

Facts and Findings from the Accident

Charting Aspects of the Volvo Ocean Race Stranding

During Leg 2 of the Volvo Ocean Race from Cape Town to Abu Dhabi, Team Vestas Wind ran aground on the night of 29 November 2014 on the Cargados Carajos Shoals. The shoals were shown on the portion of the electronic chart displayed onboard; but only as a blue patch enclosed by a 200m isobath with scattered soundings; the shoalest of which the navigator reported to be 40m. The fact that the feature comprised low lying islands with a fringing drying reef is only apparent when zooming in sufficiently on the Electronic Chart System (ECS). What are the factors that played a role from charting and marine mapping perspective? What can be done to avoid this kind of accident – even taking into account the special circumstances that a race brings? This article presents the facts and views of various experts, and gives you their impressions in the immediate aftermath of the stranding.

Chart Facts

- The Indian Navy conducted modern multibeam surveys of Cargados Carajos Shoals between 2008 and 2010, and produced a usage band 4 (Approach) ENC and a paper chart at a scale of 1:75,000. The ENC number is IN42503A and the paper chart number is IN2503.
- UKHO (British Admiralty) also covered the area with a paper chart, BA1881 scale 1:121,000, derived from an 1846 survey. The latest edition was published in 1941. This chart was withdrawn in March 2015.
- A new edition of the corresponding usage band 4 ENC cell was issued in March 2014, based on the Indian chart. The previous ENC edition only covered the northern half of BA1881. The new edition covers the whole of the paper chart.
- The shoals are also clearly indicated as a drying feature on two small-scale (planning and overview) paper charts. BA4072, covers the whole of Leg 2. BA4702 (Figure 1) includes the critical section of the shoals northward from Mauritius and covers the Chagos Archipelago to the east.
- In this case, the charts used were C-Map MAX, which are unofficial vector electronic charts.
- The screen shot in the Marine GeoGarage Blog from Team Alvimedica, the yacht that

was standing by, appears similar to that from the casualty in the YouTube video of the grounding (at 1:16). Both show a large-scale image of the reef, depths and contours.

The fact that depths are shown to the East of the reef indicates that C-Map must have accessed either the new Indian ENC or the latest paper chart. No soundings are shown there on the Admiralty paper chart.

- The Reef and associated Islands, also known as St Brandon, are correctly positioned within the ECS in use. Paper charts were onboard as back up to the ECS.
- The main vector electronic chart producers for small craft, C-Map and Navionics, do not include the accuracy data found in the source diagram on paper charts, or the S-57 data quality attributes such as CATZOC, so the navigator will not have had explicit information on the data quality. However, this was not an issue affecting the stranding.

Navigation System Facts

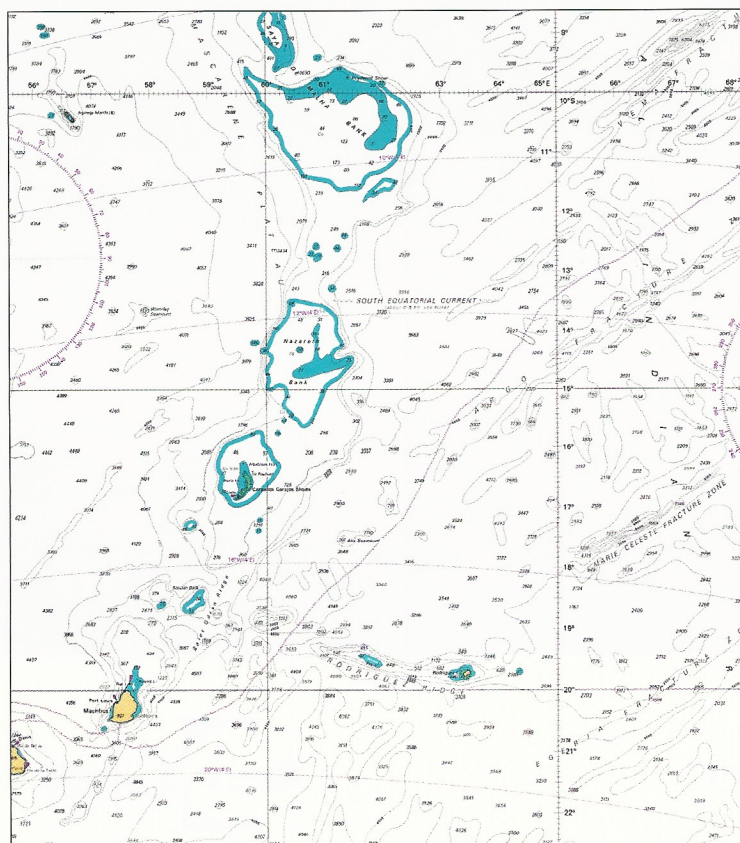
- The C-Map electronic charts are unofficial, the conditions of use state that they should not be used as the *sole source* of navigation information
- The navigation system was not a type-approved ECDIS.
- The navigation software applications used

in the Volvo Ocean Race are Expedition, Adrena or B&G Deckman for Windows. They are ECS dedicated at first to weather routing and sailing performance. Navigation relies on commercial electronic charts.

- The reef only shows up on the higher zoom levels of the chart plotter, and so if they had not zoomed in they would not have seen it (race navigation systems do not have the comprehensive route checking capabilities found in an ECDIS).
- There is a facility to delineate danger zones, as was demonstrated in the Team Alvimedica screen shot; see the Panbo Marine Electronics Hub website.
- As pointed out by one of the other teams,

Race organisers shifted eastern limit of the piracy exclusion zone westward

the navigation systems were showing territorial sea limits around the shoals. This would have been another clue that there were not just shoals but islands.



▲ Figure 1: Paper chart BA4702, which includes the critical section of the shoals northward from Mauritius and covers the Chagos Archipelago to the east.

Event Facts

- The crew size for the newly adopted 'one design' 65ft (19.8m) Volvo racing yachts is limited to 9 including Skipper, navigator and on board reporter. The latter is not part of the sailing crew; but carries out essential domestic duties.
- This leg, involving a North/South transit of the Indian Ocean, was first introduced in the race itinerary in the previous edition of the race. The choice of route between start and finish of each leg is entirely the responsibility of each team. The organisers only lay down broad constraints, such as in this case a Piracy Exclusion Zone and areas affected by extreme weather. Shore-based navigators mainly advise on weather and ocean current routing. They are forbidden to communicate with their crew from the start of a Leg until its conclusion. *Vestas Wind* did not have this facility.
- Approximately 12hrs before the start of the Leg the race organisers shifted the eastern limit of the piracy exclusion zone westward. This was to enable boats to avoid the centre of a developing tropical storm in the southern central Indian Ocean.
- As a consequence of this change and the need to keep west of the storm, the fleet routed itself along the axis of an oceanic

ridge. The Island of Mauritius is part of this ridge, as well as the line of shoals and Islands extending northward via Cargados Carajos Shoals to the Northern limit of the Saya De Malha Bank in Lat. 8° 30' S.

Grounding Facts

- Team *Vestas Wind*'s navigator had hoped to revise his passage plan and check the new route after leaving Cape Town. Before sailing his priorities were the start, establishing the expected weather conditions in the preliminary stages of the Leg and reacting to the presence of the reported tropical storm.
- The vessel sailed Cape Town 19 November 2014. Shortly thereafter she would have experienced very turbulent seas on encountering the Agulhas current, which flows contrary to the prevailing westerly winds.
- In the days before the stranding the vessel was in rough weather and testing sailing conditions as she passed through the edge of the forecast tropical storm.
- The light FI(3) 30s26ft12M on Coco Is. (Île du Sud) marking the southern tip of Cargados Carajos Shoals is no longer operational and was deleted from BA1881 by UKHO Notice to Mariners 3330/2012

(source Indian Chart 2503). No sighting of the light was reported by either Team *Vestas Wind* or Team *Alvimedica*. *Vestas Wind* navigator subsequently revealed that the light structure no longer exists.

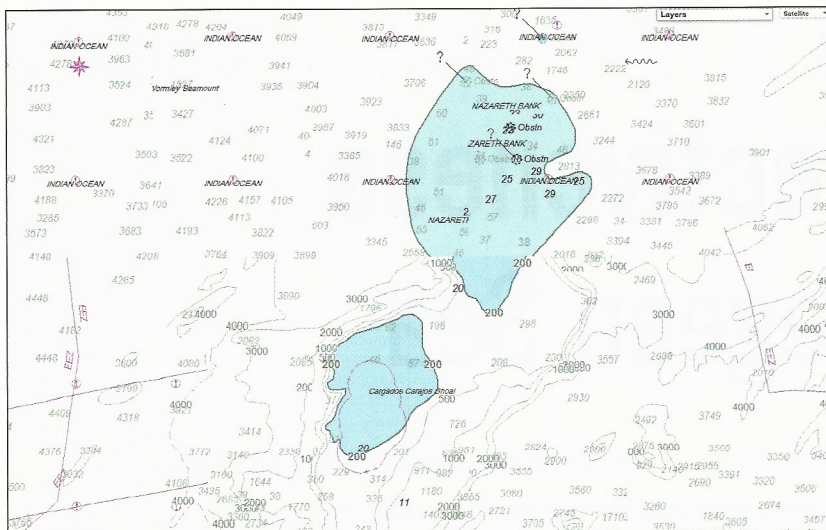
- At the zoom level interrogated by the navigator, the Cargados Carajos Shoals (Figure 2) are named and indicated by a blue shaded area bounded by the 200m isobath with spot depths from 20 to 82m. The navigator stated that the planned track passing over the shoal area was based on the least depth being 40m.
- Navionics rectified the chart in between times. There has been no reaction from C-Map.
- In the video of the grounding one of the crew reports a sounding of 40m just before the hit. Probably too late to take evasive action at 19 kts; but none appeared to have been attempted.
- The 6 other race participants managed to steer clear of danger; but leading boats would also have done so in daylight. Several reported that the true nature of the shoal was only apparent at much higher zoom levels than was usually required for passage navigation.

Reaction of Volvo Ocean Race Organisation

- A panel, chaired by Rear Admiral Chris Oxenbould (Rtd), provided its report on 31 January 2015. Volvo Ocean Race made the report publicly available by the Auckland stopover (27 February – 15 March 2015) to ensure its findings benefit the whole sailing world.
- The Terms of Reference of the panel were to:
 1. Determine what caused the *Vestas Wind* to run aground
 2. Consider all the Race's administrative procedures and documentation in place for the race
 3. Review the emergency management procedures in place and their effectiveness in the incident
 4. Make findings and recommendations as to any changes to the race rules, procedures, administration, documentation, boats or equipment that might serve to prevent a possible recurrence.

Conclusion

There should not be a rush to judgment in this case. What can be said with certainty is that while the cause of the stranding was not any



▲ Figure 2: The Cargados Carajos Shoals at the zoom level interrogated by the Vestas Wind navigator.

deficiency in the available hydrographic data, there is some question about the appropriate selection of that data for display in the ECS onboard *Vestas Wind*.

In fact the Independent Report has not apportioned blame, but made the following conclusions:

- i. There were deficiencies in the use of

electronic charts and other navigational data onboard *Vestas Wind*.

- ii. There were also deficiencies in the cartography presenting the navigational dangers on the small and medium scales of the chart system in use.

Acknowledgments

This text was compiled with input from Tim Thornton (TeamSurv); Marcel van Triest (5 times Volvo race navigator, currently advising one of the teams); Ian Halls and Mike Prince (Australian Hydrographic Service); Peio Elissalde (*Marine GeoGarage* Blogger); Joost Boers (editorial manager *Hydro International*); and Leendert Dorst (contributing editor *Hydro International*). They are greatly acknowledged for their valuable assistance. ◀

Further reading

Chris Oxenbould, Stan Honey and Chuck Hawley: Volvo Ocean Race Independent Report into the Stranding of *Vestas Wind*, 31 January 2015:

Jeppesen C-Map MAX: <http://ww1.jeppesen.com/marine/lightmarine/gb/max/>

Marine GeoGarage Blog: <http://blog.geogarage.com/2014/12/questions-asked-about-volvo-ocean-race.html>

Panbo Marine Electronics Hub: http://www.panbo.com/archives/2014/12/lessons_of_vestas_volvo_wreck_but_what_about_the_c-map_grounding_alarm_similar.html

Vestas Wind Grounding Report online: http://www.volvooceanrace.com/en/news/8549_Vestas-Wind-grounding-report.html

YouTube video of the grounding: <https://www.youtube.com/watch?v=1gmWZCEiw>

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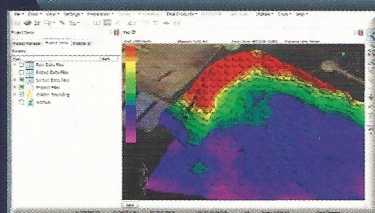


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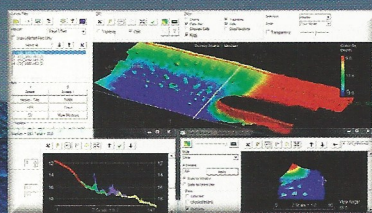
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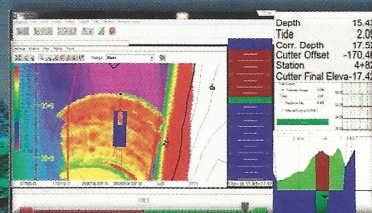
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