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**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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## Grounding of the liquefied gas carrier *Navigator Scorpio* on Haisborough Sand, North Sea 3 January 2014

### SUMMARY

At 1521 (UTC+1) on 3 January 2014 the Liberia registered liquefied gas carrier, *Navigator Scorpio*, ran aground on Haisborough Sand in the North Sea. The vessel was undamaged by the grounding and there were no injuries or pollution; 2.5 hours later, it refloated on the rising tide. The investigation found that the vessel ran aground in restricted waters after the officer of the watch had become distracted and lost positional awareness. The passage plan was incomplete and the significant effects of wind and strong tidal streams had not been properly taken into account. Given the proximity to danger, appropriate navigational techniques were not applied and the bridge manning was insufficient. Additionally, weaknesses in the crew's navigation capability had been identified during an audit of the vessel, however, follow up actions were not sufficient to prevent the grounding.

The vessel's managers, Bernhard Shulte Shipmanagement, have conducted a thorough investigation into the grounding and taken action to prevent recurrence. This includes additional assessments and training for the crew of *Navigator Scorpio* as well as improvements to the safety management system. As a result, no safety recommendations are made in this report.



*Navigator Scorpio*

<sup>1</sup> Universal Co-ordinated Time

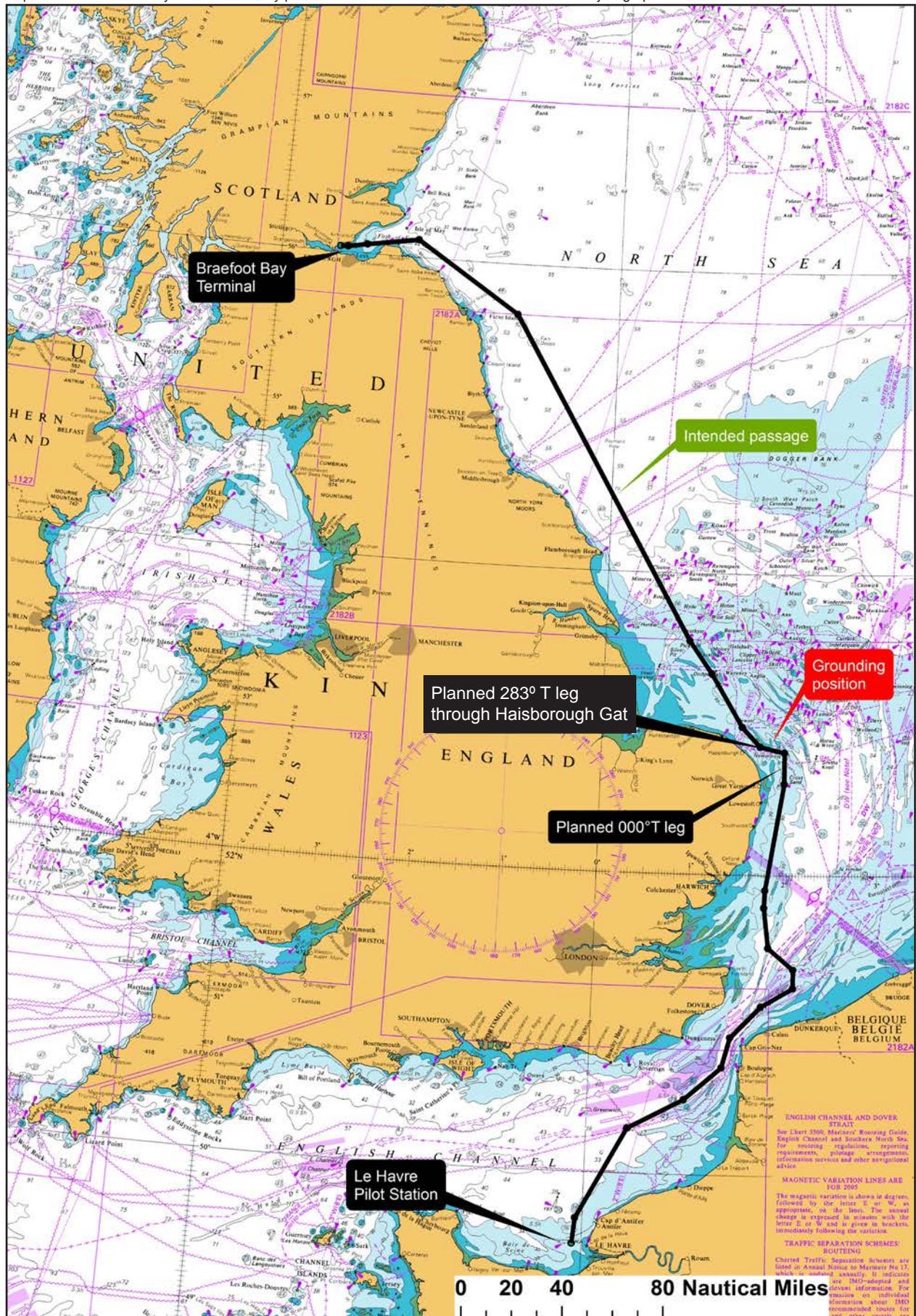


Figure 1: Intended passage from Le Havre to Braefoot Bay

## FACTUAL INFORMATION

### NARRATIVE

#### Chart delivery and departure

On 30 December 2013, the master of *Navigator Scorpio* was notified by its owners that the vessel's schedule had been changed and that the next port of call would be Braefoot Bay in the Forth Estuary, Scotland (**Figure 1**). The following day, the master advised the vessel's managers that additional North Sea coastal charts were required in order to plan the amended passage. The charts, which were not up to date with the latest corrections, were delivered to the vessel in Le Havre, France at around 1500 on 2 January 2014. At 1848 the same day, the vessel got underway in a ballast condition. The newly delivered charts had not been corrected prior to sailing and the passage plan, which was incomplete, had not been checked by the master.

#### Pre-grounding passage

After passage overnight through the Dover Strait, the vessel headed into the North Sea. During the morning of 3 January 2014, the master and the second officer<sup>2</sup> (2/O) reviewed the detail of the passage plan for the remainder of the day. When the master saw the 2/O's proposed 283° True (T) leg<sup>3</sup> through Haisborough Gat (**Figure 2**), he suggested that it should be adjusted south to increase the distance from danger. However, after discussions with the 2/O, the master agreed to leave the plan unchanged but directed that, due to the close proximity to danger, the fixing interval on the 283°T leg was to be reduced from 15 minutes to 5 minutes. He also decided to reduce speed by 4 knots (kts) to approximately 11kts in order to meet the expected time of arrival in the next port.

#### The afternoon watch

At 1200 the same day, the 2/O arrived on the bridge to take over as officer of the watch (OOW). He did not take the opportunity at that time to review the passage plan in order to identify the potential hazards or likely navigational sightings ahead. During his watch, the 2/O recorded and plotted fixes every 15 minutes. In between fixes, he continued to work on the detail of the passage plan; drawing up charts and completing the outstanding corrections that were required on the newly delivered charts.

#### The grounding

At 1430, the 2/O fixed and plotted the vessel's position (**Figure 2**) but he did not calculate the predicted time for the impending alteration to 283°T. At 1437, a radar alarm sounded indicating that the vessel was 5 cables (c) south of the waypoint marking the start of the 283°T leg. The 2/O acknowledged this alarm and decided to fix the vessel's position. Using global positioning system (GPS) data and a range and bearing from Newarp racon buoy, he plotted a fix, shown on the chart at 1438 (**Figure 2**), then continued with his chartwork.

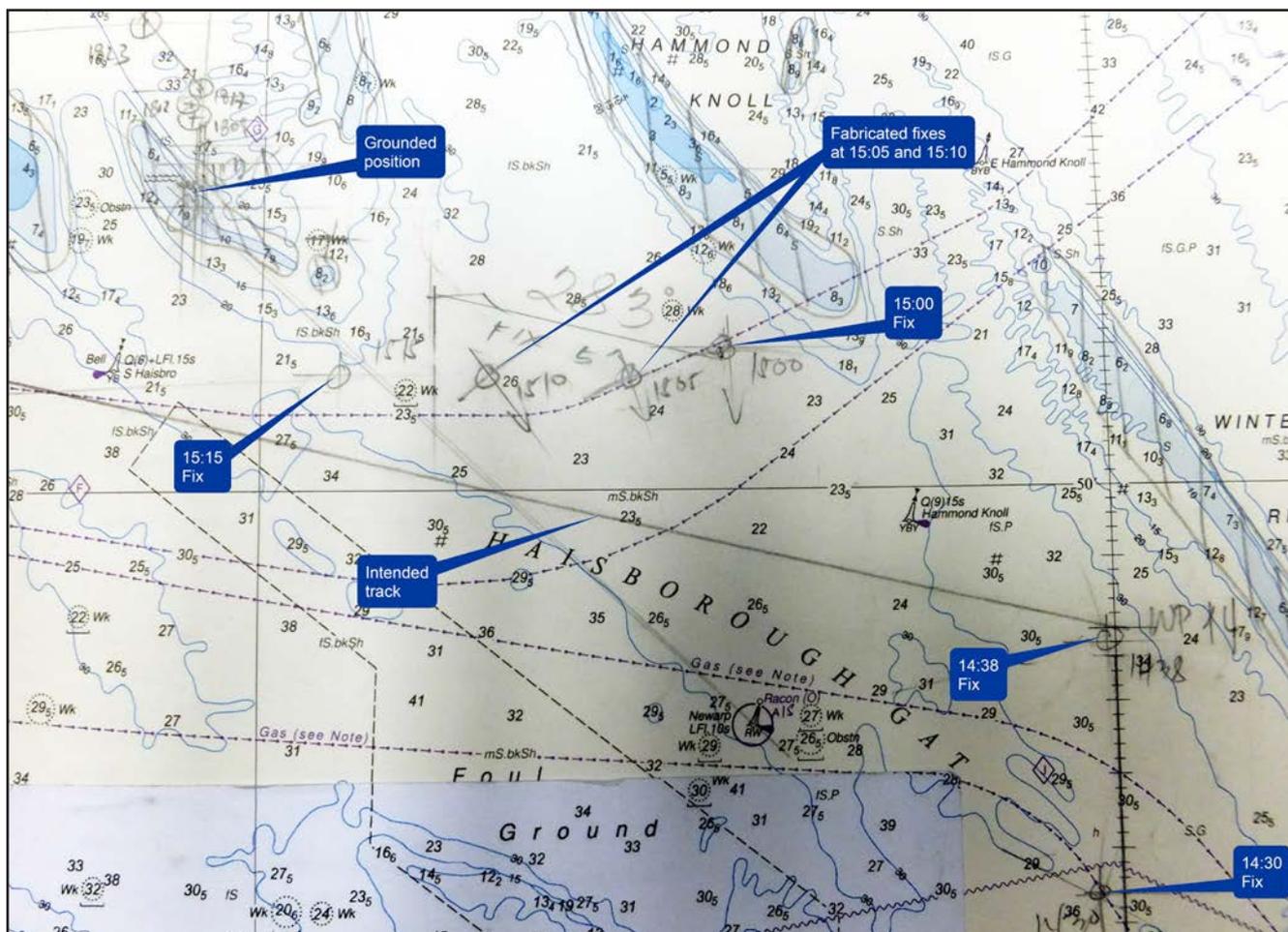
At 1441, the radar alarm sounded again. This time, the alarm indicated that the vessel was crossing the northern boundary of the 5c safety corridor on the 283°T leg. Having acknowledged the alarm, and then realising that he had missed the turn to the new course, the 2/O applied port rudder and, at 1448, the vessel steadied on a heading of 270°T. Twelve minutes later, at 1500, the 2/O recorded and plotted a fix (**Figure 2**) which showed that the vessel was significantly to starboard of the planned course; as a result, he adjusted *Navigator Scorpio*'s heading further to port to 267°T.

The 2/O then correctly recorded a GPS fix in the log at 1515, but incorrectly plotted it 1 mile to the south of the vessel's actual position. At 1521, the vessel's speed started to reduce and the bow swung to port as it grounded on Haisborough Sand.

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<sup>2</sup> The 2/O also held the duties as navigating officer

<sup>3</sup> Use of the term 'leg' in this context refers to the section of the passage plan between each waypoint.



**Figure 2:** Image of chart in use during grounding

### Post-grounding actions

Initially, the 2/O assessed the unexpected course change to be a gyro failure. However, he soon appreciated that the vessel was in some difficulty and placed the telegraph to slow, then to stop, and called the master. The master arrived on the bridge at 1524 and rapidly assessed the situation. Having identified that the fix taken at 1515 had been incorrectly plotted and that the vessel was aground, he initiated grounding contingency plans including informing the vessel’s managers of the situation by phone. He ordered the crew to carry out internal and external checks of the vessel for signs of damage or pollution and also to pump ballast. The bridge team informed Humber Coastguard by very high frequency radio at 1649 and also transmitted a ‘pan pan’ urgency broadcast at 1720.

At some point after the vessel grounded, the 2/O added the fixes on the chart shown at 1505 and 1510 (**Figure 2**). At 1756, unaided on the rising tide, *Navigator Scorpio* refloated and continued its passage to the Forth Estuary. On 6 January 2014, a dive survey in Rotterdam confirmed that the hull was undamaged.

### Environmental conditions

When *Navigator Scorpio* grounded the wind was from the south-south-west at force 6<sup>4</sup>, the sea state was moderate, visibility was good and there was a strong tidal stream in a north-westerly direction. The height of tide at the time of grounding was 1.4 metres (m). As the vessel approached danger, the combined effects of wind and tidal stream resulted in a set of 3.1kts in a direction of 351°T. Additionally, the UK was experiencing a succession of low pressure systems which had generated an extended period of storm conditions with more forecast.

<sup>4</sup> Beaufort Wind Scale Force 6 is a strong breeze, wind speed 22 – 27kts

## Vessel and management

*Navigator Scorpio* was owned by Navigator Gas who undertook cargo management from its London office. Technical and safety management of the vessel was the responsibility of Bernhard Schulte Shipmanagement (BSM). The International Safety Management Code, Document of Compliance was issued by Lloyd's Register (on behalf of the Flag State) to the BSM office in Newcastle, England. BSM's technical management staff were based in its Poland office, and crewing arrangements for the vessel were organised from its Isle of Man office.

## Crew

*Navigator Scorpio's* crew of 19 complied with the Flag State's safe manning requirement and included four officers<sup>5</sup> holding the appropriate STCW<sup>6</sup> qualifications necessary to keep a bridge watch. The master was a 49 year old Lithuanian; he was a career mariner and had been employed by BSM for 12 years. He joined *Navigator Scorpio* in September 2013 and had previously been in command of a similar vessel. The 2/O was a 37 year old Filipino; he joined the vessel in June 2013 as the third officer and was promoted on board to 2/O in September 2013. At the time of grounding, the 2/O was the sole bridge watchkeeper although he was not alone on the bridge as the third engineer was using the satellite phone.

## Navigation methods

The vessel was fitted with an electronic chart and display information system (ECDIS). However, it was not in use because the vessel manager's ECDIS implementation programme, including crew training and electronic chart procurement, was still being developed. As a result, paper charts were the primary means of navigation. Once a passage plan had been approved by the master, the intended track (including a 5c safety corridor) was entered manually into the S-band radar system on the starboard side of the bridge. This was intended to aid positional awareness for the OOW. The vessel's position was also plotted manually on the chart at intervals determined in the passage plan. Dead reckoning (DR<sup>7</sup>) or estimated positions (EP<sup>8</sup>) were not routinely calculated although fixing by visual, GPS and radar as well as parallel indexing techniques were all understood by the bridge team. The echo sounder was normally left running.

At the time of grounding, all bridge equipment was functioning correctly and the planned route had been entered into the S-band radar; the echo sounder alarm depth was set to 1.6m below the keel.

## Safety management system

BSM's safety management system included detailed guidance on the conduct of passage planning and bridge procedures; key extracts of which are:

### Passage planning:

- *'Passage plans for every voyage shall be made from berth to berth. The passage plan is to be made by the 2<sup>nd</sup> officer, checked and signed by the master before it is put into use. When preparing a passage plan the following factors must be taken into account:*
  - *Depth of water in relation to draft*
  - *Currents and tides.'*

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<sup>5</sup> Master, chief officer, 2/O and a third officer

<sup>6</sup> International Convention on the Standards of Training, Certification and Watchkeepers, as amended

<sup>7</sup> DR is a position obtained from the vessel's course and speed through the water and no other factors

<sup>8</sup> EP is derived from the DR position adjusted for the predicted effects of leeway, tidal stream, currents and surface drift

### OOW procedures:

- *'The officer taking over the watch shall familiarize himself with:*
  - *State of tides and currents at handover and expected in next six (6) hours*
  - *Vessel's draft as related to present and expected depth of water*
  - *Navigation marks in sight or to be sighted in the next six (6) hours.'*

### Distractions on the bridge:

- *'The effective implementation of safe navigation practices requires a co-ordinated approach between all bridge watchkeepers, the master and the pilot when on board. It is therefore essential that there are no distractions or non-essential activity on the bridge.'*

### Navigation in restricted waters:

- *'The OOW must exercise great care in POSITIVELY identifying the navigation marks.*
- *Position fixes must be taken at the intervals specific in the passage plan, the frequency shall depend on factors such as distance from the nearest hazard, speed of the vessel, set experienced, etc.*
- *In confined waters, the frequency of fixing the position on the chart generally should not be more than every 15 minutes.'*

### **Internal audit**

From 1 - 4 October 2013, with the same crew on board as for the grounding, the Marine Superintendent from BSM conducted an internal audit of *Navigator Scorpio*. Although the vessel was found to be in good condition, navigation was identified as a weak area. The report's summary stated:

- *'Special attention to be paid to passage planning and position fixing methods as those areas require improvement due to inadequate experience of newly promoted 2/O. Training provided.'*

Although some guidance on this issue was offered by the Marine Superintendent during the visit, the primary responsibility for addressing the identified shortfall rested with the vessel's master.

### **Post-accident external navigation assessment**

On 8 January 2014, on behalf of BSM and as a result of the grounding, International Marine Consultants Ltd conducted a navigational assessment of the vessel. The report from this audit noted that navigation standards were acceptable. However, weaknesses were identified in position monitoring, passage planning and upkeep of charts and publications, including:

- *'The position fixing interval during the previous passage did not always agree with the passage plan*
- *GPS was often used when suitable terrestrial positions were available*
- *Tidal diamond information blocks had not been marked with the relevant high water times and whether spring or neap tides applied.'*

## ANALYSIS

### Passage planning

The International Convention for the Safety of Life at Sea (SOLAS)<sup>9</sup> requires a ship's master to ensure that the intended voyage had been planned using the appropriate nautical charts and publications for the area concerned. This should take into account the guidelines and recommendations contained in International Maritime Organization (IMO) Resolution A.893(21) - *Guidelines for Voyage Planning*. These explain that:

- *The development of a plan for voyage or passage, as well as the close and continuous monitoring of the vessel's progress and position during the execution of such a plan, are of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment.*

The IMO resolution discusses the four key components necessary to ensure the effective planning and achievement of a safe passage. The initial voyage planning appraisal stage involves the gathering of all information relevant to the intended voyage. The next stage requires the detailed planning of the whole voyage from berth-to-berth. The third and fourth stages are the effective execution of the plan and monitoring the progress of the vessel during the implementation of the plan.

The late notice change to *Navigator Scorpio's* schedule and anticipated poor weather led to the master's decision to plan a coastal route through the North Sea from Le Havre to Braefoot Bay including passage through the Haisborough Gat. This was an entirely reasonable decision; however, the charts required for this plan were not delivered until just prior to departure. This meant that the vessel sailed from Le Havre without a complete berth-to-berth passage plan.

Once underway, the 2/O focused on developing the passage plan in more detail and the master reviewed it in stages. The 2/O's main effort was on drawing up the intended track to follow on each chart and he did not properly highlight navigational dangers or assess the expected environmental effects. Thus, when the master reviewed the planned 283°T leg through Haisborough Gat, he was not briefed on the surrounding dangers, navigational marks or, critically, the expected effects of wind and strong tidal streams. Nevertheless, the master identified that the intended course was unnecessarily close to Haisborough Sand and should have trusted his instinct and directed that the plan be altered to pass further from the danger. As a minimum, he should have required the calculation of a course-to-steer through the Gat to counter the environmental effects. However, he was unaware of the expected tidal streams so agreed to the plan but mitigated the risk, as he saw it, by imposing a 5 minute fixing interval on the 283°T leg.

### The execution and monitoring of the passage plan

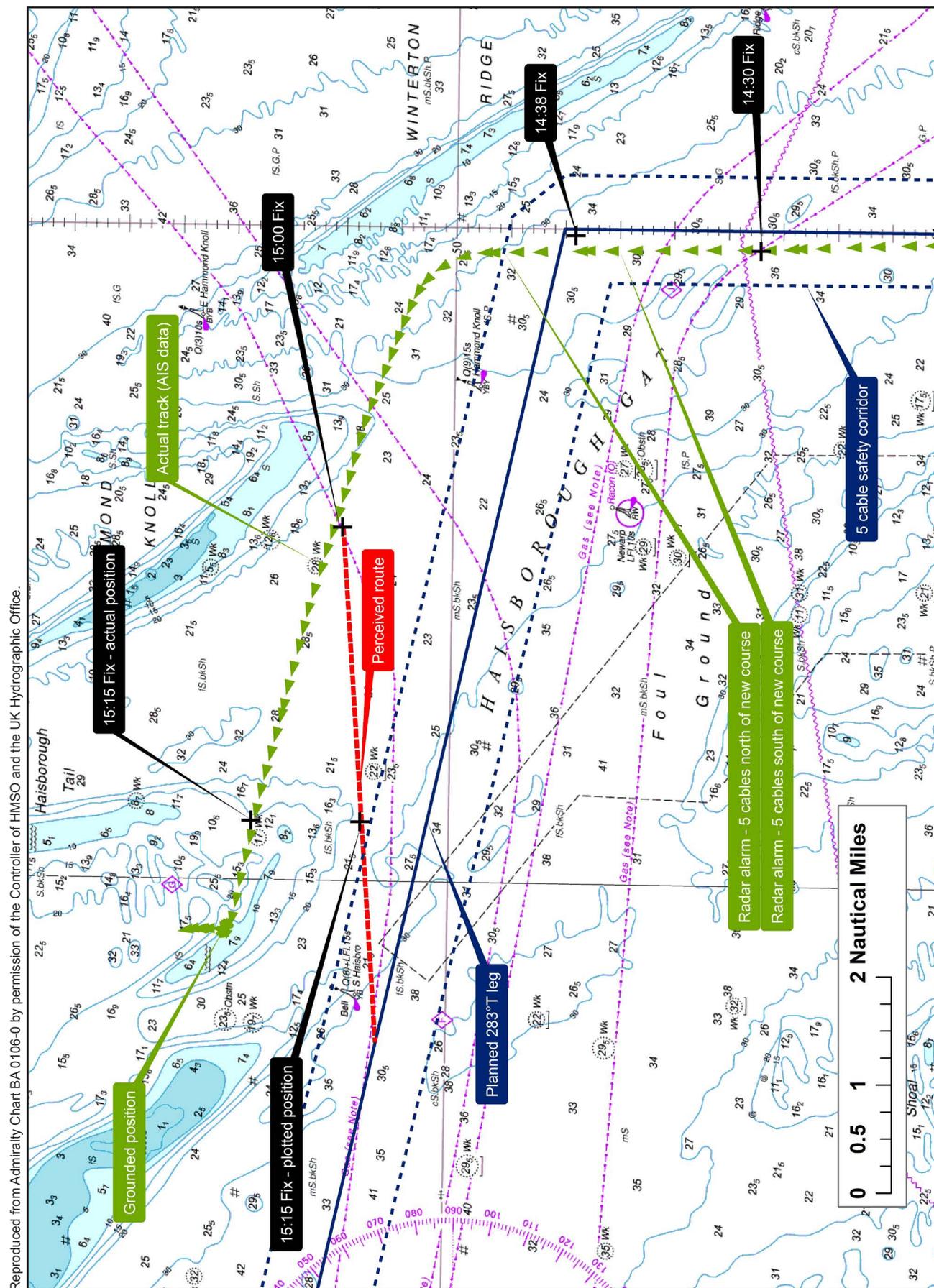
When the 2/O arrived on the bridge to take over the watch, he did not check to identify what sightings, particularly navigation marks, would be made or the potential dangers that lay ahead for the watch. He also made no assessment of the expected effects of tidal stream or wind. Both these actions are standard navigation practices and were a requirement of the vessel's safety management system.

As the vessel approached the turn to 283°T, the 2/O was not expecting the radar waypoint alarm as he had no appreciation of the significant northerly set affecting the vessel. Thus, his decision to check the position by plotting a fix was understandable but unhelpful. When the decision was eventually taken to alter course, the vessel was already well to starboard of the new track. The 2/O appreciated this but did not take a fix immediately after completing the turn. This denied him the opportunity to build up a plot of the course made good or calculate an effective EP; either of these actions would have been opportunities to determine an appropriate course-to-steer. Consequently, his choice of 270°T and the subsequent adjustment to 267°T were not effective in regaining track.

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<sup>9</sup> SOLAS chapter V – Safety of Navigation: Regulation 34 – Safe Navigation and Avoidance of Dangerous Situations.

Although it was correctly recorded in the log, the fix taken at 1515 was incorrectly plotted 1 mile to the south of the vessel's actual position. When plotting the fix, the OOW's understanding of the situation was that the vessel was regaining track. As a result, it is highly likely that he plotted the fix where he perceived the vessel to be based on this incorrect assessment (**Figure 3**).



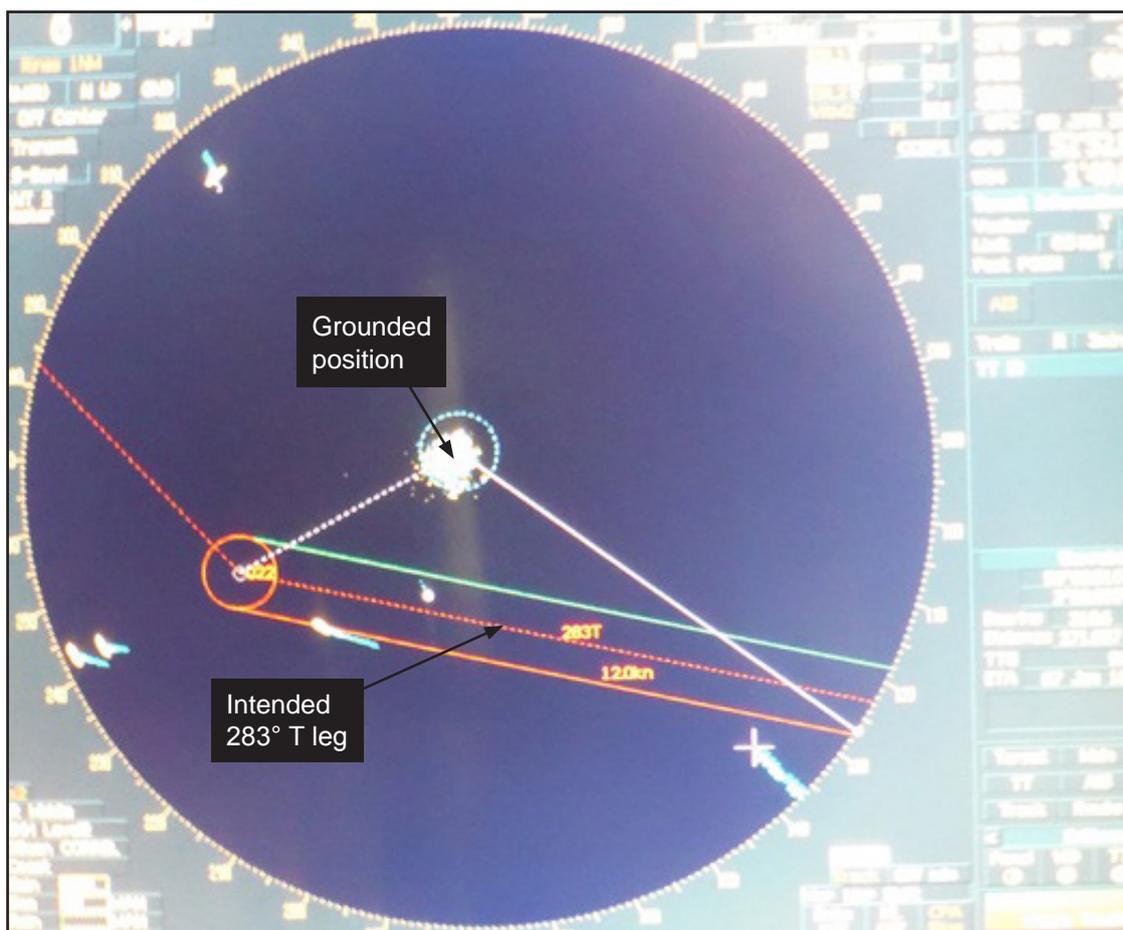
**Figure 3: Analysis of perceived route**

Other clues that the vessel was not regaining the planned track were available. Had the 2/O correlated visual observations with the chart, it would have been readily apparent that South Haisbro buoy was on the port bow when it should have been to starboard. The S-band radar picture would have clearly shown the vessel's actual track diverging away from the intended track. This is evident from an image of the radar display (**Figure 4**) when aground. The GPS display would also have shown the course and speed over the ground which, if compared with the course and speed through the water, would have indicated a very significant difference. Radar parallel indexing techniques were understood and could also have been used to accurately monitor the vessel's position relative to track.

The echo sounder was a final, potential safety barrier to the grounding. However, it did not alarm, which was almost certainly as a result of the vessel being set sideways onto the sand resulting in the depth transducer not passing over ground shallower than the alarm setting.

During his watch, the 2/O spent long periods of time at the chart table correcting and preparing the newly delivered charts. With responsibility for navigation, it is understandable that he felt a strong duty to prepare the charts for the passage ahead. However, this task distracted him from his primary role of maintaining a lookout and monitoring his vessel's passage, and resulted in him missing the planned turn into the Haisborough Gat.

All of these factors meant that the 2/O did not have continuous and accurate positional awareness. Had the 2/O not been distracted and been aware of the significant environmental effects to be taken into account when predicting times for altering course and courses-to-steer to make good the intended track, he would have been better prepared to successfully execute the passage plan.



**Figure 4:** Image of S-band radar display at time of grounding

## **Fabrication of plotted fixes**

Having realised the vessel was aground and concerned that he had not followed the master's instruction to fix at 5 minute intervals, the 2/O fabricated two fixes on the chart, shown at 1505 and 1510 (**Figure 2**). The 2/O's intent was to create a chart which showed fixes at 5 minute intervals to give the impression that he had followed the master's instructions.

The post-grounding actions of the 2/O are not uncommon; similar chart alterations post-casualty are often discovered during MAIB accident investigations. The chart in use at the time of a marine casualty is critical evidence and, in the interests of safety and in accordance with accident reporting regulations<sup>10</sup>, should not be altered after the grounding.

## **Bridge resource management**

The master was fully aware that a berth-to-berth passage plan had not been prepared and that the new charts had not been amended prior to departing Le Havre. The reduction in speed on the morning of 3 January 2014 indicated that there was time in hand to delay sailing or go to a suitable anchorage to allow time for a more detailed passage plan to be completed. However, having chosen to proceed on passage, the master still had options that would have allowed the 2/O to fulfil his navigation officer duties; there were sufficient qualified officers on board to permit his temporary withdrawal from OOW duties and allow him the time necessary to complete the passage plan and chartwork.

Haisborough Gat is a restricted navigational passage which requires a high degree of positional awareness. Manually recording and plotting fixes at 5 minute intervals would be almost impractical for an OOW on the bridge alone. However, when this measure was discussed by the master and the 2/O, no consideration was given to increasing bridge manning levels. During the passage through the Gat, the master and lookout should have been on the bridge, which would have allowed the 2/O to focus on position fixing and track monitoring.

## **Effectiveness of post-audit actions**

BSM's internal audit conducted in October 2013 was a thorough and comprehensive inspection which took 4 days to complete and accurately identified shortcomings in the navigation department. The Marine Superintendent who conducted the audit took time to offer some additional navigational advice, but primary responsibility for addressing the reported shortcomings was left with the master.

It was apparent from this investigation that the performance of the 2/O immediately prior to the grounding did not meet acceptable navigation standards and reflected the level of inexperience identified during the audit. It was also evident that the standard of passage planning, chartwork and watchkeeping routines were acceptable to the master.

Thus, the events leading up to the grounding and the findings of the external audit conducted immediately after the grounding indicates that BSM and the vessel's master did not apply a sufficiently high priority to addressing the navigational weaknesses highlighted 3 months earlier.

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<sup>10</sup> The Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, Paragraph 10 (Preservation of Evidence)

## CONCLUSIONS

- *Navigator Scorpio* was underway without a complete berth-to-berth passage plan. The plan that was prepared was not thoroughly checked by the master. In addition, when the master did identify a potential hazard, he did not take effective action to mitigate the danger.
- When taking over as OOW, the 2/O was not aware of the navigational hazards ahead or the very significant effects of wind and tidal stream. He did not calculate an estimated time for the course alteration to 283°T and was, therefore, not expecting the radar alarm indicating the vessel was approaching the new leg.
- As the sole bridge watchkeeper, the 2/O was distracted by undertaking passage planning and chart corrections when on watch, causing him to miss the planned course change and lose positional awareness.
- On the 283°T leg, the 2/O did not follow the master's instructions to fix the vessel's position at 5 minute intervals. However, this direction was impractical and the 2/O needed additional support, thus bridge manning was insufficient for the restricted passage.
- After the alteration of course to 270°T, the 2/O did not effectively monitor the vessel's position; no fix was taken when steady on the new course, no EP was calculated and radar parallel indexing was not used. The further alteration of course to 267°T was ineffective in regaining course.
- Unaware of the significant northerly set, the 2/O assessed that the intended track was being regained and plotted the 1515 fix where he perceived the vessel to be.
- Post the grounding, false information was added to the chart, which was not in the interests of safety.
- Although an internal audit had identified weaknesses in the vessel's navigational capability, actions taken by the vessel's master and managers as a result were insufficient to prevent the grounding.

## ACTIONS TAKEN

**Bernhard Shulte Shipmanagement** has:

- Undertaken a thorough investigation of the incident, which has identified causal factors. The company's investigation report has been circulated to other vessels and reviewed at a fleet officers' seminar.
- Conducted further assessments of *Navigator Scorpio's* bridge team leading to focused additional training for the crew in passage planning, passage monitoring and bridge team management.
- Updated the safety management system to clarify guidance relating to navigation in restricted waters.
- Issued a safety bulletin highlighting the dangers associated with distractions on the bridge.
- Issued an operational guideline which reiterates the importance of following safe navigational procedures for passage planning and monitoring.

## RECOMMENDATION

As a result of the actions taken by Bernhard Shulte Shipmanagement, no safety recommendations are made in this report. However, the circumstances of this report should serve as a warning to mariners of the dangers of navigating in coastal waters and the actions required to maintain positional awareness.

## VESSEL PARTICULARS

Vessel's name	<i>Navigator Scorpio</i>
Flag	Liberia
Classification society	Lloyds Register
IMO number/fishing numbers	9404792
Type	Liquefied gas carrier
Registered owner	Navigator Scorpio LLC
Manager(s)	Bernhard Shulte Shipmanagement
Year of build	2009
Construction	Steel
Length overall	159.97m
Gross tonnage	18,311gt
Minimum safe manning	13
Authorised cargo	Liquefied gas

## VOYAGE PARTICULARS

Port of departure	Le Havre, France
Port of arrival	Braefoot Bay, Forth Estuary, Scotland
Type of voyage	Short international
Cargo information	Vessel in ballast
Manning	19

## MARINE CASUALTY INFORMATION

Date and time	3 January 2014, 1521 (UTC+1)
Type of marine casualty or incident	Less Serious Marine Casualty
Location of incident	Haisborough Sand, North Sea
Injuries/fatalities	None
Damage/environmental impact	None
Vessel operation	On passage
Voyage segment	Mid-water
External & internal environment	Wind: south-south-west, force 6 Visibility: good Sea state: moderate