FILE : **CV4 aka CORK**

FILE NO. : **100163/RH**

REFERENCE : **REGISTRAR OF SHIPPING, JERSEY**

SUBJECT : **GROUNDING & SUBSEQUENT LOSS**

DATE : **24TH JANUARY 2010**

1. INSTRUCTIONS

Instructions were received on 16th January 2010 from the Registrar of Shipping, Regulatory Service, Jersey (the Flag State[1]) regarding the grounding and subsequent loss of the vessel "CV4", Registration No. 737-69, on 14th January 2010.

I was required to carry out a preliminary, independent inquiry to ascertain the facts of the grounding as far as they are known in order that the Flag State could determine whether the conditions under which the Clipper Venture Fleet requires amendment and whether a formal investigator should be appointed under Jersey shipping law in order to take matters further.

I was further instructed to take statements from the skipper and watch leader, confirm their qualifications and if possible review the navigational log and relevant charts.

[1] UK, as flag-state, has devolved to Jersey the authority and power to deal with IMO flag-state matters.

2. ATTENDANCE

The undersigned met with the Clipper Ventures Race Director, Mr Jonathan Bailey and the Race Manager, Ms Lizzie Nicholas in our office in Singapore prior to the Clipper fleet arriving in Batam. Thereafter a schedule was arranged for interviewing the crew of "Cork" after they arrived on the rescue yachts "Finland" and "California".

After a meeting with Jonathan Bailey, Lizzie Nicholas and Rachel Dickinson (Fleet Operations Manager) the meetings with the watch-leaders and crew commenced, followed by an interview with the Skipper. This was carried out in a private room.

The interviews continued without a break throughout the day and were completed about 1900LT 20th. After a brief break for dinner the statements of the Skipper and on-duty watch-leader were drafted from the notes taken. These were completed during the early hours of the morning (21st), discussed and amended as necessary after breakfast and finally completed, printed and signed at about 1215LT.

Each of the final statements was signed by the person making the statement and witnessed by myself.

I subsequently attended Keppel Marina at Singapore on 30th January to examine the log books of other yachts and obtain further and better particulars on several matters.

3. INTERVIEWS

3.1 Off-duty watch-leader – Keith Hale

Keith Hale answered all questions well and was a good witness.

Keith is an Irish national, 25 years old. He sailed for about 7 years in keelboats, mainly local racing, before undergoing 4 weeks training with Clipper Ventures. The last week of training was on "Cork", during which time he was selected by the Skipper (Richard Fearon) as watch-leader. He was onboard "Cork" at the commencement of the Round the World (RTW) voyage and was scheduled to do all legs.

Apart from minor discrepancies in times of occurrences, after the grounding there were no anomalies between his testimony and those of the other crew members. These are summarized later in this report.

He described the system of watches on "Cork" as follows:

Watches were maintained on a "4 on, 4 off" basis with each watch taking 4 hours on deck and 4 below. However during one day-watch the on-duty watch would extend their duties by 1 hour (i.e. carry out a 5 hour watch) and the succeeding watch would also extend their duties by 1 hour. This advanced the time coming on watch each day so that no watch would be permanently on the "graveyard watch", and be considered disadvantaged. Additionally there was a rotating "Mother watch". This involved each watch-keeper having their turn below, for cooking and cleaning up, after which they enjoyed an extended watch below. This was on a rotating schedule.

Notwithstanding the above, if there was a major sail-change or other action requiring the full crew, all hands would be called on deck.

3.2 Off-watch crew

There were 8 crew below deck at the time of the grounding. These included the watch-leader, 6 off-watch crew members and the "Mother watch" crew member (Tania Dolinschek).

The off-watch crew and a summary of their pre-race experience is as follows:

Sarah Bell

Sarah is a British national, 43 years old. She had minimal sailing experience before undertaking the 3 weeks Clipper Ventures training course. She joined the yacht at Geraldton and was extremely positive.

Sean Coote

Sean is an Irish national, 46 years old. He has sailed on a 36' keelboat, mainly inshore. He underwent the 4 weeks Clipper training course and joined the yacht in Hull to undertake the entire RTW voyage. He was also positive.

David Paton

David is a British national, 55 years old. He was undertaking Legs 1 – 4 of the Clipper Ventures series. He had some dinghy sailing experience before undertaking the CV training course. He was very positive about the boat, the crew and the entire venture.

Alan Moss

Alan is a British national, 39 years old. He was taking part in the entire RTW voyage. He had little sailing experience prior to undertaking the 4 weeks CV training course. Although rather less positive about his experience than the other crew he unreservedly expressed his confidence in the Skipper.

Tiewa Li

Tiewa ("Tie") is a Chinese national, 27 years old. He lives in Australia. He had mainly day-sailing experience until his 3 weeks training with CV. He joined the yacht in Geraldton, for 1 leg only. Tie was reserved and made few comments. However he expressed great confidence in the Skipper.

Orio Louise Mellet

Orio is an Irish national who turned 30 years old on the day the yacht grounded. I failed to record her sailing experience before she carried out her 4 weeks CV training. She joined the yacht before the start of the race in Hull and was to do the RTW race. She was highly complimentary on the CV training and also the quality of the training personnel, as well as the Skipper.

Tania Dolinschek

Tania is an Australian national, 33 years old. She was normally on the 'other' watch however was, on this occasion, doing the "Mother watch" and therefore enjoying some extra sleep. Tania was interviewed with the 2nd (on-watch) group however she has been included in this section as she was below at the time of the incident. Tania has been sailing dinghies since she was a child and has been racing small keelboats for many years. She holds a Masters Class 4 and has sailed as Mate on the Sail Training vessel "Leeuwin" for 10 years Tania was doing Legs 2 & 4 of the voyage – and would have liked to do more if she was able to afford it. She was highly complimentary about the CV training however expressed disappointment in the practical navigation training. Tania suffered a suspected bruised or broken rib during the grounding. She was uncomplaining. She gave high praise to the Skipper for his calm demure, confident leadership and concise instructions after the grounding which, in her opinion, calmed the entire crew and resulted in a successful and uneventful abandonment of the vessel.

3.3 On-watch watch-leader – Michael Lewis

Michael is an Irish national, 30 years old. He has been sailing since childhood and later became a paid University dinghy instructor. He carried out the 4 weeks CV training course prior to the commencement of the race. He stated that the first week of training was intensive, hard work and very instructive. He was appointed as watch-leader during the 4th week of training.

He was a good witness. Whilst he clearly had loyalty to the Skipper he

answered all questions apparently without favor. He advised that the log was maintained about every hour, the on-watch crew who happened to be down below entering the course, wind direction & force, barometer, sea state and remarks.

There were no written standing orders given by the Skipper. However the Skipper thoroughly briefed the watchleaders and crew at the commencement of each leg of the voyage and was always open to suggestions or comments from all the crew.

3.4 On-watch crew

There were 7 on-watch crew on deck at the time of the grounding. The Skipper was up & about however was actually in the navigation station when the vessel grounded. The on-watch crew were interviewed together; however, each was briefly questioned. Apart from the watch-leader, (Para. 3.3) a summary of their pre-race experience and other comments is as follows:

Jacqueline Anne Browne

Jackie is an Irish national, 48 years old. She advised that she has been sailing dinghies since she was a child and later sailed in keelboats. I later learned that she has sailed on a number of 'Tall-Ships' races however she did not mention this when interviewed. Jackie undertook the 3 weeks of training and was taking part in legs 2,3,4 & 7 of the race.

Noreen Patricia Osborne

Noreen is an Irish national, aged 31 years. She had minimal sailing experience before undertaking the CV 4 weeks training course. She was participating in all legs of the RTW race. She also undertook the optional 2 day Sea Survival Course, which she stated was very good – and highly recommended it, especially in view of her experience. She commented that the 1st week of training was seriously intense but of great value.

Gavin Kelly

Gavin is an Irish national, aged 34 years. He had little sailing experience before joining the 3 weeks CV training course. He was taking part in Legs 4 & 5 of the race. He was also highly complimentary of the initial training course.

Marco Bruno Giana

Marco is an Australian, aged 36 years. He had some dinghy and small keelboat sailing experience prior to the CV training however admitted to being generally inexperienced before the CV training. He stated that the Navigation & Meteorology Course was good – and counted towards the RYA Yachtmasters qualification. He also did the Sea Survival Course and believed that this should be mandatory.

Sarah Rose Boyle

Sarah is an Irish national, age 27 years. She sailed in dinghies as a child and also on a keelboat during the past 3 years for inshore races. She only joined “Cork” at Geraldton for legs 4, 5 & 6.

Written statements of On-Watch crew

Copies of the written statements from all the On-Watch crew and watchleader were provided by Clipper Ventures.

4. CV4 WATCH COMPOSITION

From interviewing the Skipper, Watch-Leaders and crew it was noted that during starts, finishes, major sail changes etc. all hands were on deck. During normal sea watchkeeping there were 7 persons on deck for each watch. Additionally there was the Skipper, who was on call at all times, and the “Mother watch” duty person, who was below deck for the meals etc.

Watch-leaders were specifically advised at the commencement of each leg of the voyage that the skipper should be called at any time but specifically for weather, approach of traffic, alterations of courses, change of wind, close proximity to land, unusual change of depth, any concern about navigation or any other matter that caused concern.

The entire crew were briefed before each leg of the voyage and advised of the skipper’s requirements. They were all told that although there were watch leaders they should, if in doubt, call the skipper personally. The above was stated by the Skipper and confirmed by the watch leaders and the crew.

5. THE YACHT

"CV4" (also known by the sponsor's name of "Cork") is 68' sailing yacht fitted with an auxiliary diesel engine. The yacht was constructed of GRP foam-sandwich on the hull and deck, with the exception of the bottom of the hull, which is hand-laid GPR. There is a transition from the foam sandwich to mono lay-up in way of the lower part of the hull.

The principal particulars are said to be:

Type	: Monohull, cutter-rigged
Designer	: Ed Dubois
Built	: Shanghai, China
LOA	: 20.80m
Beam	: 5.76m
Draft	: 3.0m
Displacement	: 30,000kg
Keel	: 9,000mt steel, fin keel bolted onto hull
Mast	: 24m high, 3 spreader, aluminium, S.S wire-rope rigging
Aux. Engine	: Perkins 130hp diesel

CV4 was one of ten (10) yachts built. The yachts have previously carried out 2 Around the World races and are currently on their 3rd circumnavigation.

6. THE RACE

The first leg of the race is from Hull, England, to La Rochelle, France. The 2nd leg is from La Rochelle to Rio de Janeiro, Brazil, the 3rd leg from Rio to Cape Town, South Africa, the 4th leg from Cape Town to Geraldton, Australia and the 5th leg from Geraldton to Singapore. Thereafter the race continues to Qingdao, China, thence to California, Panama, Jamaica, New York, Cape Breton Island, Ireland (Cork) and UK (Humber).

7. CLIPPER VENTURE TRAINING

A professional skipper is appointed to each of the 10 yachts. Many of the crew have previous sailing experience. However all crew are trained for a minimum period of 3 intensive weeks. This comprises of both practical and theoretical tuition on and off the water. There are a substantial number of “drop-outs” however those who stay have been subjected to periods of close proximity in the confined quarters of a racing yacht.

The crew training first week, Part A, starts in the early morning and continues to late every night and takes place on the Clipper 60 yachts. This includes both practical sailing throughout the day and theory in the evening. It continues into part B with some racing and further theory. The 3rd week, Part C is on the Clipper 68’ yachts, the type that they will sail around the world on. There is a 4th week, Part C extension, for the crew who are participating in the entire Around the World race. These are the potential Watch Leaders.

Other courses provided, mandatory or optional, include navigation & meteorology, Sea Survival, first aid etc. The navigation & meteorology course was recognized as contributing towards a qualification for the Yachtmasters (Theory) Certificate.

8. REGISTRATION & CERTIFICATION

The 10 yachts in the Fleet are registered by the Registrar of Shipping, Jersey. All were constructed and fitted out in compliance with the MGN280 and the Jersey Code requirements for small commercial vessels. This is an extension of the MCA requirements for yachts under 24m in length.

The Jersey Code includes requirements for navigation, publications, navigational equipment etc.

Section 18 stipulates the equipment required or recommended for maintaining the ship's position. This includes GPS, ECDIS, chart plotters etc. as well as sextant and sight reduction tables, which are considered a seamanlike back up system to electronic failure.

Section 19.1 stipulates the Nautical Publications to plan and display the vessels route for the intended voyage. This includes light lists, tide tables, navigational hazards, routing, weather information etc. The electronic format is covered by the MCA and is included in the Mecal website. This specifically contains technical notes and advice on various subjects, including electronic charts.

Clipper Ventures Director advised that prior to commencement of the voyage they were inspected by MECAL Ltd on behalf of the Jersey Administration. MECAL's Unique Number for CV4 is MJ05SV0200698.

9. NAVIGATION & RADIO EQUIPMENT

Navigation equipment comprised of the following:

- Plastimo Liquid magnetic compass
- Raymarine Fluxgate compass
- Depth finder
- Wind-speed & direction instruments, masthead mounted
- Raymarine GPS & handheld back-ups
- Seapro chart-plotter in PC
- Back-up soft wear in case of PC failure
- Raymarine C120 combined chart plotter, depth finder & radar
- Euronav SeaPro 3000 with updated electronic charts for voyage
- Paper Charts for voyage
- Sextant, sight reduction tables, & nautical almanac back-up for the GPS.
- BA Sailing Directions and publications for entire voyage, as follows:
    - Nautical Almanac 2009
    - Electronic tide tables – 2009 & 2010 – worldwide
    - Sight reduction tables
    - Imray South-East Asia Cruising Guide Vol. II
    - Ocean Passages of the World
    - Admiralty Digital List of Lights & Radio Signals (electronic format)
    - IAMSAR Vol. III
    - 5011 Symbols & Abbreviations

All navigation equipment and aids were reported to be in good working order at the commencement of the voyage from Geraldton and also at the time of the grounding.

The electronic charts were all updated at the commencement of the voyage. I was advised that there were updates provided and installed whilst the yachts were in Geraldton, Australia prior to the commencement of the leg of the voyage from Geraldton to Batam/Singapore.

Radio equipment included

- Iridium satellite communications
- Inmarsat Fleet 55 system
- Inmarsat C
- VHF Transceivers

10. THE GROUNDING

Details of the events leading up to the grounding, and the grounding itself, are provided in the record of interviews. In summary, CV4 was proceeding on the port tack on a course of about 051^0(T). The wind was from WSW at about 30 knots. Sail included the No.3 Yankee, staysail and single-reefed mainsail. At this time the yacht was making approximately 10 knots on a broad beam reach.

The deck watch, headed by Michael Lewis, took over the watch at 0100LT. He was instructed to call the Skipper, Richard Fearon either 10 miles or 8.5 miles before reaching the waypoint[2]. (Note: The discrepancy makes no difference as the vessel remained on the same course and finally altered course at the point designated by the skipper).

The waypoint was situated approximately 1 mile due east of the mark of the course, which was the lighthouse/Racon beacon on Gosong Mampango, in position Lat. 3^0 34.7'S, Long. 109^0 10.1'E. The Skipper's intentions were to pass the south-east corner of the reef at a distance of about 0.6 miles to his marked waypoint 1 mile east of the lighthouse[3].

The Skipper was called about 0320LT[4] (GMT+8). After viewing the vessel's position as shown on the chart plotter the skipper went on deck and instructed the watch-leader, Mike Lewis, to take in another 2 reefs in the main. The decision to reef further was because the course was being altered from about 051^0 (T) to 000^0(T), that is, from a broad reach to hard on the wind. This would cause the apparent wind to increase as well as greater pressure on the sails when hard on, necessitating a reduction in sail area.

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[2] Richard Fearon's advice was to call him about 10 miles before the waypoint. Michael Lewis's advice was to call him about 8.5 miles before the waypoint

[3] The position of the Skipper's waypoint was indicated on a chart during the interview. The actual position is not known as this was on the Seapro chart plotter and lost with the yacht

[4] The Skipper stated that he was called shortly after 0300. However Mike Lewis believed it was closer to 0320. This discrepancy is not relevant to the grounding.

The Skipper took over the helm whilst Mike Lewis and his watchkeepers reefed the mainsail. During this period the original course was maintained.

After the sails were shortened the Skipper continued on the helm for a short while and Mike Lewis went below to view the chart plotter and vessel's position. The Skipper then called Mike Lewis on deck and returned below to the navigation station.

There are two chart plotters in the navigation station. In addition to the Euronav SeaPro 3000 'ECDIS' chart plotter with corrected electronic charts there is a Raymarine C120 combination of Chart Plotter, Radar and Depthfinder. The Skipper advised that this was running at all times and while he used the SeaPro 3000 for navigating he was trying to raise the reef and the Raycon beacon, which is activated by radar pulses. He also monitored the depth-sounder which was recording depths of around 30m. He instructed the deck watch to keep a close visual lookout for the light, shown on the chart as Fl.5 secs, 12M.

There was no sign of the light or the Racon beacon either on the radar or visually. The skipper monitored the yacht's position on the SeaPro electronic chart as they passed the south-east corner of the reef, the chart plotter indicating that the closest approach was 0.63 miles. The electronic chart then showed the distance from the island opening until the light was bearing 270^0(T) x 1.0 miles[5].

When the electronic bearing was 270^0(T) the Skipper ordered the helmsman to commence altering course to port by 10 degree increments, allowing the 3 sails to be brought in together without luffing, until the yacht was hard on the wind. This was finally achieved, with course approximately 000(T) being steered and COG 007^0. Almost immediately thereafter there were 2 small bumps followed by a heavy bump as the yacht grounded and stopped. This was variously estimated by the on & off-watch crew to be between 0400 & 0420LT. However from information

[5] A plot using the distance of 0.63' on course 051^0(T) confirms distance 1 mile when light 270^0(T)

received from CV5 ("Finland") who was 5 miles off at the time and was actually monitoring the AIS and viewed the symbol mark of CV4 change from moving ahead to stopped, the grounding time was 0415LT. An urgency signal (PAN PAN) was logged as received by CV5 at 0418LT and a VHF message stating that CV4 was aground on rocks was logged at 0420LT.

11. EVENTS AFTER GROUNDING

The Skipper Richard Fearon, the Watch-Leader Michael Lewis and the entire crew of CV4 were interviewed. The Radio Log of CV5 was also reviewed. A summary of the events after grounding is as follows:

It was completely dark when the yacht grounded. The waves were hitting the side of the yacht, pushing the bow around and lifting it on the reef. The Skipper ordered all hands on deck, the Yanker 3 to be dropped and a PAN PAN call to be made by one of the crew, who was radio qualified[6]. This all occurred between 0415LT & 0418LT. A head count was then made and it was confirmed that all hands were on deck

At this time it was believed that the yacht was on the eastern, leeward side of the reef. The main and staysail were kept set as the Skipper believed that they may be able to sail off the reef. Attempts to get off the rocks were made using the engine however these were discontinued as the yacht leaned further over.

The Skipper instructed crew to go below and pass up warm clothing and the "grab bags" containing passports etc. He advised that they would remain with the yacht as there was no immediate danger and await dawn, which was estimated to be about 1hr 30 minutes away. As the yacht settled somewhat the crew were permitted to collect their valuables and necessary clothing and then return to the windward rail to await daylight.

He noted that it was one of the birthday of one of the crew[7] and led the crew with singing Happy Birthday. This was followed with some other

[6] Tania Dolinschek holds a Masters Class 4 and is a Square-Rigged Sail Training Mate.

[7] Oria Mellet 14/1/1980

songs. During the interviews the crew unreservedly praised the Skipper for his very successful morale-boosting which greatly alleviated the concerns of the amateur crew onboard.

By 0530LT there was a hole in the side of CV4 in way of the navigation station, bulkhead and galley. At 0540LT all electrical power on CV4 failed. However the hand-held VHF and torches had been brought on deck and communications were taking place with CV5.

The damage to the leeward (starboard) side worsened and by 0552LT[8] the starboard bulkhead had failed.

Daylight commenced about 0600 - 0630LT. At this time it was noted that the yacht was on the windward (western) side of the reef and there was a raised area of reef, with a small structure and the wreck of a fishing vessel, on the starboard side.

Preparations with the life-raft were commenced, the Skipper instructing the crew to familiarize themselves with the launching operations. The forward liferaft was inflated, followed by the other 2 life-rafts. The 2nd life-raft upper buoyancy ring snagged a pushpit aerial and this part of the life-raft deflated. The life-raft was still usable, but not efficient.

The life-rafts were sent ashore, one at a time, always with a long line attached. The first life-raft reached the shore at about 0753LT, the 2nd at 0818LT and the 3rd at 0847LT.

The dry area of the reef consisted of small sticks of coral that dropped off at the edge to a harder area of coral. The life-rafts were then “walked” around to the leeward side, where CV5 (“Finland”) and CV10 (“California”) were standing off.

Whilst on the reef the “lighthouse” and Racon beacon were inspected. There was little left of anything and it was apparent that they have not worked for years.

[8] Radio log times and advice recorded on CV5

The wind and tide direction was ascertained from several parts of the leeward side of the reef by releasing fenders. When the drift was determined the 2 watches each took one life-raft, the damaged life-raft being abandoned.

The first life-raft left the reef at 0913LT and was secured alongside CV10 ("California") at 0927LT. All crew were onboard via the scramble nets and helping hands by 0942LT.

The second life-raft left the beach at 0951LT, was secured alongside CV5 ("Finland") at 1006LT and all crew were onboard by 1015LT.

Hot drinks and food were provided to the rescued crews by both CV5 and CV10. Shortly thereafter the life-rafts were abandoned and the 3 yachts (including "Qingdao", which had arrived at the latter part of the rescue) departed for Batam.

During the period between grounding and safe rescue of the crew of CV4 there were some minor injuries to four crew members. These included one minor left eye injury, one case of bruised ribs, one bruised knee cap and one alleged "whiplash-type" neck & shoulder pain said to be caused by the shock when the boat grounded. These injuries are not elaborated on as they do not fall within the scope of this investigation.

12. NAVIGATION OF CV4

The Skipper, Richard Fearon, was the only person actively engaged in the navigation of the vessel. No doubt other persons looked at the Chart Plotter however the interest was, I believe, casual.

The watch-leader at the time of the grounding, Mike Lewis, was not aware that the radar was on at the time CV4 was approaching Gosong Mampango. However he did examine the SeaPro 3000 chart plotter.

Paper charts were on board. These were provided by Kelvin Hughes, as one of the sponsors. I was advised that Clipper Ventures worked closely with KH to come up with a suitable wardrobe of navigation publications, both electronic and paper and that prior to departing the UK KH either supplied new paper charts or updated existing ones with the latest Notices to Mariners.

All of the electronic charts were also new prior to departing from Hull and electronic updates were provided at Geraldton before the start of the leg from Geraldton to Batam/Singapore.

Clipper Ventures Race Director advised that the MECAL inspector viewed the charts and publications at the end of August during the Cat 0 certification. I sighted the Periodical Survey Report issued 24 August 2009. Part 5, (Navigation and Radio Equipment) includes *Nautical publications* and *Other equipment* but does not include Charts. However I believe that the Mecal surveyors Mr Tim Petitt or Ross Millard would have carried out a random inspection of the chart folio in the course of their inspection and satisfied themselves that they had the latest corrections.

I was informed that the paper charts were not necessarily the largest scale available. They were for the purpose of “back-up” in case of ECDIS failure and were considered as adequate for this purpose.

All electronic charts were updated prior to departing from Geraldton on 10th January 2010. The paper chart, BA941A, last correction was 2009[3799].

The full details of the navigational equipment on board CV4 are included in Section 9 of this report. This includes ECDIS (GPS chart plotter with electronic charts), combined radar/chart plotter/depth finder, magnetic & fluxgate compass, GPS, wind-speed/direction, sextant & publications.

It was reported that Radar was used for navigation checks in some areas however the principal mode of navigation was the ECDIS Chart Plotter.

13. LOG BOOK

The Log Book was kept on the chart table. The Skipper's wallet was kept under the chart table flap. The area that was stove in after the yacht was driven aground was the starboard side in way of the navigation station. Neither the Skipper's wallet nor the Log Book was recovered. I fully accept that the Log Book was lost shortly after the starboard side was stove in.

At my request the CV Race Director provided copies of the log from the previous leg of the voyage (Capetown to Geraldton). The Log Book has instructions for use and entries to be included. It has 24 lines to a page however no times. Upon viewing several of the CV yacht log books it was noted that it was common to enter each time at the left hand side of the page instead of every 4 hours (every 4 lines) and enter intermediate times & events on the right hand side.

Columns for time, course, wind direction, wind force etc. were included on the left hand side and a space for comments on the right hand side.

I noted that CV4 log from Cape Town to Geraldton was properly kept. This included GPS positions approximately every hour, courses, wind direction and force, sail changes and miscellaneous remarks. There were no entries for weather or sea/swell condition at the end of each watch and log readings were not entered, as required by the instructions for use.

I examined the log of several other yachts. Some of these were not as thorough or well kept as CV4, in fact one log had no entries for over 6 hours. Proper log upkeep assists in the navigation of the vessel, particularly if there is a failure in the electronic navigation systems. This matter needs to be addressed.

14. PRINCIPAL CAUSE OF GROUNDING

On the morning of 14th January when CV4 was approaching Gosong Mampango the wind was about 30 knots with moderate to rough seas. The radar was in use however was not obtaining a target. Soundings are relatively sparse and between 30m – 45m, with no banks to indicate close proximity to the reef.

The Race waypoint was the light & Racon beacon on Gosong Mampango. The alter-course waypoint as decided by the Skipper of CV4 was approximately 1 mile 090^0 (T) from the light. The course, from the south-west (051^0(T) had CPA 0.6 miles on the SE corner of the reef. The chart indicated that there was a steep drop-off from the reef.

Navigation was being carried out using the electronic charts. These included details of the largest scale chart but, as far as I determined, not all the warnings outside the border of the chart.

There are two principal paper charts for the area where CV4 grounded, 2872, Selat Karimata and Approaches and 3757, Gosong Aling to Pulau Pesemut. These were not provided. There is also a much smaller scale chart, 941A. This was the back-up chart provided in case the electronic chart system failed.

The electronic chart contained details of the largest scale paper chart. However the second-largest scale paper chart, 2872, Scale 1:500,000 has been modified since the original print and is WGS84, that is, GPS positions can be plotted directly onto the chart. However the *largest* scale paper chart, 3757, Scale 1:250,000 is *not* WGS84 and there are warnings on the upper edge of the chart *outside the border*. My investigation revealed *that these warnings were apparently not included on the electronic charts.*

All electronic charts were updated prior to departing from Geraldton on 10th January 2010. The paper chart, BA941A, last correction was 2009^{3799}.

The paper charts had the following cautions:

CHARTS 2872 AND 2873 POSITIONS
Positions on chart 941A differ from those on charts 2872 and 2873 by varying amounts; positions should be transferred by bearing and distance from common charted objects, not by latitude & longitude.

CAUTION: SATELLITE-DERIVED POSITIONS
Positions obtained from satellite navigation systems, such as GPS, are normally referred to the WGS84 Datum. The differences between the satellite-derived positions and the positions on this chart cannot be determined; mariners are warned that these differences MAY BE SIGNIFICANT TO NAVIGATION and are therefore advised to use alternative sources of positional information, particularly when closing the shore or navigating in the vicinity of dangers

UNCHARTED DANGERS: Mariners are warned to exercise caution when using this chart as uncharted dangers may exist due to inadequate depth information.

The aids to navigation within Indonesian waters are reported to be unreliable. They may be missing, unlit or out of position.

Additionally the largest scale paper chart (3757) has the warning:

POSITIONS: Gosong Mampango Lighthouse(3^0 35'S, 109^0 10'E) approx.) and associated reefs Karang Batuan, Karang Sembar and Gosong Kelumpang, were reported to lie0.9' further east in 1992.
Gosong Aling lighthouse (3^0 31'S, 110^0 11'E approx.) and the associated reefs were reported to lie up to 2 miles further eastnortheast.

A comparison of the position of Gosong Mampango on the 2 largest scale paper charts (not provided on board however included in the Electronic Charts) is as follows:

3757 Scale 1:250,000 Racon 3^0 34.6'S 109^0 10.2'E
2872 Scale 1:500,000 Racon 3^0 34.8'S 109^0 10.9'E (WGS84)

On the electronic chart it was visually apparent that when the scale was changed the reef position moved.

There are common rules of seamanship that have been developed as innovations and advances in navigation have been made. These are incorporated in various publications. One such publication (Bridge Procedures Guide) states:

"*On charts whose survey source data is very old, the accuracy of those charts may be poor in certain areas: under these circumstances the OOW should not totally rely on position fixing using electronic systems, and should where possible use visual and radar navigation techniques to maintain safe distances off the land."*

Chart 941A was published on 11 November 1867. Although upgraded since that time the basic chart and many of the reefs remain as charted 150 years ago. The electronic charts have been developed from the paper charts and reproduce any inaccuracies.

There was no way of checking the position during the early morning hours of 14th January. There was no moon at this time (neap tides), no significant change in the soundings that would indicate a line of position and a heavy sea that would likely produce enough clutter to obscure a small echo from the reef.

It would have been prudent seamanship to have 2 alternate waypoints on the Chart; a daylight waypoint and a darkness waypoint. The latter would be (say) 10 miles to the east of the reef. However there was one waypoint for daylight and darkness and that was 1 mile from the reef.

As it eventuated the reef was between one-half to one mile to the east of the charted position. The reef is approximately one-half mile across. Although the yacht was initially believed to have grounded on the east side of the reef it was later visually confirmed by the skipper to be grounded on the west of the reef in GPS position Lat. 3^0 34.683S Long. 109^0 10.583E.

The light/Racon is sited in the middle of the reef and its geographical position as shown on the chart is Lat. 3^0 34.678S Long. 109^0 10.102E. However its position varies from chart to chart as noted in the previous page. The substantial difference on the charts is principally that one chart has corrected to WGS84, that is, GPS positions can be plotted directly onto the chart and the other is originally charted by the hydrographers without the benefit of satellites.

Whilst this is a significant charted error, when taking into account the navigational instruments available in 1867 this error is not surprising. Furthermore it is clearly pointed out in the warnings on the charts.

The principal causes of the grounding and loss of CV4 were

- Total reliance was placed on electronic navigation. No second system of navigation was used to verify positions obtained from the GPS
- Total reliance was placed on the chart, even though the survey source data was very old
- Warnings regarding GPS positions and chart accuracy were disregarded, even though they clearly indicated that the charts were unreliable
- The position of the reef on the chart was inaccurate, approximately 1000m east of the charted position
- The navigation light and the Racon beacon were not working. (Warnings on the chart advised that the aids to navigation within Indonesian waters may be missing, unlit or out of position)
- The electronic charts did not appear to contain the warnings that were shown on the borders of the largest scale paper chart, which should have alerted the skipper to the fact that Gosong Mampango was almost a mile to the east of its charted position
- When the light and Racon beacon were not raised visually or on the radar no precautions were taken

15. GENERAL COMMENTS

15.1 Clipper Venture training

This has been briefly commented on in Section 7 of this report. It is a daunting task to prepare a rank amateur who may have never been sailing to cope with the physical and mental hardships of racing a yacht over extended periods in a variety of weather.

Clipper Ventures have, in my opinion, succeeded. Sailing to windward in 30 knots over an extended period is hard work and certainly not comfortable. I observed the crews of the yachts arriving at Batam after the sail, working cheerfully tidying up and flaking sails and behaving as a team. To achieve this in a short period of time is most credible. Furthermore the crews, when interviewed, without exception strongly praised the training – although they all said that it was very tough.

15.2 The Skippers

I met with 3 of the Skippers. However, I did not have a great deal of time to discuss matters with them. I was advised that Clipper Ventures issued Standing Orders and they were encouraged to write their own for the crew of their yacht. Clipper Ventures clearly left the running of the yachts, including type of watches, selection of watch-leaders etc. to the Skipper.

Richard Fearon, the Skipper of CV4, had clearly made a most favorable impression on all his crew. At the two separate watch interviews for the on and off-watch groups only, without watch-leaders or skippers, they spoke very highly of Mr Fearon's abilities as skipper and leader and had the utmost confidence in his abilities.

It was stated that the following yacht CV5 ("Finland") was sighted visually and on the radar about 5 miles astern of CV4 immediately before CV4 struck the reef. I subsequently plotted her recorded positions at 0100, 0200, 0300 & 0400 and these showed that she was on the same track and, if CV4 had just cleared to windward of

the reef CV5 may have hit it. The above is supposition. Nevertheless it would appear that a number of yachts were heading towards an out of position reef, all relying on GPS.

15.3 The Race Organization

I interviewed the Clipper Ventures Race Director, Jonathan "Joff" Bailey, the Race Manager Lizzie Nicholas and the Fleet Operations Manager Rachel Dickinson. Documents were requested and provided immediately. Those that they did not have they arranged to be scanned and sent by email. They were totally transparent and were keen to put into place the necessary precautions that would prevent a repetition of the incident.

From the discussions I understood that they endeavored to select good skippers in whom they had the utmost confidence. They provided general & specific guidelines for safety & the running of the boats, issued Racing Instructions & let the Skippers get on with it.

Full shore support was provided at the beginning of each leg and all necessary equipment was provided, repaired or replaced prior to the commencement of the next leg of the race.

15.4 Reliance on GPS & ECDIS

GPS and electronic charts have improved to such a state that vessels are proceeding up channels to berths in dense fog, using ECDIS but also radar back-up. However in a recent tragedy (Yacht "Shockwave" ran aground on Flinders Island whilst racing at night, 2 persons lost) it was found that most GPS satellites were below 20^0, 2 satellites were on either side of the yacht, in line on opposite bearings and one other, affectively providing only 2 crosses, which is an unreliable fix. This was found to be partly causative in the accident. This is a real example of system anomalies that occur from time to time. Similarly there are a number of collisions in the Singapore Strait involving vessels on the wrong side of the Traffic Separation Zone as a result of inaccurate GPS on board, with up to 0.3 miles error.

16. RECOMMENDATIONS

Clipper Venture Standing Orders to be amended to include:

- total reliance should not be placed on electronic navigation systems
- visual & radar position fixing techniques should be used whenever possible
- 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 hours of darkness
- the Skipper should not rely on charts, even those corrected up to date, whose survey data is very old as the accuracy may be poor in certain areas

It is recommended that the Standing Orders should be issued to each boat and receipt acknowledged by the Skipper.

It is recommended that the Skipper be required to issue his own Standing Orders, incorporating relevant sections of Clipper Venture Standing Orders, and these should be acknowledged as read by *each* member of the crew when they join the yacht. These should be exhibited on the bulkhead. (My reason for recommending the formalizing of the Standing Orders is for both practical and legal purposes).

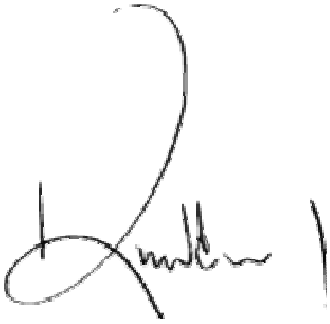
It is suggested that the Sea Survival Course should be made compulsory. It is understood that this is currently an optional course. High praise for this course was given by the crew members interviewed who had included this option during their training.

It is suggested that if the Race Committee put waypoints on low-lying areas that may not be visible by radar they should stipulate that yachts should not pass closer than (say) 10 miles from the waypoint. Geographical positions can be used as waypoints and yacht positions can be monitored by the Race Organizers' Satellite Tracking Device fitted to all yachts.

Consideration should be given to nominating a navigator for each yacht. He should be selected by the Skipper and would be responsible to the Skipper for the navigation of the yacht. However this would not in any way restrict the Skipper in his choice of courses, tactics, decisions or course/tactics change during the course of the Race. It would also not restrict the Skipper from carrying out his own navigation at any time. However it would involve a 2nd party in the navigation of the vessel, the making of Passage Plans and relieve some of the workload from the skipper. It would also require the Skipper to discuss the navigation with a second party who would be required to raise any points of caution.

Comment on above: I would envisage that the navigator would keep a watch as usual but do additional off-watch work as & when required. This would not be a hardship or involve lengthy hours. However he/she would have the incentive and kudos of being “the Navigator”.

Issued at Singapore this 31st day of January 2010.



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