resting below; prior to this time, the whole crew had been available for evolutions such as gybing or tacking. Gybing a Clipper 70 at night with a spinnaker hoisted was a time-consuming and complex evolution requiring teamwork and leadership on deck.

Reproduced from Admiralty Chart 4150 by permission of HMSO and the UK Hydrographic Office

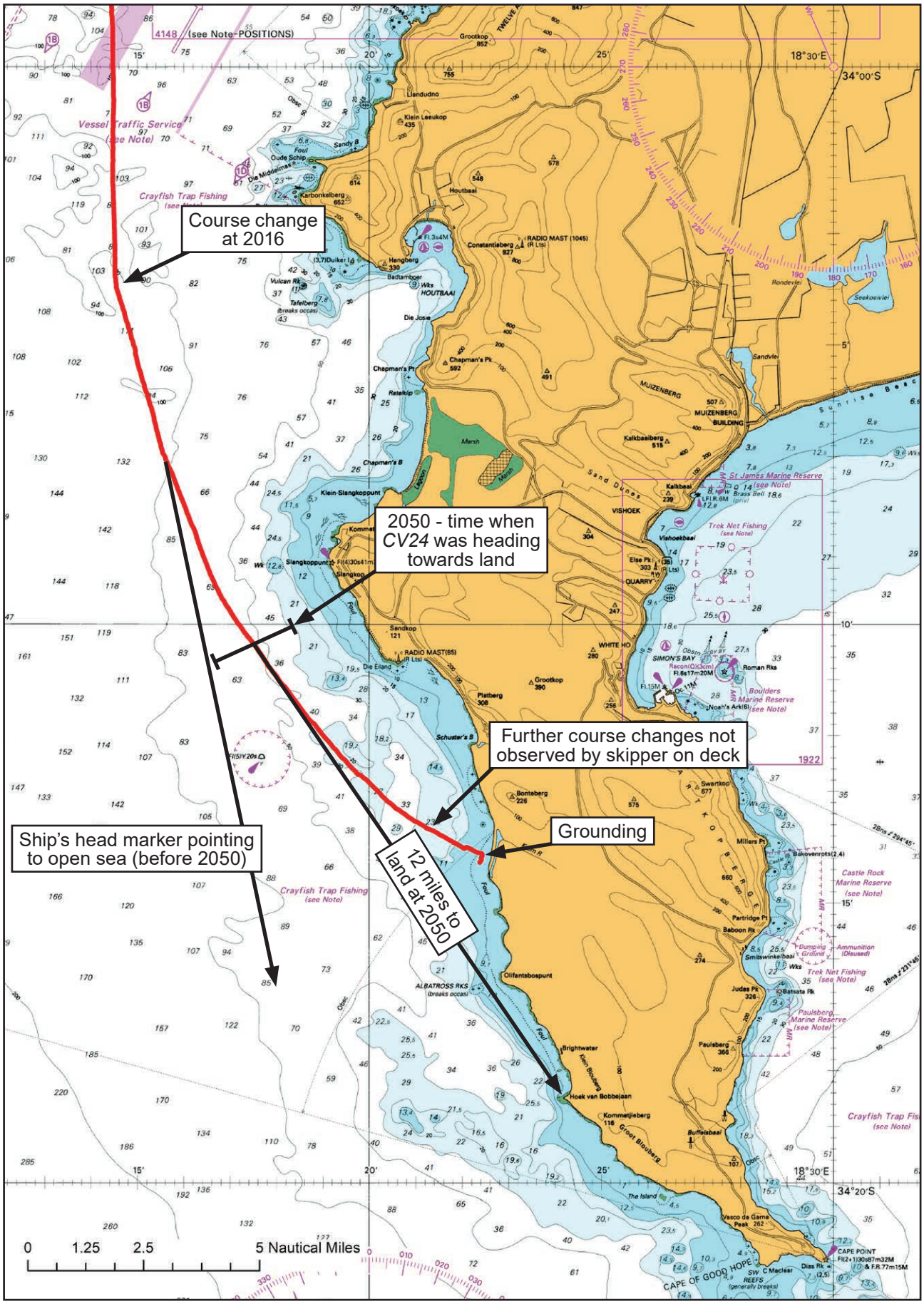

Figure 18: Chart showing analysis of coastal passage

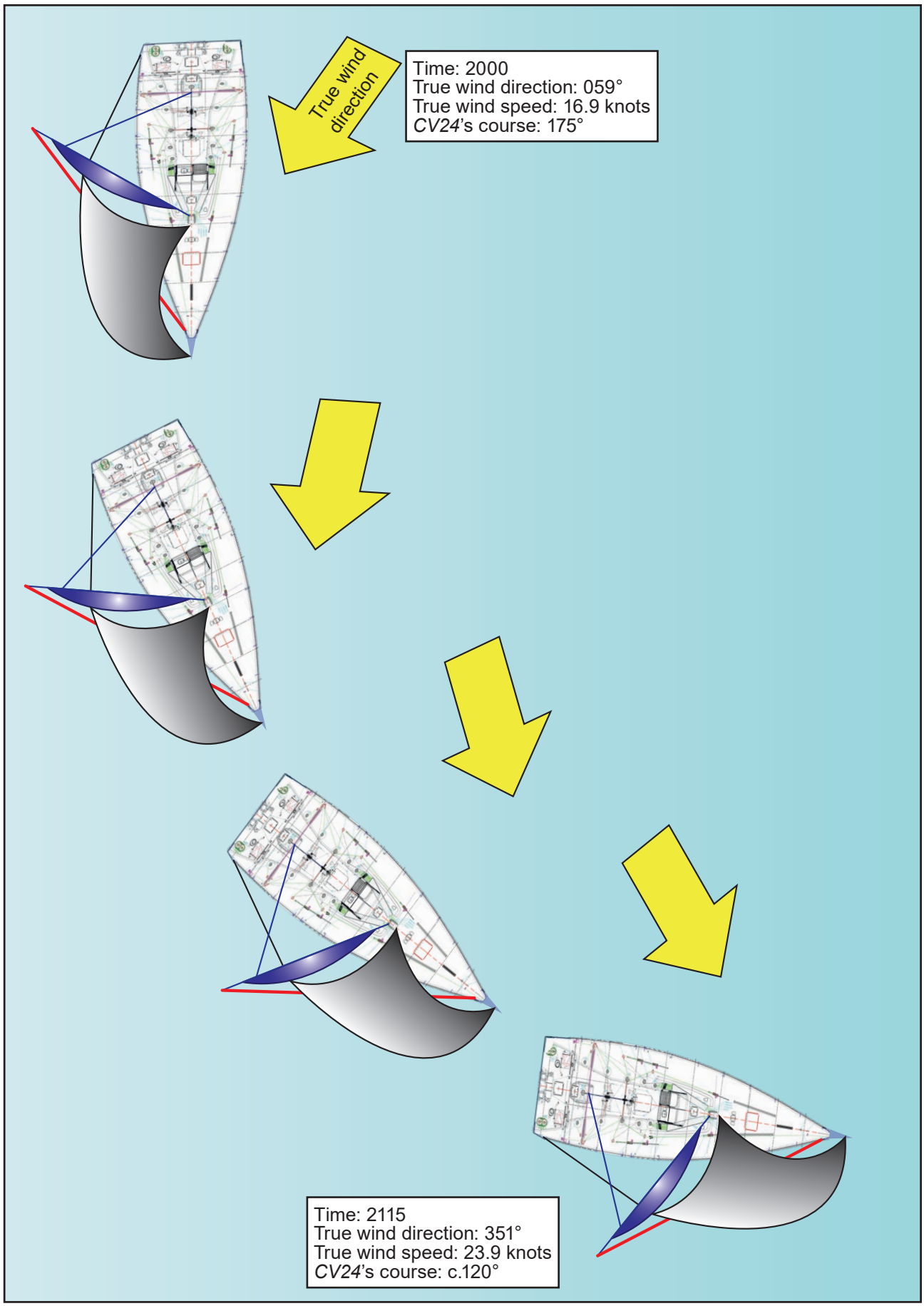

Figure 19: Diagram illustrating *CV24*'s turn to port as the wind backed

Although all of crime watch had completed Clipper's pre-race training, which included gybing under spinnaker, only three of the crew on deck had worked together in the watch system before. The watch leader was not familiar with the strengths and weaknesses of his team, having switched watches in Cape Town, and was also focused on helming from 2100 onwards. Preparations for gybing were also slowed by the darkness as more care and time was required for deck evolutions at night.

The skipper had initially notified the crew on deck that a gybe would be necessary at about 2100, soon after noticing that the yacht was heading towards land. Around 10 minutes later and only 15 minutes before the grounding, the skipper was on deck taking charge of the crew for the gybe evolution. It was only at this stage that the deck preparations were properly underway to safely gybe the yacht. In the dark, with a spinnaker raised and a newly formed watch on deck, 15 minutes was probably insufficient time to undertake a complex, time-consuming deck evolution in a controlled and safe manner. As the crew were preparing to gybe, *CV24* broached in a gust and control of the yacht was lost, further delaying the gybe while the yacht was brought back under control.

2.3.3 Appreciation of danger

Once clear of Table Bay, the skipper had been regularly assessing the navigational situation using the Timezero display. The ship's head marker on this display had been indicating that, if a steady course was maintained, *CV24* would pass the Cape safely **(Figure 18)**. As a result, although the skipper was aware that *CV24* had turned to port, his analysis of the situation was that there would be no requirement to gybe as the yacht would eventually pass clear of land.

By 2050, *CV24* was heading towards land **(Figure 18)**. Soon after this time the skipper saw the ship's head marker on the Timezero display pointing to the distant shore, and reacted by telling the crew on deck that a gybe would be necessary in order to pass the Cape safely. When the skipper first saw the ship's head marker pointing to shore, the land directly ahead was 12nm away **(Figure 18)**. The skipper had made a mental note of this situation and assessed that there was plenty of time to carry out the gybe manoeuvre. Indeed, given the yacht's speed was about 12kts, if a steady course had been maintained, the skipper's calculation would have been that there was about an hour to complete the turn.

From about 2110, the skipper was on deck taking charge of the gybe and supervising the crew sailing the yacht on the first night of the leg; he detached the preventer and heaved in the mainsail himself to speed up the gybe preparation. However, by taking part in the gybe evolution himself, the skipper became distracted from the critical task of navigating the yacht. Working in the cockpit without direct access to navigational information, the skipper was unaware of the yacht's continued slow turn to port, an alteration of course effectively halving the time available for the gybe **(Figure 18)**. The close proximity of other yachts, tracked on AIS and seen visually, might also have given a false sense of security to the skipper and crew that there was no immediate danger.

At 2054, *CV24* crossed the 50m contour, and at 2102 it crossed the 30m contour. However, as echo sounder information was not on display at the port helm position, the rapidly decreasing depth was not observed. Once close inshore, *CV24*'s crew were not alerted to the danger ahead visually as the landscape was featureless and

obscured in the hazy conditions. It was not until the assistant watch leader went to the fore deck and saw the beach that there was any indication of close land. However, the distance was hard to judge.

When the skipper had last seen the Timezero display, *CV24* had been on a south-easterly heading and his perception was that a gybe would be sufficient to take *CV24* on to a south-westerly heading, away from the land. However, after the broach, *CV24* was on a heading of about 120º, directly towards the beach **(Figures 3** and **20)**. As a result, the gybe did not take *CV24* away from danger, at best it put the yacht on a course running parallel with the shore. The skipper could not have known this since he was still in the cockpit, where there was no heading information available to him.

The skipper's distraction from navigation, the depth information not being displayed and the hazy conditions meant that neither the skipper nor any of the crew on board *CV24* properly appreciated the immediate risk of grounding.

2.4 THE OTHER YACHTS

CV20, CV22, CV26, CV27, CV29, CV30 and *CV31* all followed tracks similar to *CV24* **(Figure 7)**. Of these yachts, *CV31* experienced a very similar set of circumstances to *CV24*, including delays in the preparation for gybing and the skipper being in the cockpit without immediate access to positional data. When the skipper of *CV31* heard the impacts on the hull, his instinct was to turn the yacht away from danger by means of an immediate gybe.

CV20, CV24 and *CV31*'s tracks are shown at **Figure 20**. *CV24*'s grounding position was 450m from the beach, whereas *CV31* passed 190m from the beach and just 140m from a point of land after the gybe. Based on the initial report by the skipper of *CV31* [Section 1.3.7] and this analysis of the proximity to danger, it is assessed that *CV31* almost certainly grounded, but did not stop.

2.5 THE ROLE OF NAVIGATOR

The investigation into the grounding of *Vestas Wind* [Section 1.11.3] described how the preparation and monitoring of a passage plan was a full-time role on board an ocean racing yacht. The MAIB's report into the fatal accidents on board *CV21* recommended the presence on board of a second suitably qualified person, and the report into the grounding of *CV4* in 2010 also recommended that consideration be given to nominating a dedicated navigator for each yacht.

Clipper Ventures' syllabus for race crew training levels 1 to 4 [Section 1.7.1] did not include navigation, which meant that the company had not identified a need to prepare paying crew to take responsibility for navigation. The Clipper coxswain training scheme did include navigation; however, this was intended as a safeguard against incapacitation of the skipper rather than providing the skills needed for a formal role as navigator. Additionally, the original skipper's manpower plan **(Annex F)**, allocating crew roles prior to the start of the round the world race, made no mention of a navigator, reinforcing the absence of any expectation that the crew would assist with navigation.

Image courtesy of Esri, Digital Global

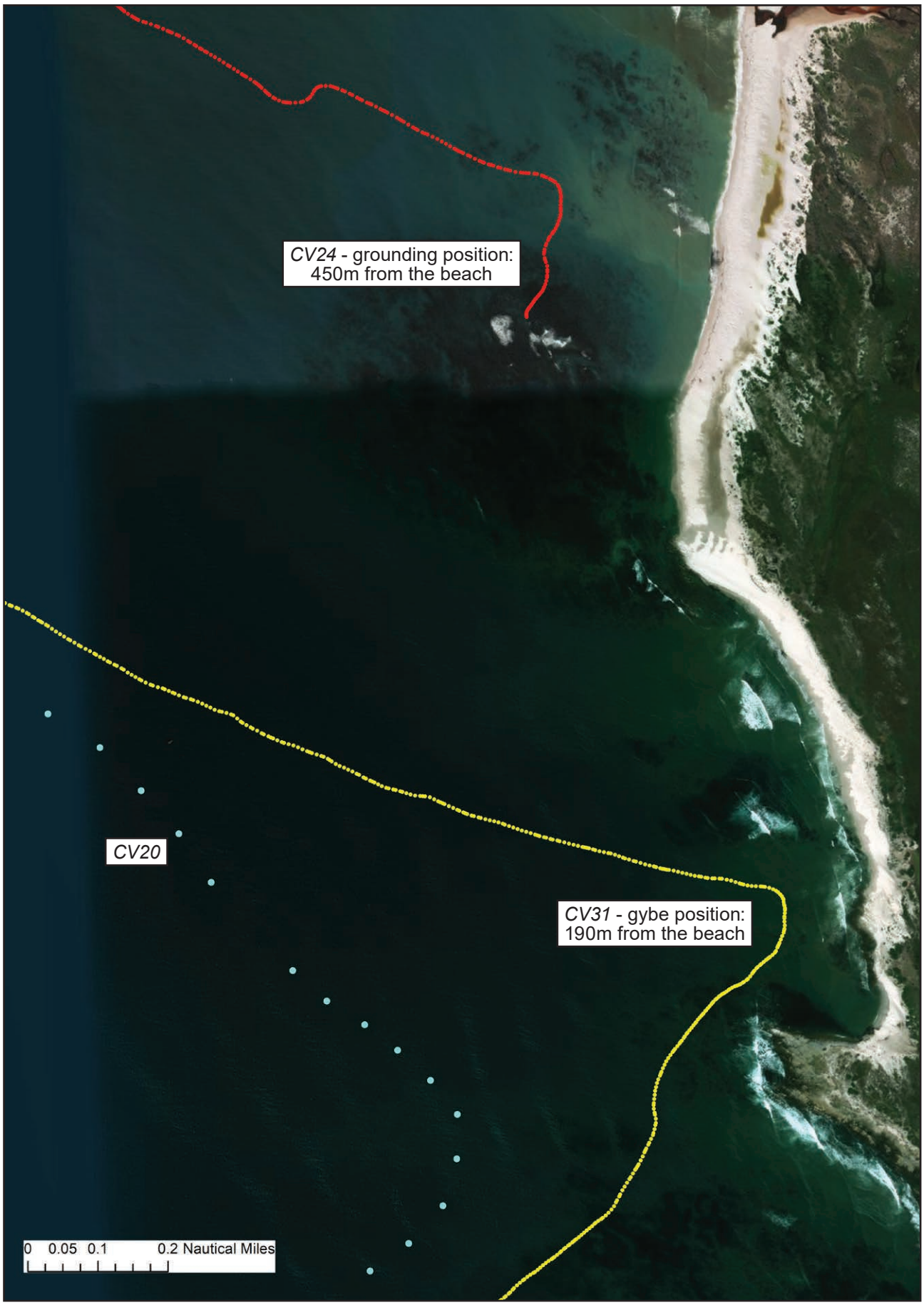

Figure 20: Tracks of *CV20*, *CV24* and *CV31* superimposed on earth satellite imagery

Nevertheless, Clipper skippers were required to nominate a navigator on the pre-race declaration form before the start of each leg. For leg 3, *CV24*'s skipper nominated two crew members as navigator **(Annex G)**, both of whom had sailing experience and qualifications. However, neither of the nominated navigators had assisted the skipper with passage planning and both were off watch prior to the grounding.

CV24's crew watchbill for leg 3 **(Figure 14)** assigned 'nav' duties to a member of each watch; this was referred to on board as the watch navigator. However, none of Clipper Ventures' documentation offered any guidance on such a role. The watch navigator of crime watch held an RYA coastal skipper qualification and had sailing experience; however, he had been on deck helming and check helming prior to the accident and was not instructed by the skipper or watch leader to assist with navigation. Even if the watch navigator had gone to the nav station, there was no passage plan to monitor or report on [Section 2.8].

On Clipper Ventures' yachts, there was no formal role of navigator to assist the skipper. Despite evidence and recommendations from previous accidents reinforcing the importance of the role, and the presence on board *CV24* of crew with previous sailing experience, Clipper Ventures had no specific expectation of crew members assisting the skipper by taking on some responsibility for navigation.

2.6 SAFE MANNING

The SCV Code required Category 0 yachts to have a minimum of two crew both holding a commercially endorsed RYA Yachtmaster qualification. There was also a requirement to ensure that there was *at all times, a person with adequate experience in charge of the navigational watch.*

However, Clipper Ventures had negotiated a bespoke agreement with the MCA, which led to the issue of a letter **(Annex D)** stating that *whenever possible Clipper Ventures plc should have suitably qualified persons onboard as required by the SCV Code*. The letter went on to state that when a Clipper Ventures' yacht did not have a second Yachtmaster qualified person on board, *a second person must be onboard who has successfully completed the Clipper Coxswain's Course.* Clipper Ventures' interpretation of this letter was that a crew member who had completed the Clipper coxswain course was acceptable as the second qualified person throughout the round the world race. While the letter did not state any conditions under which the MCA would accept the absence of a second Yachtmaster, its intent was clear in the opening paragraph, which required SCV Code compliant manning *whenever possible.*

Although the fatalities from *CV21* during the 2015 – 2016 race were not navigational accidents, the MAIB report recommended a second employee or contracted seafarer in order to provide for the health and safety of everyone on board. However, Clipper Ventures chose to continue with its policy of having only one professionally qualified skipper for the 2017 – 2018 round the world race.

Given the SCV Code obligation for the skipper to have minimum hours of rest, there was a requirement for delegation of safe conduct of the navigational watch to the watch leaders. Watch leaders on board Clipper Ventures' round the world yachts were chosen by skippers after allocation of crew to each yacht. Watch leaders were chosen based on their *leadership, communication and decision-making skills*

and their responsibilities included *sailing the yacht, her safety and the safety of the crew*; however, there was no additional training provided for the role. The watch leader of crime watch, who was helming at the time of the accident, had no previous sailing experience before applying to Clipper Ventures. Although chosen because of leadership and communication skills, the watch leader did not have the appropriate qualifications or experience to be delegated responsibility for maintaining a safe navigational watch when the skipper was not immediately available.

Given the duration of the race legs, the potentially harsh sea conditions and the largely amateur crew, the use of a single, employed, professional seafarer on board did not provide adequate safe manning for the round the world race.

2.7 PASSAGE PLANNING

Passage planning is an obligation under SOLAS regulations [Section 1.8.1] and required consideration of a broad range of documentary and electronic references to prepare a comprehensive plan.

During the Cape Town stopover, *CV24*'s skipper reviewed the overall plan for the passage ahead, electronically highlighting potential hazards on Timezero, and researching likely weather patterns and routing options for the ocean passage. The day before leaving Cape Town, the skippers were issued with their logbooks for leg 3; *CV24*'s skipper then completed the passage planning template that formed part of the log **(Annex I)**.

Although the South African coastline had been identified as a hazard in the written plan, there was no information detailing how *CV24* was to be kept safe. While this written passage plan fulfilled the company's obligation for skippers to complete a plan, it fell short of the level of detail necessary, particularly for the coastal passage stage of the voyage. The skipper's electronic planning on Timezero was focused on the ocean passage and did not highlight hazards for the coastal passage. The safety features available in Timezero had not been utilised and no electronic track with cross track distances had been plotted, no dangers had been highlighted and no safety depths or parameters for a look ahead zone had been calculated. **Figure 21** is a photograph of *CV24*'s Timezero display taken when aground, illustrating the absence of any electronic safety information for the coastal passage. **Figure 7** also illustrates that none of the yachts adhered to the company's planning guidance, that navigational hazards should, where possible, be avoided by 10nm at night.

It was unhelpful that the bespoke passage planning form for the leg was not issued to the skipper until the day before sailing as this undermined the importance of the company's requirement to prepare a plan. The absence of a dedicated navigator also meant that no member of the crew was formally responsible to assist the skipper by preparing a passage plan. However, the lack of sufficient pre-departure passage planning largely occurred due to the skipper's low expectation of navigational danger. The skipper's intention to head offshore after leaving Table Bay, keeping clear of the Cape Peninsula, eroded the need for a detailed plan for the coastal section of the leg, although he had identified hazards for the ocean passage.

Image courtesy of Don Peterson

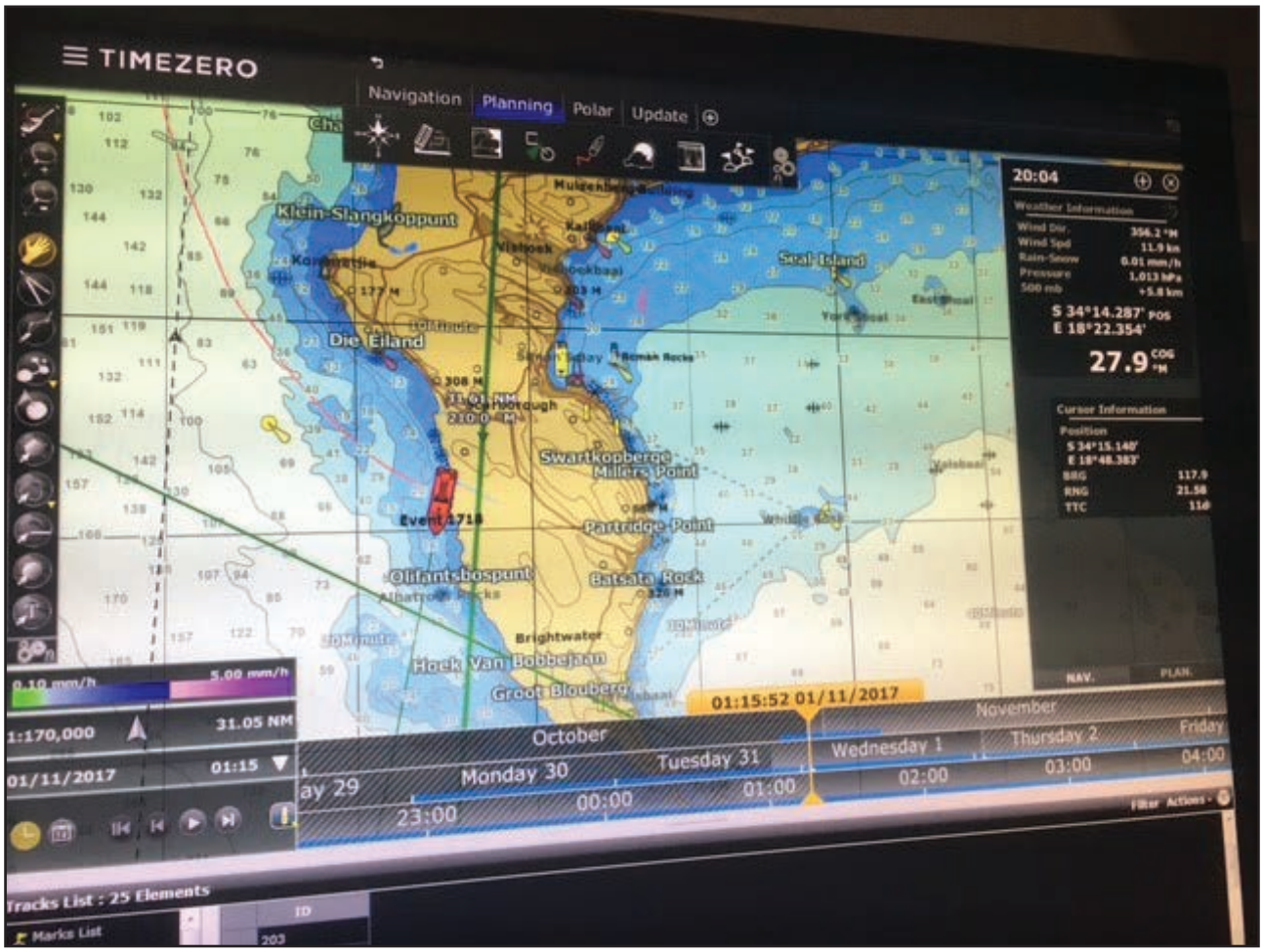

Figure 21: Image of *CV24*'s Timezero plotter when aground illustrating the absence of a passage plan or safety areas

2.8 PASSAGE MONITORING

Although the skipper's plan was to stay away from the coast and head out into the open sea, the voyage from Cape Town to the Cape of Good Hope was a coastal passage. Navigational decisions in coastal waters need to be made based on accurate, up to date information.

CV24 was navigated primarily using the Timezero system. Although the Timezero software offered a range of navigational safety features, it was not integrated with the other navigational displays. This imposed a significant operational limitation in that navigational awareness from the Timezero system could only be obtained by going below deck to the nav station. Therefore, when the skipper was not in the nav station, there were only two ways in which to ensure that current navigational data was available: either the necessary information was accessible on deck, or the nav station was manned. Neither of these conditions was met on board *CV24* before the grounding.

When *CV24*'s skipper was in the cockpit, he could not see the helm instruments. Information such as the COG or echo sounder depth could have been called out to him by crew at the helm position. However, the skipper believed that he had a good understanding of the navigational situation from his last visit to the nav station, so did not ask for this information. Additionally, prior to the grounding, the watch leader

had not checked the navigational situation before taking over. Although the watch leader was aware of this requirement, it did not happen on this occasion because he knew that the skipper was awake and taking a close interest in the navigation.

During training, particularly in the Solent, Clipper skippers would sometimes use personal GPS enabled portable navigation devices on deck to provide them with the information required to navigate safely. The *Vestas Wind* report made clear that, had the crew on deck been using their MFD as a plotter when the nav station was not manned, it could have offered valuable warning of the danger ahead. However, *CV24*'s helm instruments were not MFDs, and could not display the plotter information from either the newly fitted Garmin plotter or the Timezero plotter.

If the nav station is to be manned, this needs to be performed by a member of the crew who has sufficient navigational knowledge and experience to be able to manage the flow of information to the skipper or watch leader, ensuring that it is both timely and appropriate to the situation. Such skill levels would need to be gained during the race as navigation did not feature during Clipper's level 1 to 4 pre-race training. Manning the nav station also requires reliable and clear communications to the crew on deck. The VHF intercom on the Clipper 70 was often difficult for the crew on deck to hear, and had a significant operational limitation in that the VHF radio could not be used when the handset was in use as an intercom. The most effective method of communications between the nav and helm stations would be to open the hatch **(Figure 11)**. The Race Crew Manual suggested that the design of the yacht specifically placed the nav station at the stern to bring it closer to the helm station than on earlier designs. On previous round the world races, this hatch was sometimes opened at sea **(Figure 12)**; however, on the 2017 – 2018 race, it was required to be closed other than in an actual emergency, and had been fitted with an anti-tamper device. When emphasising the need to keep the hatch closed at sea, Clipper Ventures had not considered the potential impact on navigational safety by restricting communications between the nav and helm stations solely to the intercom. In any event, since the skipper was on deck and there was not a member of crime watch briefed to conduct coastal navigation from the nav station, appropriate manning was not in place.

Notwithstanding the absence of a planned route to follow, the echo sounder can be a critical safety barrier in coastal waters, provided two pre-conditions are met: a shelving seabed that will give sufficient warning to take action, and the crew's expectation of danger while monitoring the depth. Approaching the coast of Cape Peninsula, the chart data was sufficiently accurate for depths such as 50m or 30m to be used as a safety barrier. *CV24*'s echo sounder was functioning and the Garmin panel at the helm station had an audible shallow depth alarm feature. However, the depth was not on display at the port helm station. This was because there was no procedure to follow for coastal navigation, which could have required the depth to be on display. Helm instrumentation settings were at the discretion of the crew and, prior to grounding, had been set up in anticipation of ocean sailing with no expectation of operating in shallow water.

While it is not practical for a racing yacht to follow a line between two waypoints on a passage plan, given the anticipated skill levels of the crew, the provision of a safety corridor made up of cross track distances might have provided them with a means by which to support the skipper by more easily monitoring the passage.

Maintaining situational awareness is necessary to underpin timely and accurate decision-making when navigating in coastal waters. This was difficult for the skipper to achieve when on deck, a situation exacerbated by the lack of training or guidance for the crew in navigation; these issues were highlighted to Clipper Ventures soon after the accident [Section 1.11.5].

2.9 THE YACHT'S LOG AND POSITION FIXING

While completing the yacht's log creates an important historical record, it is also a component of safe navigation. Clipper Ventures required the crew to complete hourly log readings, including a position fix. The purpose of fixing is to establish a known position from which to project the yacht's course ahead and assess navigational safety within the fixing time interval.

About 10 minutes before *CV24* grounded and with no expectation of danger ahead, a crew member went to the nav station to conduct the routine watchkeeping task of filling in the log. It is unfortunate that the crew member became distracted by the need to check the freezer as this would have been an opportunity to alert the skipper to the close proximity of land. A few minutes later, when the crew member returned to the nav station, the danger became apparent from the Timezero display; however, it was too late to alert the skipper.

2.10 EMERGENCY RESPONSE

After running aground, and despite a prompt from a member of the crew, the skipper did not make a "Mayday" or "Pan Pan" distress call. After 23 minutes aground, the skipper used the satellite phone to call the race director and report the emergency. It was then 50 minutes after the accident that the Cape Town MRCC was alerted to the situation.

As soon as any vessel at sea is in a distress situation, the alarm should be raised immediately. In this case, a VHF "Mayday" or "Pan Pan" message would have been appropriate and, given *CV24*'s close proximity to shore, would almost certainly have alerted the South African rescue services without delay. It is likely that the skipper chose to raise the alarm by phoning the race director due to Clipper Ventures' requirement that all accidents are reported directly to company staff [Section 1.10.10] and the absence of an emergency procedure for grounding.

Despite the delay in notifying the rescue services, the South African MRCC and NSRI's response was rapid and effective, ensuring the safe rescue of everyone on board *CV24*.

2.11 CLIPPER VENTURES' SAFETY MANAGEMENT

2.11.1 Requirement

Clipper Ventures' yachts were commercially operated and the company had an obligation to provide for the health and safety of everyone on board [Section 1.10.5]. All Clipper Ventures' yachts were certified in accordance with the SCV Code that required safe manning and operations including a continuous, safe navigational watch. Delivering company level obligations for the assurance of safe operations can

only be achieved through the rigorous application of appropriate safety management techniques. Clipper Ventures' commitment to safe operations was enshrined in the application of SOPs intended to ensure the *maximum possible levels of safety*.

Sustaining high levels of safe operation on board Clipper Ventures' yachts during the round the world race was a particular challenge given the remoteness of the operation and sometimes harsh environmental conditions. The competitive element of the event and the inexperience of many crew members also underpinned the critical importance of safety management. Hallmarks of effective safety management include: clearly defined staff responsibilities for safety, risk assessments, safety procedures, learning from previous accidents and quality supervision at all levels.

2.11.2 Risk assessment and procedures

To be effective, a risk assessment must clinically examine every foreseeable hazard and put in place effective mitigating action; guidance in the SCV Code suggests following four steps: to identify hazards, assess the chance of the event occurring, assess the severity of consequences and take action if the risk is too great [Section 1.10.5].

Clipper Ventures' risk assessment for coastal navigation **(Annex K)** identified three hazards and made an overall assessment of a 'moderate' risk based on a 'harmful' but 'unlikely' outcome. The risk assessment's harm definitions were all based on personal injury and did not address the potential consequences of grounding or collision including threats to equipment, the environment and the company's reputation. Critically, the risk assessment did not include a key mitigation for coastal navigation which is competent crew who are trained, certified and sufficiently experienced to safely manage inshore operations.

Checklists and operational procedures (including for emergencies) can provide a useful supplement to the risk assessment and crew skills gained in training. Clipper Ventures' SOPs provided the primary source of operational guidance for the company's professionally employed crew. Section 10 of the SOPs was titled *Navigation in Coastal Waters* **(Annex H)**. This SOP required a good lookout to be kept and a list of navigation equipment to be checked. However, it did not address Clipper Ventures' expectation for the fundamental requirements of safe navigation in coastal waters including assignment of crew roles, techniques for position fixing and monitoring the proximity to danger. A checklist could have helped the crew to prepare for coastal navigation including when to have crew assigned to the nav station, and critical equipment settings such as selecting the depth readout at the helm instrumentation.

Emergency procedures also form a key component of an onboard safety management system. The SOPs included a manoverboard procedure as an annex; however, there were no procedures to follow in the event of grounding.

2.11.3 Learning from previous accidents

Continuous improvement through learning from previous accidents requires a systematic approach to: timely reporting, effective investigation to identify causal factors, reviewing of previous occurrences to identify themes, then taking action to prevent recurrence.

Grounding incidents illustrate the range of potential severity for the same type of accident; some are at slow speed on a soft seabed where the vessel re-floats quickly, others can be catastrophic. This was the case with Clipper Ventures' yachts, where many of the previously reported groundings [Section 1.11] had little or no consequence. However, there were similarities in the reported causal factors, including:

- The skipper being distracted from navigation.
- The nav station not being manned in coastal waters.
- A lack of adequate situational awareness by the crew on deck.
- An underestimation of the time required for deck evolutions to be conducted safely.

Although groundings of Clipper Ventures' yachts were reported to the MAIB, many were not thoroughly investigated by the company. Clipper Ventures' organisation did not have the capacity to investigate every grounding and, for many of these incidents, particularly those with minimal consequences, the matter was closed after the report to the MAIB had been made. Had action been taken on lessons identified from previous incidents, it is possible that improvements to navigational practices could have been introduced, reducing the risk of further groundings.

Where incidents or accidents are repeated, it is possible for the associated behaviours to become normalised, particularly when the consequences are minimal. This risk of normalisation needs to be recognised and mitigated in order to ensure that all incidents (in this case groundings) are appropriately investigated and that the findings are examined with actions taken to prevent recurrence.

Management decisions to allocate resources for accident investigation, or to introduce safety procedure improvements, need to be made based on accurate data. However, analysis of Clipper Ventures' spreadsheet of accident data [Section 1.10.10] indicated that it did not contain all of the groundings that had been reported to the MAIB. This almost certainly occurred because of the company's different points of contact for accident reporting depending on whether the yacht was participating in racing, training or corporate activity.

2.11.4 Safety committee

Company safety committees can provide a mechanism for proactive management of safety issues through structured meetings, effective communications and a responsive shore support network. Clipper Ventures' safety committee was an important new initiative established for the 2017 - 2018 race. The committee comprised key Clipper Ventures' staff and the Clipper coxswains from each yacht; the stated purpose of the meetings was to uphold and improve safety culture.

The minutes of the first two safety committee meetings [Section 1.10.9] consisted primarily of feedback on safety concerns from the Clipper coxswains. Despite the loss of *CV24*, navigation issues did not appear in the minutes of the meeting after this accident. While these meetings will have provided useful insight for Clipper Ventures' staff, a better-defined structure for the committee could ensure that all safety issues are reviewed, and formal actions agreed. The scope of the safety

committee meeting was also restricted to Clipper Ventures' round the world race, limiting its effectiveness given that safety issues could equally emerge during training or corporate activity.

2.11.5 Supervision and assurance

Having set an expectation of safe operations, the board of a company requires feedback mechanisms to assure good practices are taking place. Staff who are accountable for safety need to know how to deliver safe operations and what information to feed upwards as part of an assurance process. The MAIB report into the fatalities on board *CV21* identified a lack of effective company supervision as a common factor in both accidents, emphasising the need for mature company safety management processes.

Clipper Ventures' board of directors did not meet on a formal basis and high-level decisions were taken as matters arose. This style of management potentially restricted the board of directors' visibility of risks and their opportunity to be proactive with safety management. Clipper Ventures' race director and head of training were both highly experienced yacht skippers who provided a link between the board and the on-water operations. However, neither had specific guidance or formal terms of reference defining their responsibility for safety management or assurance. Such guidance and terms of reference would improve the structure and formality of the company's safety management processes. These factors might have become apparent had Clipper Ventures sought an external audit of its safety management processes.

SECTION 3 - CONCLUSIONS

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

1. As the true wind backed to the predicted north-north-westerly direction, the crew of *CV24* focused on maintaining a safe apparent wind, which resulted in the yacht being sailed close inshore. [2.3.1]

2. The skipper was aware of the danger ahead and the need to gybe, but had not allowed enough time for the watch on deck to conduct this evolution for the first time together in the dark. [2.3.2]

3. The skipper was the only person monitoring navigation, and became distracted from this task by the requirement to supervise the gybe evolution. [2.3.3]

4. The skipper's lack of access to navigational information, the depth information not being displayed at the port helm station and the hazy conditions meant that no-one on board *CV24* appreciated the immediate risk of grounding. [2.3.3]

5. After the gybe, the skipper and crew on deck did not have sufficient positional awareness to appreciate that *CV24* was not heading away from danger as perceived. [2.3.3]

6. There was insufficient planning for the coastal passage and no safeguards were in place to warn the skipper or crew of danger. [2.7, 2.8]

7. Had a route with cross track distances been plotted in Timezero, it might have been more evident to crew in the nav station that *CV24* had departed from a safe route. [2.8, 2.9]

8. The presence of other yachts in *CV24*'s vicinity might have induced a false sense of security. [2.3.3]

9. *CV24* did not have a nominated navigator with the experience, authority and guidance to prepare and monitor a passage plan on behalf of the skipper. Provision of such a role on board Clipper Ventures' yachts had been recommended to the company in 2010. [2.5]

10. With only one professional, employed seafarer on board, the Clipper yachts were not safely manned for the round the world race. [2.6]

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

1. The watch leader did not have the appropriate qualifications or experience to be delegated responsibility for maintaining a safe navigational watch as required by the SCV Code. In addition, Clipper Ventures provided no additional training for the watch leader role. [2.6]

2. Navigation did not form part of levels 1 to 4 of the pre-race training syllabus for prospective Clipper Ventures' crew. [2.5]

3. Clipper Ventures' safety management system was not providing sufficient supervision and assurance to ensure safe operations, specifically:

    - The risk assessment and procedures for coastal navigation were not effective. [2.11.2]

    - Opportunities to improve coastal navigation standards by learning lessons from previous groundings were not taken. [2.11.3]

    - Key members of staff with responsibility for delivering operations did not have guidance or terms of reference for their safety management responsibilities. [2.11.5]

3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. Seven other yachts followed tracks similar to *CV24*'s towards the shore, and *CV31* almost certainly grounded. [2.4]

2. There was an unnecessary delay of 50 minutes in notifying the emergency services. [2.10]

3. The South African rescue services' response was swift and effective, ensuring the safety of the crew of *CV24*. [2.10]

SECTION 4 - ACTIONS TAKEN

4.1 MAIB ACTIONS

On 17 November 2017, the **MAIB** issued Recommendation 2017/151 to Clipper Ventures plc that recommended the company to:

- Take urgent action designed to improve the ability of its skippers and watch leaders 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 the duties of the watch navigator.

4.2 MCA ACTIONS

The **Maritime and Coastguard Agency** has directed that Clipper Ventures' yachts are to be manned at all times as required by the SCV Code.

4.3 CLIPPER VENTURES' ACTIONS

Clipper Ventures plc has:

- Responded to the MCA's decision to require manning of yachts in accordance with the SCV Code by recruiting a qualified mate for each yacht in the round the world race.
- Created an internal company Safety Audit Department, led by the COO. The Safety Audit Department's role is to investigate accidents and promulgate the lessons learned.
- Updated its race instructions to Clipper yacht crews, introducing a compulsory exclusion zone described as:
    - *There will be a 2nm exclusion zone from all coastline, islands and off lying hazards (awash or above the water at chart datum) between Race Start and the Finish Line.*
    - *In addition to the above, no Clipper vessel is to roam into an area of less than 20m deep (chart datum) between Race Start and the Finish Line.*
- Introduced a procedure whereby round the world skippers' passage plans are checked by company staff prior to the start of each race leg.

SECTION 5 - RECOMMENDATONS

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

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.

Clipper Ventures plc is recommended to:

2018/117 Review and improve company safety management procedures in co-operation with the **Maritime and Coastguard Agency** and aligned with the guidance proposed in MAIB recommendation **2018/116** above. This review should ensure that:

- Risk assessments for on-water operations identify all hazards and set out appropriate mitigating 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 identified in this 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 navigational systems and how to identify hazards ahead within the determined fixing interval.

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

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