ACCIDENT REPORT

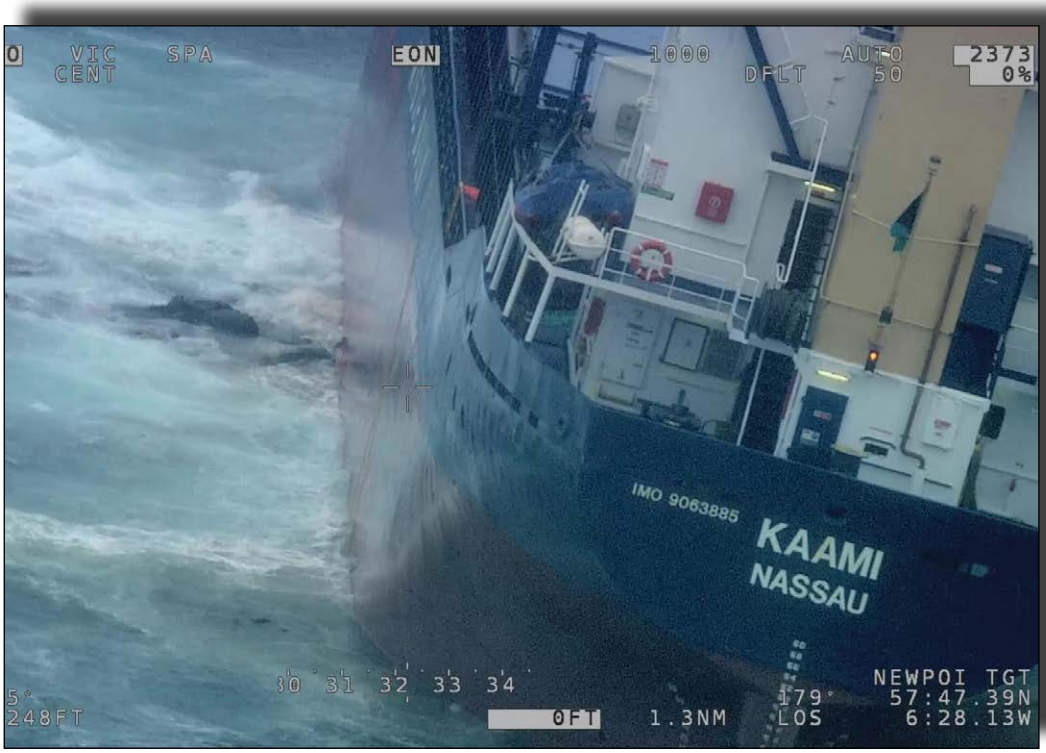
Report on the investigation of

the grounding of the general cargo vessel

# *Kaami*

on Sgeir Graidach, the Little Minch, on

23 March 2020




SERIOUS MARINE CASUALTY REPORT NO 7/2021 JUNE 2021

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

**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.

Cover image courtesy of MCA



All MAIB publications can be found on our website: www.gov.uk/maib

For all enquiries:

Marine Accident Investigation Branch
First Floor, Spring Place
105 Commercial Road
Southampton
SO15 1GH
United Kingdom

Email: maib@dft.gov.uk
Telephone: +44 (0)23 8039 5500

Press enquiries during office hours: +44 (0)1932 440015
Press enquiries out of hours: +44 (0)30 0777 7878

# CONTENTS

## FIGURES



## ANNEXES

## GLOSSARY OF ABBREVIATIONS AND ACRONYMS

| | | |
|---|---|---|
| AIS | - | Automatic Identification System |
| ALB | - | All Weather Lifeboat |
| BMA | - | Bahamas Maritime Authority |
| BNWAS | - | Bridge Navigation Watch Alarm System |
| BPG | - | Bridge Procedures Guide |
| CGOC | - | Coastguard Operations Centre |
| C/O | - | Chief Officer |
| CoC | - | Certificate of Competency |
| DCPSO | - | Duty Counter Pollution and Salvage Officer |
| DMAIB | - | Danish Marine Accident Investigation Branch |
| DNV GL | - | Det Norske Veritas Germanischer Lloyd |
| DOC | - | Document of Compliance |
| DPA | - | Designated Person Ashore |
| ECDIS | - | Electronic Chart Display and Information System |
| ENC | - | Electronic Navigation Chart |
| ETV | - | Emergency Towing Vessel |
| GPS | - | Global Positioning System |
| gt | - | gross tonnage |
| HMCG | - | Her Majesty’s Coastguard |
| ICS | - | International Chamber of Shipping |
| IEC | - | International Electrotechnical Commission |
| IHO | - | International Hydrographic Organization |
| IMO | - | International Maritime Organization |
| ISM Code | - | International Safety Management Code |
| m | - | metres |
| MCA | - | Maritime and Coastguard Agency |
| MOO | - | Maritime Operations Officer |
| nm | - | nautical mile |
| NMOC | - | National Maritime Operations Centre |
| NSC | - | Navigation subcommittee |

| | | |
|---|---|---|
| OMS | - | Operational Management System |
| RNLI | - | Royal National Lifeboat Institution |
| SCU | - | Salvage Control Unit |
| SMS | - | Safety Management System |
| SMOO | - | Senior Maritime Operations Officer |
| SOLAS | - | International Convention for the Safety of Life at Sea 1974, as amended |
| SOSREP | - | Secretary of State's Representative for Maritime Salvage and Intervention |
| SRF | - | Solid Recovered Fuel |
| STCW | - | International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention) |
| TSS | - | Traffic Separation Scheme |
| UKC | - | Under keel clearance |
| UTC | - | Universal Co-ordinated Time |
| VHF | - | Very High Frequency |
| VTM | - | Vessel Traffic Monitoring |
| XTD | - | Cross Track Distance |
| XTL | - | Cross Track Limit |

**TIMES:** all times used in this report are UTC+1 unless otherwise stated.

Image courtesy of MCA



*Kaami*

# SYNOPSIS

At 0141 on 23 March 2020, the general cargo vessel *Kaami* ran aground on Sgeir Graidach shoal in the Little Minch on the west coast of Scotland, while on passage from Drogheda, Ireland to Slite, Sweden. The crew were safely evacuated from the vessel by coastguard helicopter and *Kaami* was successfully refloated by salvors on 4 May 2020. There were no injuries but the damage to *Kaami*'s hull was extensive and the ship was declared a constructive total loss.

The MAIB investigation found that:

- A full appraisal of information was not made in the voyage planning process, the master instead relying on previous experience of navigating the Little Minch, leading to an IMO adopted recommended route not being used.

- No calculation of a minimum under keel clearance for the vessel in her departure state was undertaken, and as such the safety contour settings on the electronic chart display and information system (ECDIS) were not correct. The safety contour values had not been changed since the crew had joined the vessel a month before.

- A visual check of the route using appropriately scaled electronic navigation charts was not conducted and the ECDIS route safety check was not carried out.

- A second check of the voyage plan did not take place which meant the plan was created by a single person in isolation. With no ECDIS route safety check conducted, several errors, including two locations where *Kaami* would likely run aground were missed.

- Monitoring of the passage was ineffective as the look ahead features on the ECDIS were not activated and the use of the lookout was not effective. It is probable that the chief officer was also suffering from the effects of fatigue.

- The watchkeepers at Stornoway Coastguard Operations Centre did not intervene prior to *Kaami*'s grounding as they were unaware of the developing situation, even though the watchkeeper of a local fishing vessel had warned *Kaami* on very high frequency radio channel 16 a few minutes prior to the grounding.

Following this accident, actions have been taken by the ship managers, Misje Rederi AS, as well as the Maritime and Coastguard Agency. Recommendations have been made to Misje Rederi AS to review the number of watchkeepers on its vessels with the aim of minimising the hazards associated with fatigue, improve the guidance given in its safety management systems on the effective use of ECDIS and of bridge lookouts, and to enhance its ability of conduct internal navigation audits.

# SECTION 1 – FACTUAL INFORMATION

## 1.1 PARTICULARS OF *KAAMI* AND ACCIDENT

| **SHIP PARTICULARS** | |
|---|---|
| Vessel's name | *Kaami* |
| Flag | Bahamas |
| Classification society | DNV GL |
| IMO number/fishing numbers | 9063885 |
| Type | General cargo |
| Registered owner | Misje Bulk AS |
| Manager(s) | Misje Rederi AS |
| Construction | Steel |
| Year of build | 1994 |
| Length overall | 89.95m |
| Gross tonnage | 2715 |
| Minimum safe manning | 7 |
| Authorised cargo | Dry bulk |
| External & internal environment | Wind Beaufort force 6 – 8. Night, good visibility. Rough seas. |
| Persons on board | 8 |

| **VOYAGE PARTICULARS** | |
|---|---|
| Port of departure | Drogheda, Republic of Ireland |
| Port of arrival | Slite, Sweden |
| Type of voyage | International |
| Cargo information | 1927 tonnes of SRF |
| Manning | 8 |

| **MARINE CASUALTY INFORMATION** | |
|---|---|
| Date and time | 23 March 2020, 0141 |
| Type of marine casualty or incident | Serious Marine Casualty |
| Location of incident | Sgeir Graidach rock, the Little Minch |
| Place on board | Ship-hull |
| Injuries/fatalities | Nil |
| Damage/environmental impact | Significant breaches along length of hull leading to constructive total loss of vessel |
| Ship operation | On passage |
| Voyage segment | Coastal |

## 1.2 NARRATIVE

### 1.2.1 Events preceding the accident

On 19 March 2020 the general cargo vessel *Kaami* arrived in the port of Drogheda, Ireland to load a cargo of 1927 tonnes of solid recovered fuel (SRF)[1]. During the two-day port call the chief officer (C/O) was overseeing the cargo operations and so the master carried out chart updates on the vessel's ECDIS and planned the voyage to their next port of call, Slite, Sweden.

At 2030 on 21 March 2020 with the cargo loading completed, *Kaami* departed Drogheda. The vessel's draughts on departure were 4.90m forward and 5.40m aft.

*Kaami*'s voyage proceeded up the Irish Sea, through the North Channel and, at 2024 on 22 March, the vessel reported into Stornoway Coastguard Operations Centre (CGOC) on entering the Minches voluntary reporting system **(Figure 1)**.

At 2255, *Kaami*'s master reported to Stornoway CGOC using very high frequency (VHF) radio as the vessel entered the Off Neist Point traffic separation scheme (TSS) at reporting point 'E' **(Figure 1)**. The weather had deteriorated since departing Drogehda and was then a south-westerly Beaufort force 6 to 9 with a rough to very rough following sea condition. It was a dark night, with total cloud cover, but visibility was good.

Just before 2300 (midnight ship's time), the ship's C/O, along with an able seaman (AB) to act as lookout, arrived on the bridge to take over the navigation watch from the master.

After completing the watch handover with the master, *Kaami*'s C/O settled into his watch with the lookout who, in keeping with the company's manning requirements, kept a bridge watch only in the hours of darkness. The C/O was using the starboard radar and back-up ECDIS display near the centre line conning position while the lookout stood on the port side of the wheelhouse next to the main ECDIS unit **(Figure 2)**.

At 0058 on 23 March, *Kaami*'s C/O contacted Stornoway CGOC on VHF radio to advise that the ship was approaching reporting point 'F' **(Figure 1)** which marked the start of the International Maritime Organisation (IMO) recommended northerly route between the islands of Fladda-chuain and Eileen Trodday. *Kaami* continued along the planned track, which did not follow the recommended route but instead took a route approximately 1nm to the north of the southern cardinal mark on Eugenie Rock **(Figure 1)**. *Kaami* was making good an autopilot-controlled course of 032° and a speed of 10.6kts.

At 0135, a watchkeeper on the fishing vessel *Ocean Harvest* contacted *Kaami* on VHF radio to warn that *Kaami* was heading into 'shoal waters'. *Kaami*'s C/O responded promptly to the call, and after changing radio frequency to a working channel (Channel 67) he thanked *Ocean Harvest*'s watchkeeper for the information, confirmed that he understood and that he would be altering the vessel's course in the next few minutes.

[1] Solid recovered fuel (SRF) is a high-quality alternative to fossil fuel, produced from mainly commercial waste including paper, card, wood, textiles and plastic.

Courtesy of ALRS Vol 6 (NP 286). Inset reproduced from Admiralty Chart 1757-0 by permission of HMSO and the UK Hydrographic Office

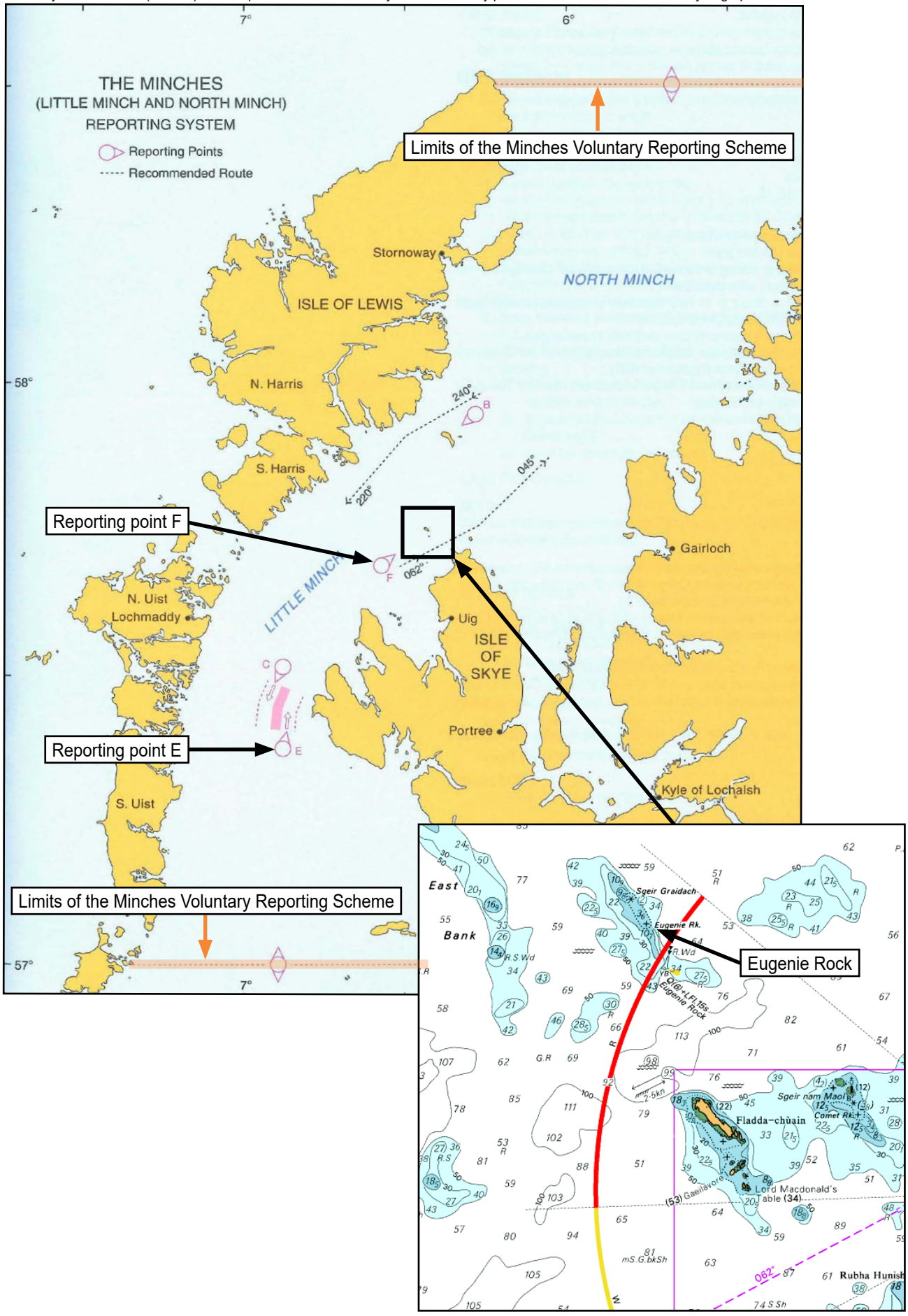



**Figure 1:** The Minches Voluntary Reporting Scheme

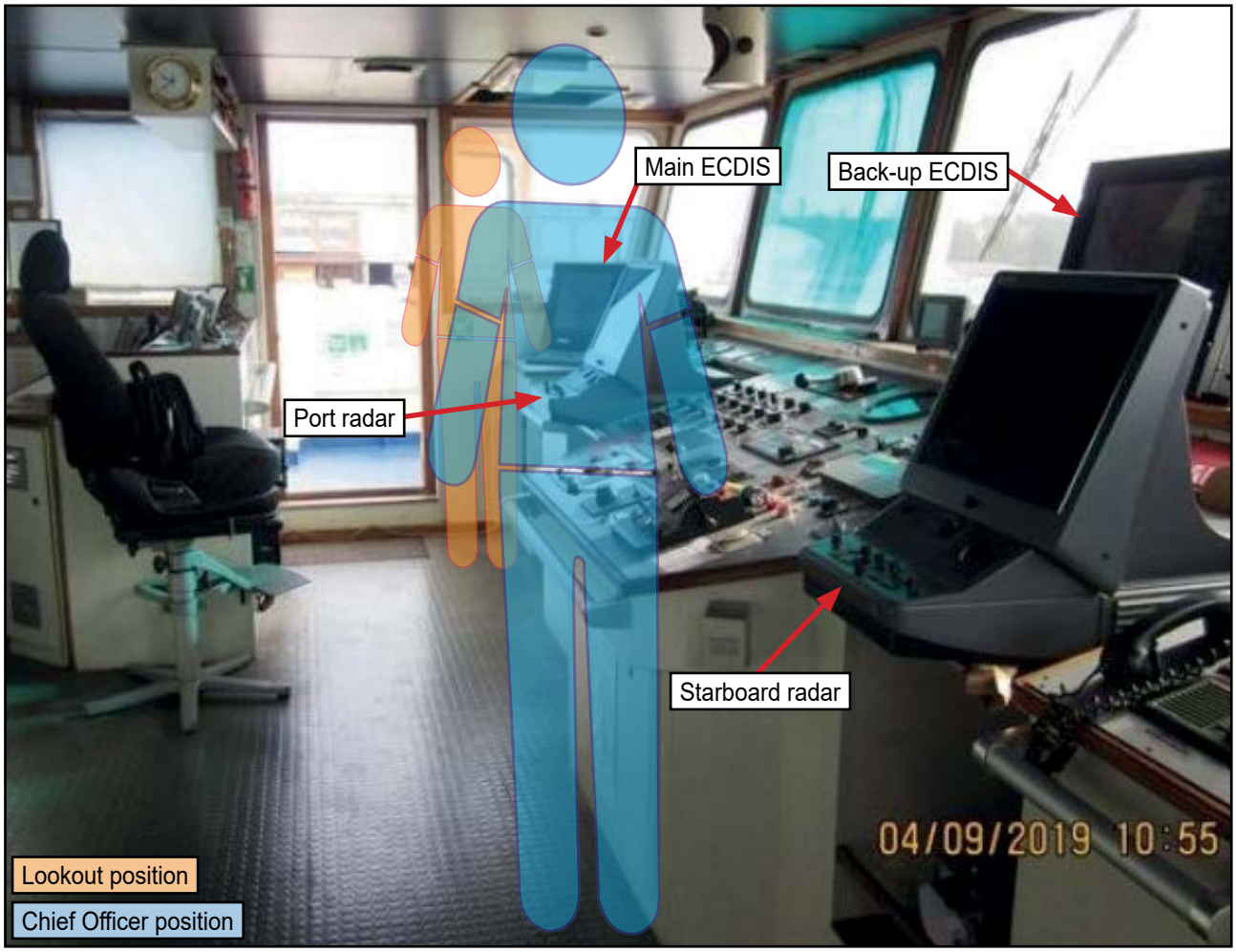



**Figure 2:** *Kaami*'s bridge

Soon after, *Kaami*'s C/O used the autopilot to alter course 10° to starboard at waypoint 19 **(Figure 3)**, in accordance with the voyage plan.

At 0141, *Kaami*'s C/O and the lookout felt two heavy impacts and the vessel came to a stop **(Figure 4)**. The deck lights were switched on and the C/O realised that the vessel was aground, and he put the telegraphs to stop.

### 1.2.2 Post grounding response

The watchkeeper on the fishing vessel *Harvester*, who was accompanying *Ocean Harvest* and was plotting *Kaami*'s track on his chart plotter, noticed that *Kaami* had stopped and so called the ship on VHF radio. *Kaami*'s C/O acknowledged *Harvester*'s call and shortly after, at 0146, *Kaami*'s C/O called Stornoway CGOC to report that *Kaami* was aground.

*Kaami*'s C/O called the ship's master, who had been awoken by the grounding, on the vessel's intercom system and the lookout left the bridge to wake the rest of the crew.

Shortly afterwards, *Kaami*'s master arrived on the bridge and was briefed by the C/O. The master ordered the C/O to go forward with the crew to complete a damage assessment. Using a hand-held spotlight, the C/O was able to see rocks on the vessel's port side, but he was unable to determine if there was any significant damage to the ship's hull.


**Figure 3:** *Kaami*'s starboard ECDIS showing waypoint 19

Image courtesy of MCA


**Figure 4:** *Kaami* aground on Sgeir Graidach

The forepeak tank was sounded and a water level of 3.5m was returned. The tank was empty on departure from Drogheda, which indicated that it had been breached. The C/O could also hear the movement of water from the sounding pipes connected to the bow thruster space and he believed that this space was also breached.

To further assess *Kaami*'s damage, the master began to de-ballast number 1 (port and starboard) water ballast wing tanks and the C/O carried out a series of soundings. With the level of water reducing with each sounding the master was confident that the number 1 wing tanks were not breached.

Meanwhile, at 0207 Stornoway CGOC's watchkeepers tasked rescue assets, including the Portree Royal National Lifeboat Institution (RNLI) all weather lifeboat (ALB) and the Maritime and Coastguard Agency (MCA) contracted emergency towing vessel (ETV), *Ievoli Black*. At 0210, the MCA's duty counter pollution and salvage officer (DCPSO) was also informed.

With *Kaami*'s movement on the rocks worsening, the master sounded the general alarm and called the crew back to the bridge where they were ordered to don immersion suits and life jackets. Soon after the movement of the vessel became so violent that the crew were unable to stand safely and had to lie down on the deck of the bridge.

At 0307, *Kaami*'s master informed Stornoway CGOC he wanted to abandon ship, and by 0355 the coastguard helicopter Rescue 948 was on scene. By 0421 all the crew had been safely winched off the vessel and taken to Stornoway.

### 1.2.3 Salvage and damage sustained to *Kaami*

A 500m temporary exclusion zone was immediately established around *Kaami* by the Secretary of State's Representative for Maritime Salvage and Intervention (SOSREP), with the *Ievoli Black* standing by on scene.

On 25 March, the first salvage crew were able to board *Kaami* and an assessment identified that 50% of the tanks were breached. As there was also water in the single cargo hold it was presumed by the salvors that the tank top was breached in at least one location. By 28 March, all tanks forward of the engine room had been breached **(Figure 5)**.

A Salvage Control Unit[2] (SCU) was convened by SOSREP and a plan created for the removal of pollutants, ballast, and cargo **(Figure 6)**. On 30 March 2020 Misje Rederi AS entered a constructive total loss request, which was accepted by the hull and machinery insurers on 21 April 2020. With the removal of pollutants and cargo successfully completed and with extensive temporary repairs, *Kaami* was refloated on Monday 4 May 2020 and towed to the Kishorn dry dock facility for disposal **(Figure 7)**.

[2] The SCU's primary role is to monitor salvage operations and actions that are being taken and/or proposed relating to salvage activity and to ensure that such actions do not have an adverse effect on safety and the environment.

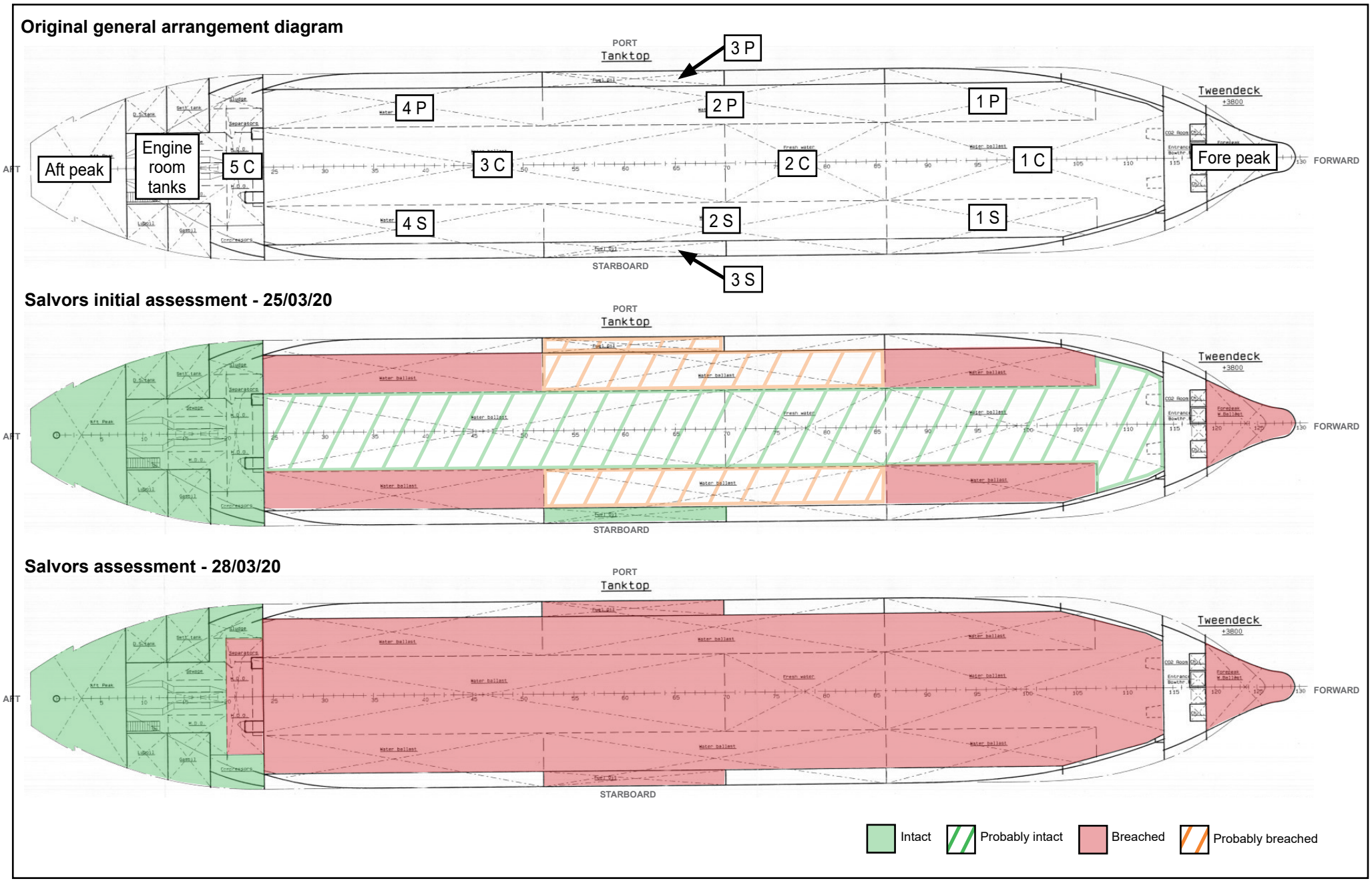



**Figure 5:** General Arrangement plan showing progression of damage

Image courtesy of MCA

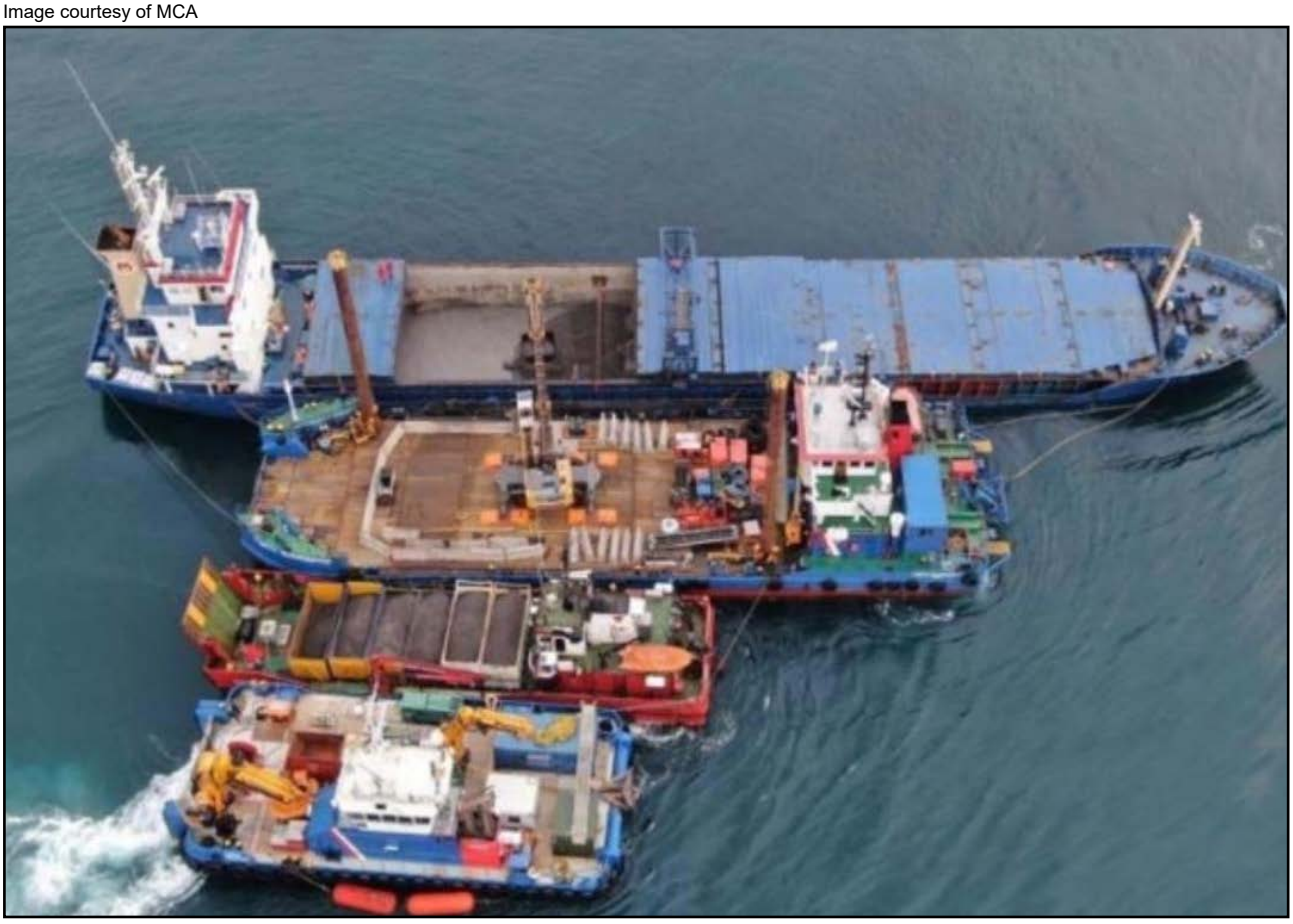


**Figure 6:** Salvage barges alongside *Kaami*

**Figure 7:** *Kaami* in the Kishorn facility

## 1.3 VESSEL

MV *Kaami* was a general cargo vessel owned by Misje Bulk AS and managed by Misje Rederi AS, a chartering and management shipping company, which operated from Bergen, Norway (management) and Kaliningrad, Russia (operations, technical and recruitment).

*Kaami* mainly operated around western Europe, carrying cargoes including wheat, rapeseed meal, scrap, and coal in the 5,764 $m^3$ single cargo hold.

### 1.3.1 Bridge equipment

*Kaami*'s bridge was equipped with a JRC JAN 2000 ECDIS. The ECDIS was designated as the primary means of navigation. The main terminal was used for planning and was located on the port side of the bridge. The back-up terminal was close to the centre line in the vicinity of the starboard radar and was used for navigation **(Figure 2)**.

Other equipment on *Kaami*'s bridge included:

- Sperry marine radar x 2 (it was common practice to leave the port radar switched off on passage),
- Furuno FE-700 echo sounder, which was only used on arrival to and departure from port,
- Cassen & Plath magnetic compass,
- RGC 11 SIMRAD gyro compass,
- G9-FAP9 autopilot,
- JRC global positioning system (GPS) GP-80.

A bridge navigational watch alarm system (BNWAS) was also fitted. This was turned on during passage, and it was turned off by the salvors when they boarded in order to silence the alarm.

## 1.4 CREW/MANNING

### 1.4.1 General

*Kaami*'s eight crew consisted of a master, C/O, chief engineer, second engineer, an able seaman/cook and three able seamen; all the crew were Russian nationals. The normal practice for Misje Rederei AS crews was to join the vessel together for a 3-month contract, after which they had a 3-month period of leave.

### 1.4.2 Master and bridge team

*Kaami*'s master held an International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended, (STCW), regulation II/2 certificate of competency (CoC), and was 54 years old. This was his

first contract on *Kaami* and with Misje Rederei AS, but he had experience on similar sized vessels and of the operating area. He left his previous position as master on a similar type and size of vessel when the owning company sold the vessel.

The C/O was 46 years old and held an STCW II/2 CoC. This was his second contract with Misje Rederei AS, having previously completed 3 months on board *Kaami*, also as C/O.

The lookout was 36 years old and had been on *Kaami* as an AB for several contracts. He held an STCW II/4 and II/5 CoC.

### 1.4.3 Watchkeeping routines

At sea, the master and C/O kept bridge watches as follows:

- Master: 0700 – 1200 and 1700 – 0000
- C/O: 0000 – 0700 and 1200 – 1700

During cargo operations in harbour, the C/O worked the hours necessary to supervise loading or discharge while the master kept the bridge watch. A lookout was required in the hours of darkness and at the time of the incident an AB was rostered on to the 0000 – 0400 watch.

### 1.4.4 Crew ECDIS training

Both officers had completed generic ECDIS training courses and had also recently completed type-specific familiarisation for the JRC JAN 2000 ECDIS. The training was computer-based and had been provided, via a video link, by Brommeland Elektronikk, with accompanying guidance notes and manuals provided for reference.

## 1.5 VOYAGE PLANNING

### 1.5.1 Overview

The principles of voyage planning are stated in International Convention for the Safety of Life at Sea 1974, as amended (SOLAS) Chapter 5, Regulation 34 and are expanded upon in IMO Resolution A.893(21) (Guidelines for voyage planning). Voyage planning requires:

- *Appraisal of all the relevant information,*
- *Planning the intended voyage,*
- *Execution of the plan taking account of the prevailing conditions,*
- *Monitoring of the vessel's progress against the plan continuously.*

The following sections summarise the various stages of voyage planning.

### 1.5.2 Appraisal

Appraisal is the process of gathering all information pertinent to the voyage, which will give the planning officer and master of the vessel a clear and precise indication of the hazards present and areas of safe and unsafe waters. This will allow the master to predesignate the safety margins appropriate for the voyage in line with company guidance.

IMO Resolution A.893(21) **(Annex A)** states inter alia:

> *'2.1 All information relevant to the contemplated voyage or passage should be considered. The following items should be taken into account in voyage and passage planning: …*
>
> *.5 appropriate scale, accurate and up-to-date charts to be used for the intended voyage or passage, as well as any relevant permanent or temporary notices to mariners and existing radio navigational warnings; …*
>
> *.7.1 mariners' routeing guides and passage planning charts, published by competent authorities; …*
>
> *.7.5 existing ships' routeing and reporting systems, vessel traffic services, and marine environmental protection measures; …*
>
> *.2.2 On the basis of the above information, an overall appraisal of the intended voyage or passage should be made. This appraisal should provide a clear indication of all areas of danger; those areas where it will be possible to navigate safely, including any existing routeing or reporting systems and vessel traffic services; and any areas where marine environmental protection considerations apply.'*

This is supported in the voyage planning section of the company safety management system (SMS), which stated;

> *'The urge to start planning as soon as possible should be resisted. The time spent on the assessment (appraisal) stage will be rewarded later on.'*

Only once the appraisal is complete should the planning officer be able to move on to the planning stage.

### 1.5.3 Planning

During the planning stage the planning officer should 'put lines on charts' using which ever medium is the primary means of navigation. In *Kaami*'s case this was ECDIS.

Further guidance is contained in IMO Resolution A.893(21). Section 3.2.1 states that one of the main elements inherent in voyage planning is the consideration of manoeuvring characteristics of the vessel and its draught in relation to the available water depth.

The guidance in IMO Resolution A.893(21) also includes the need for a voyage plan notebook to contain relevant important information that has not been included on the chart. This is to be available to the navigating officer at the conning position, either on paper or electronically. This is also highlighted in SOLAS Annex 23, which states:

> *'Depending on circumstances, the main details of the plan should be marked in appropriate and prominent places on the charts to be used during the voyage. They should also be programmed and stored electronically on an ECDIS where fitted. The main details of the voyage plan should also be recorded in a bridge notebook used specially for this purpose to allow reference to details of the plan at the conning position without the need to consult the chart.'*

Misje Rederei AS's SMS contained a proforma to enter the details of the voyage plan that, in conjunction with the passage details printed out from the ECDIS, would form a notebook such as described above **(Annex B)**.

### 1.5.4 Execution

The execution of the finalised voyage plan must take into consideration various factors including arrival times at critical points for tide height and flow, metrological conditions, as well as weather routing, and traffic conditions, especially at navigation focal points.

### 1.5.5 Monitoring

Once the vessel is executing the voyage plan, progress against the plan should be closely and continuously monitored by the bridge team by all available means. If any doubt arises as to the safety of the plan or the position of the vessel the master should be called immediately and, if necessary, the navigating officer should take appropriate action for the safety of the vessel.

The International Chamber of Shipping (ICS) publication The Bridge Procedures Guide (BPG) states in Section 3.11.3:

> *'For ECDIS to be effective as a tool for monitoring a passage, the following checks should be conducted prior to departure from the berth:*
>
> - *The safety settings, particularly safety depth contours, are set in compliance with the SMS and reflect the current operational status of the ship including actual draught.'*

The bridge team at the time of the grounding consisted of the C/O and a lookout. Section 1 of the ICS BPG states that the bridge team should work together and co-operate to ensure the safe navigation of the ship, and that all members of the bridge team understand the duties assigned to them.

Section 1.1 of the ICS BPG also reminds the reader that information which supports an effective bridge organisation should be included in the SMS. This is a requirement of the International Safety Management (ISM) Code and should take into account effective communication and teamwork.

The role of the lookout within the Misje Rederi AS SMS for *Kaami* was thus:

> *Lookout personnel must observe all activity around the vessel, paying particular attention to other approaching vessels. This also applies to threats to their own vessel in waters where the vessel is headed.*

Section 1.2.8 of the ICS BPG states that familiarisation should cover all bridge equipment and procedures appropriate to the duties and responsibilities of individual member of the bridge team.

The lookout had not been familiarised with any of the navigation equipment on the bridge.

### 1.5.6 Responsibility

The company SMS designated the responsibility of voyage planning to the deck officer, in this case the C/O, with the master responsible for approving the plan. Initially the master was expected to set safety margins (not specified) for the voyage, based on the information presented to him from the deck officer's appraisal of available information, and secondly to approve or reject the final voyage plan created by the deck officer using the safety margins set previously.

In practice, it was accepted that, should the C/O be busy in port managing cargo operations, the master would complete the voyage planning. In the month spent on board together, prior to the grounding, the master had completed every voyage plan.

The '*Job Instructions – Chief Officer*' section of the SMS stated:

> *'The company endeavours to have a flexible organisation and at any given time each employee may be required to perform duties other than those included in the job instructions, depending on the company's requirements.'*

It was assumed among the crew and the company management that this statement allowed the voyage planning to be conducted by the master.

The voyage plan was prepared by the master on the same day as departure from Drogheda, while alongside, taking 1½ to 2 hours to complete.

### 1.5.7 Second check

SOLAS Annex 23 (voyage planning) states the following inter alia:

> *'Masters, skippers and watchkeepers should therefore adhere to the IMO Guidelines taking the following measures to ensure that they appreciate and reduce the risks to which they are exposed: …*
>
> *b) ensure that there is a systematic bridge organisation that provides for:*
>
> *iii) cross checking of individual human decisions so that errors can be detected and corrected as early as possible'.*

The steps, as laid out in the SMS for voyage planning, were designed to include interaction between the deck officer and master, with the final approval or rejection of the plan by the master. There were no instructions in the SMS to cover the situation where the master completed the passage plan.

## 1.6 ECDIS

### 1.6.1 Approval and installation

The JRC JAN 2000 ECDIS was certified by QinetiQ as being compliant with SOLAS. The system was supplied and fitted on board by Brommeland Elektronikk in June 2014, who also confirmed that the installation met the applicable requirements of the International Electrotechnical Commission (IEC), the International Hydrography Office (IHO) and SOLAS. The international carriage requirements for ECDIS are specified in SOLAS Chapter V, regulation 19.

The ECDIS system comprised of a main planning unit on the port bridge wing and a back-up unit on the centre line above the main control station **(Figure 2)**. Both computers were connected via a local area network and each system was supported by an independent, uninterrupted power supply. It was possible for either terminal to be used independently from the other. For example, the navigating officer could use the centreline back-up ECDIS for passage monitoring at sea, while the main ECDIS on the port wing was used for voyage planning. The ship's gyro compass data, GPS, log, echo sounder, anemometer, and automatic identification system (AIS) were fed into the ECDIS.

### 1.6.2 Alarms

The JRC JAN 2000 could generate alerts related to navigation, AIS targets, vessel sensors and specific to the route being navigated. The parameters for each alert could be customised by the operator. When the alert parameter was met, the operator received an audible and visual alarm and, when applicable, the hazard on the electronic navigational chart (ENC) would be highlighted.

### 1.6.3 Depth contours

The safety contour is a critical feature intended to show the operator a difference between safe and potentially unsafe water; crossing the safety contour triggers a mandatory ECDIS alarm. When a safety contour depth is set, if the selected contour is not available the system defaults to the next deepest contour available. (For example, if the safety contour was set to 15m but the ENC contours available were only every 10m, then the display would show the safety contour at 20m.)

The safety depth value is intended to assist the operator by highlighting spot depths less than the chosen setting using a bold font. The following depth limits (in metres) could be set on the JRC JAN 2000:

- Shallow contour
- Safety contour
- Safety depth
- Deep contour

The shallow and deep contours controlled only colour shading on the ECDIS display. The safety contour and safety depth settings required values that were appropriate to the local navigational conditions taking into account; the ship's draught, the effect of squat[3] and, where appropriate, the height of tide.

### 1.6.4 Waypoint input

When planning a voyage on the JRC JAN 2000 the navigator had the option either to use the 'table editor' to enter the waypoints numerically using latitude and longitude or use the 'graphic editor' to drop waypoints directly on to the ENC using the click of a mouse. Parameters such as leg speed, cross track distance (XTD[4]) and turn radius could be adjusted in the voyage planning mode **(Figure 8)**.

### 1.6.5 Safety check

The safety check function for the JRC JAN 2000 ECDIS could either be automatically conducted during route editing, by selecting the option from the route planning setting menu, or at any point in the editing process within the table editor or graphic editor modes **(Figure 8)**.

The IHO paper 'Information on ENC Generalisation, Over-Scaling and Safety Checking Functions in ECDIS' states the following about the safety check function of ECDIS:

> *The ECDIS safety checking function verifies the user-defined safety corridor against the entire chart database in the ECDIS for dangers, not just against the extent of visual point symbols displayed on screen. The ECDIS will graphically identify points along the proposed route that are a danger to the vessel and return a textual list of the same hazards.*
>
> *ECDIS safety check only verifies data along the user-defined corridor; the width of the corridor is set by the cross track distance (XTD). The safety check will be performed against the largest scale information within the ECDIS system irrespective of the ECDIS display scale. Point features will only be identified as hazards if they fall within the safety zone being checked regardless of the size of the symbol displayed on screen and regardless of the actual extent of the physical feature it represents. The mariner must therefore ensure his safety corridor XTD is sufficiently wide enough to identify all navigational dangers along the intended route. Mariners are also required to conduct a thorough visual check of the intended route to complement the automated safety check.*

### 1.6.6 Look ahead

The look ahead feature compares the safety settings that have been entered into the ECDIS with the depth and isolated danger mark information contained within the ENC. It generates an alarm where the safety settings are contravened to provide advanced warning of dangers and is intended to prevent grounding. The look ahead acts as a final layer of safety should a navigational danger be missed by the ECDIS safety check or visual check of the route.

---

[3] Squat is a hydrodynamic phenomenon causing a ship on passage at speed through shallow water to be closer to the seabed than would otherwise be expected.

[4] The XTD or cross track limit (XTL) alarm is used to provide a warning of when a vessel is about to deviate by more than a specified distance from the planned route.

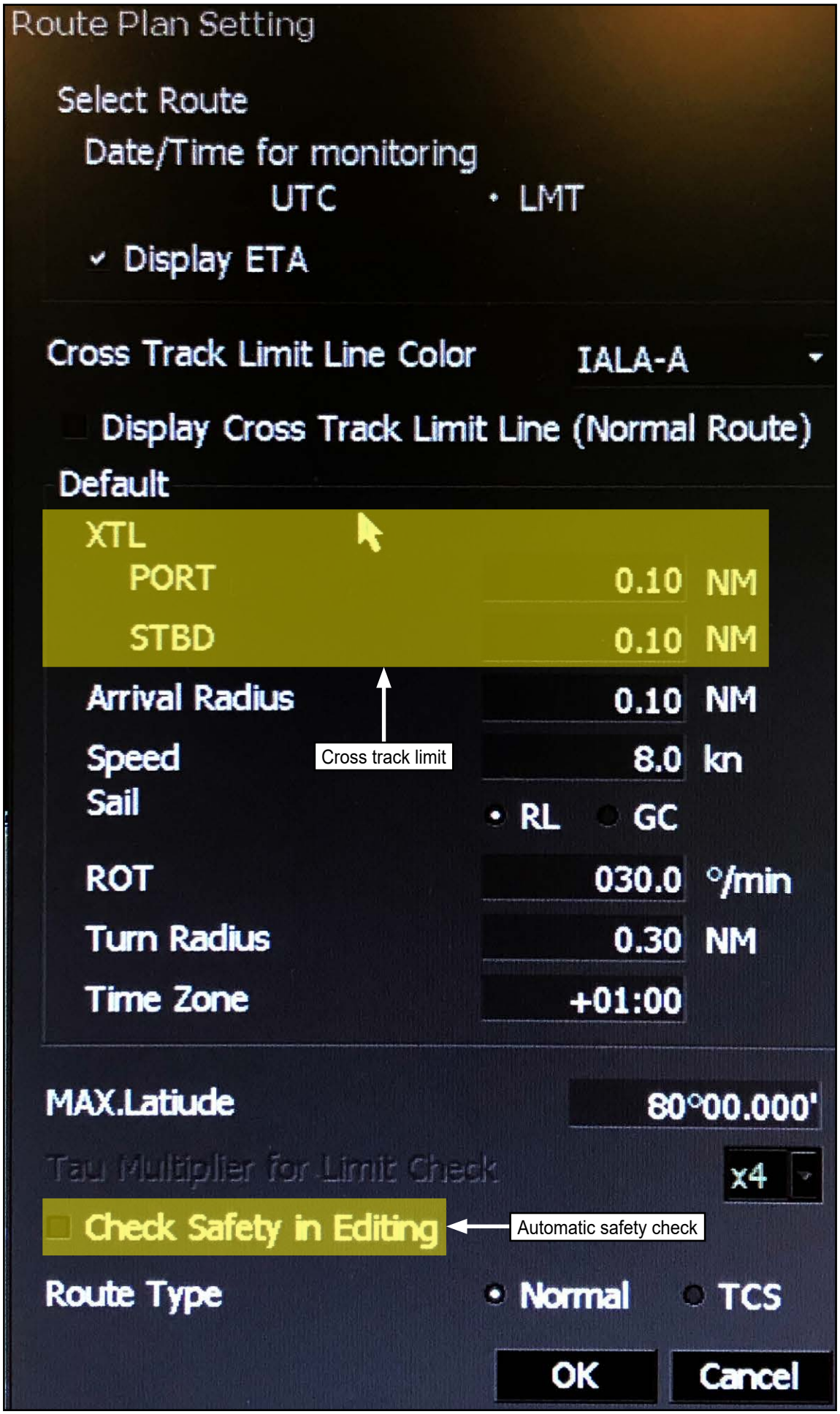



**Figure 8:** Voyage planning screen showing XTD and safety check

The operator had the option of two look ahead options which, when activated, would trigger an alarm on the ECDIS. The scope and length of each could be customised **(Figure 9)**.

- Vector – a safe corridor either side and ahead of the vessel. The operator could change the width (nm) and length ahead of the vessel using a set distance in nm, or minutes ahead that used ship's current speed to set the distance. The vector would produce an indication when the safe corridor crossed a safety contour.

- Sector – a cone ahead of the vessel. The operator could change the width (degrees) and radius (minutes or nm) of the cone. The sector would produce an indication when making contact with an isolated danger symbol embedded in the ENC.

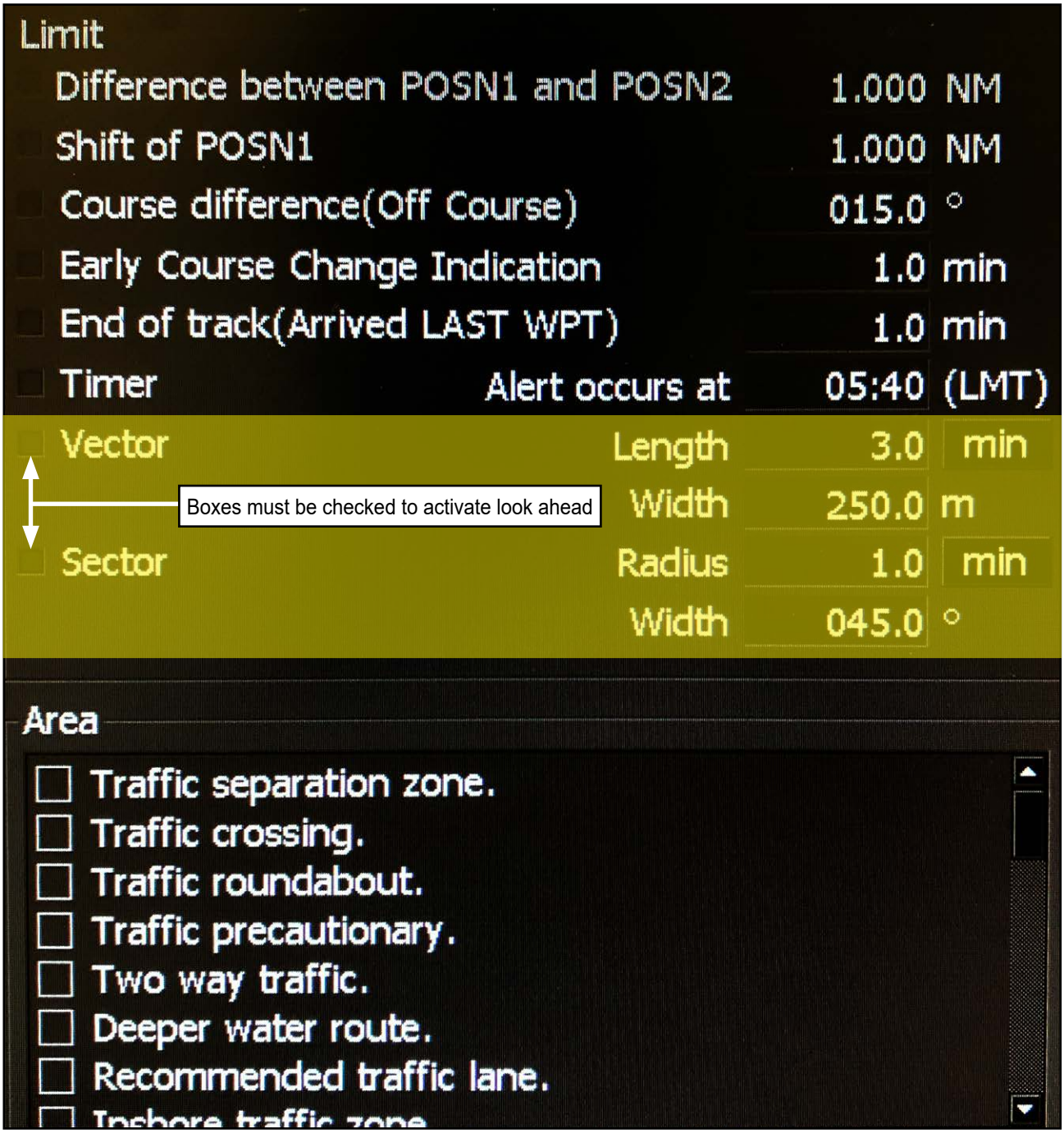



**Figure 9:** Look ahead options on *Kaami*'s JRC JAN 2000 ECDIS

### 1.6.7 ECDIS training requirements

Masters and officers in charge of a navigational watch serving on vessels fitted with ECDIS should undertake generic ECDIS training and be familiarised with the ship's equipment including the ECDIS.

On ship's fitted with ECDIS the SMS should detail how local ECDIS familiarisation should be achieved, which may include type specific materials provided by the ECDIS manufacturer.

The IMO publication MSC.1/Circ.1503/Rev.1 – ECDIS – Guidance for Good Practice **(Annex C)**, states:

> *'… shipowners and operators should ensure that their ships' masters and deck officers are provided with generic ECDIS training and an ECDIS familiarisation programme so that the ships' masters and deck officers fully understand the use of ECDIS for passage planning and navigation.'*

### 1.6.8 ECDIS performance standards

The performance specifications for ECDIS are detailed in IMO Resolution MSC.232(82), which was adopted by the Organization on 5 December 2006. The requirement for performance standards includes the following inter alia:

> *'5.8. It should be possible for the mariner to select a safety contour from the depth contours provided by the system ENC. ECDIS should emphasize the safety contour over other contours on the display, however, if the mariner does not specify a safety contour, it should default to 30m….*
>
> *11.3.4. An indication is required if the mariner plans a route across an own ship's safety contour….*
>
> *11.4.3. ECDIS should give an alarm if, within a specified time set by the mariner, own ship will cross the safety contour.*
>
> *Appendix 5 lists the ECDIS features which are specified as alarms or indications. The 5 mandated alarms are;*
>
> - *Crossing safety contour*
> - *Deviation from route*
> - *Positioning system failure*
> - *Approach to critical point*
> - *Different geodetic datum.*
>
> *An alarm is defined as 'an alarm or alarm system which announces by audible means or audible and visual means, a condition requiring attention'.*

## 1.7 EXAMINATION OF *KAAMI*'S ECDIS

### 1.7.1 Initial observations

*Kaami*'s main and back-up ECDIS units were recovered for analysis. During examination, the following were identified:

- The alarm audio buzzers were all set to level 0 (no sound) **(Figure 10)**.


**Figure 10:** Alert buzzer settings all set to zero

- The depth settings **(Figure 11)** were:
  - Shallow contour: 5m
  - Safety contour: 5m
  - Safety depth: 7m
  - Deep contour: 25m

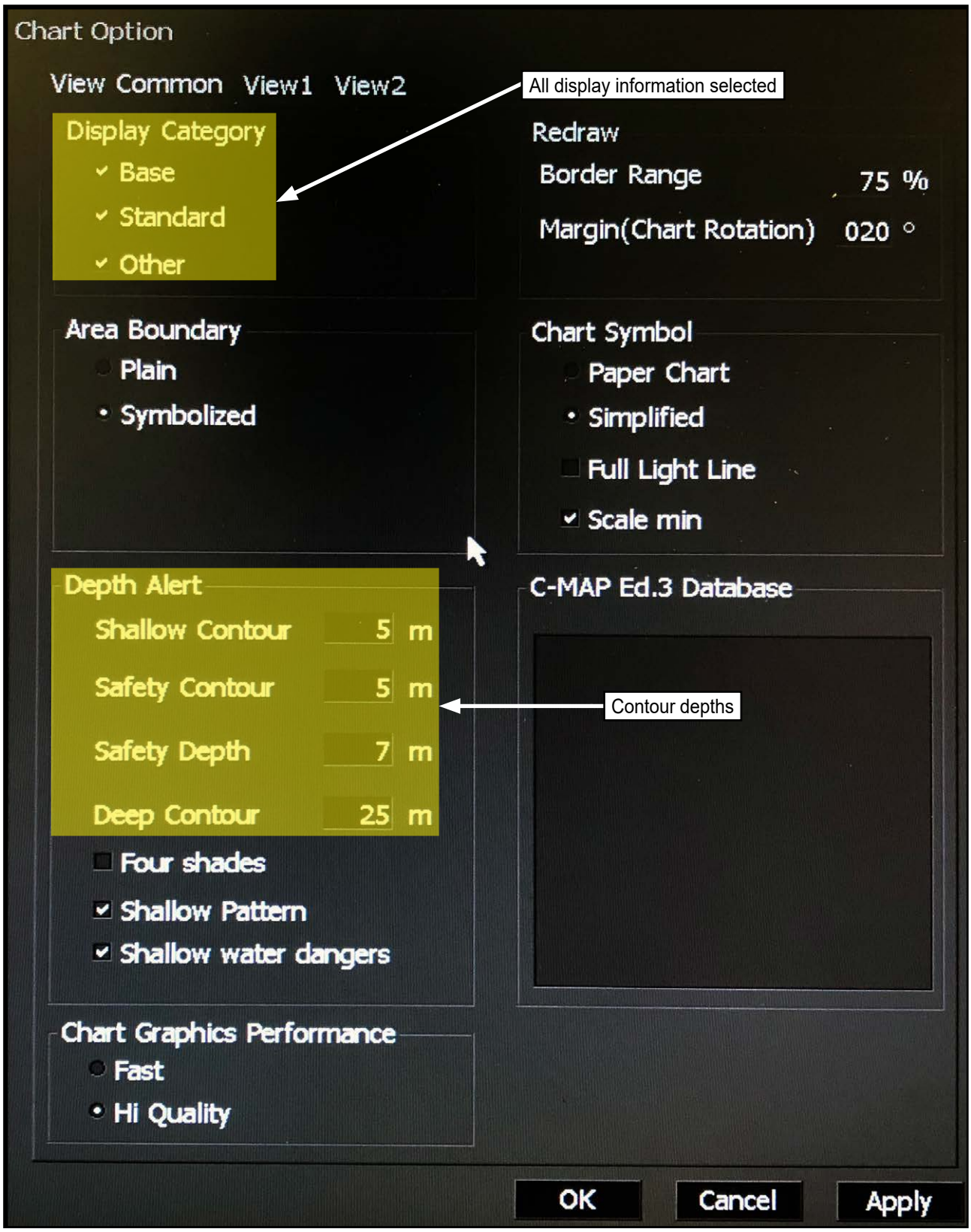



**Figure 11:** Depth contour settings

- All available information was selected to be displayed on screen.
- The look ahead vector was set to length 3.0 minutes[5] x width 250.0m but was not activated **(Figure 9)**.

[5] The lengths of the look ahead vector and sector were set to the distance covered in minutes corresponding to the ships speed at the time.

- The look ahead sector was set to radius 1.0 minute x width 045.0° but was not activated **(Figure 9)**.

- A two-colour palette had been selected[6].

- XTD was set to 0.1nm **(Figure 8)**. The isolated danger symbols and area where *Kaami* crossed the safety contour fell within this safety corridor.

- The ENC cell *(GB 302210)* **(Figure 12)** that covered the IMO recommended route to the north of the Isle of Skye was not loaded on *Kaami*'s ECDIS system.

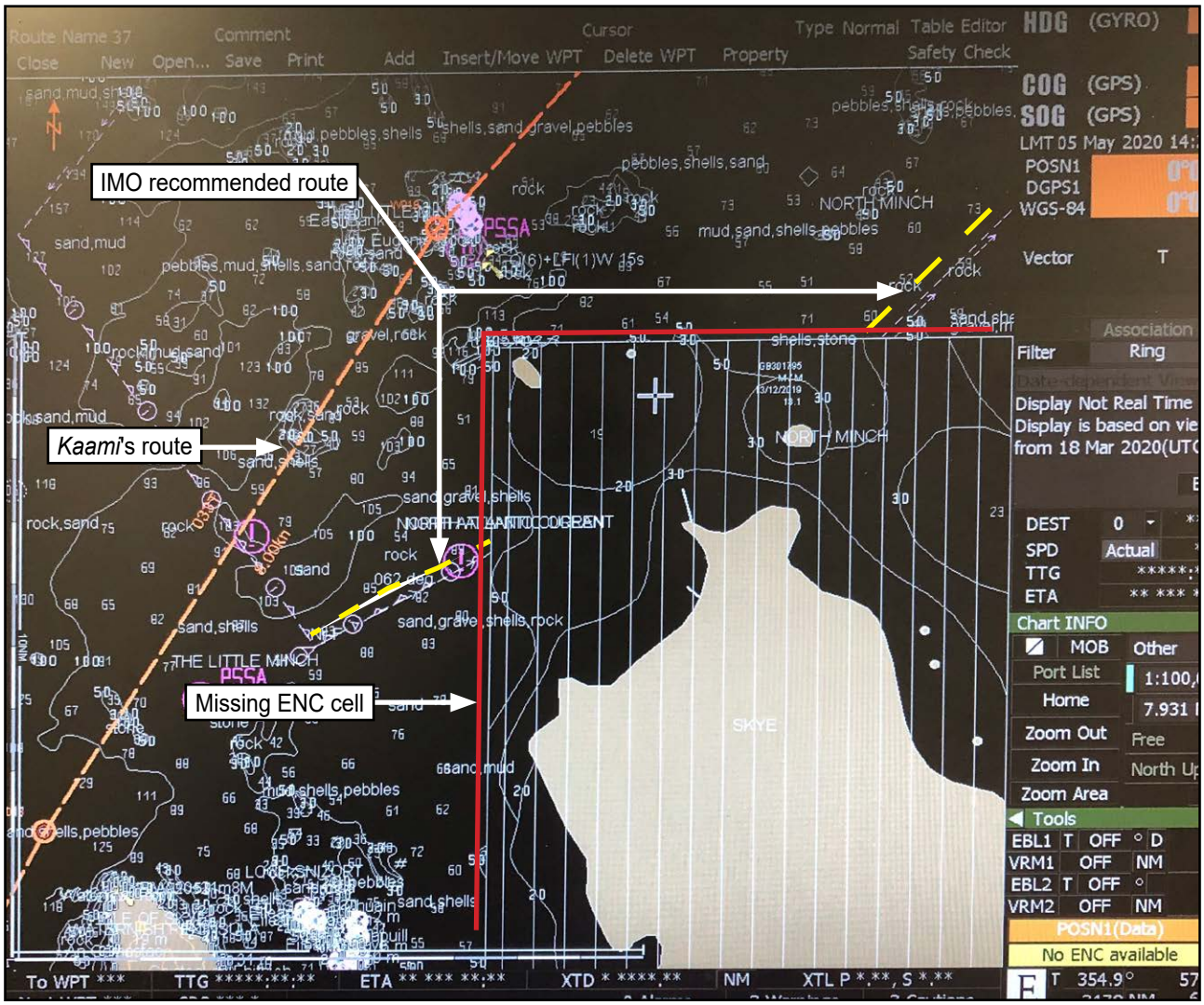



**Figure 12:** ECDIS with missing electronic navigation chart cell indicated by vertical bars

### 1.7.2 Use of safety check

It was not possible to ascertain from *Kaami*'s ECDIS whether a safety check had been conducted for route 37 before it was used. A safety check of the route 37 was conducted during MAIB's ECDIS analysis and identified 479 separate Errors[7] on the route. A safety check of the individual leg being followed at the time of the grounding (waypoint 19 and 20) identified 15 Errors including two hazards (isolated dangers)

[6] The operator has the option of a two-colour or four-colour palette when setting the safety contour depths. In the two-colour palette there is a clear division between safe and unsafe water at the safety contour chosen. In the four-colour palette depths greater than the deep contour and shallower than the shallow contour had their own distinct colour.

[7] Throughout the report, when referring to a system defined Error, the word will start with a capital letter, to differentiate from an operator error.

and the crossing of a safety contour **(Figure 13)**. An automatically generated caution message was displayed regarding the area of the grounding **(Figure 14)**. This caution message would have been visible, regardless of the scale of ENC in use if the individual leg safety check had been carried out.

### 1.7.3 Voyage plan anomalies

A printed version of the voyage plan was recovered from the voyage planning notebook on board *Kaami*. The route from the voyage planning notebook had significant differences in two areas (North Channel/Inshore route and North Sea) when compared to the route loaded into the ECDIS. Both routes passed over the location of grounding **(Figure 15)**.

Further analysis of the ECDIS route identified an area to the north of the Danish coast, as the route passed from the Skagerrak into the Kattegat, where the safety contour was crossed **(Figure 16)**.

## 1.8 SAFETY MANAGEMENT

### 1.8.1 Internal audits

The company audit programme was primarily carried out by the designated person ashore (DPA), based in Misje Rederi AS's office in Kaliningrad. An internal ISM audit took place on *Kaami* between 19 and 23 February 2020. Voyage planning and ECDIS use was an audit item and no discrepancies were found. The setting of safety contours and activation of look ahead features were not checked.

The DPA had been in the role since September 2019 and had worked as a superintendent for Misje Rederei AS before that. Even though he had sailed as master on similar vessel's before starting his shore-based career, the DPA had never sailed with ECDIS as a primary means of navigation and, as such, had little operational experience of its use. Furthermore, he had not attended generic ECDIS or type-specific training.

### 1.8.2 Safe manning

*Kaami*'s minimum safe manning document issued by the Bahamas Maritime Authority (BMA) in March 2019 stated the minimum level of manning as seven including a master and C/O. The manning of *Kaami* had been increased on advice of the DPA by one further AB, to eight, to assist with ship maintenance.

IMO Resolution A.1047(27) Principles of Minimum Safe Manning, Annex 2, paragraph 1.4.2 states that:

> *In determining the minimum safe manning of a ship, consideration should also be given to the capability of the master and the ship's complement to coordinate the activities necessary for the safe operation and for the security of the ship and for the protection of the marine environment.*

Annex 3, paragraph 2.7 goes on to state that:

> *The Administration (flag state) should consider the circumstances very carefully before allowing a minimum safe manning document to contain provisions for less than three qualified officers in charge of a navigational watch, while taking into account all the principles for establishing safe manning.*

Safe Check Result

WP019->WP020 "15 Error(s)"

| WPT | Cause | Position | Result |
|---|---|---|---|
| 19->20 | Restricted area. | 58°07.375'N 5°54.408'W | Error |
| 19->20 | Sensitive sea area. | 58°07.375'N 5°54.408'W | Error |
| 19->20 | Caution area. | 58°07.375'N 5°54.408'W | Error |
| 19->20 | Military practice area. | 58°07.375'N 5°54.408'W | Error |
| 19->20 | Hazard. | 57°47.380'N 6°28.108'W | Error |
| 19->20 | Safety contour | 57°47.298'N 6°28.146'W | Error |
| 19->20 | Hazard. | 57°47.298'N 6°28.146'W | Error |
| 19->20 | Caution area. | 57°56.311'N 6°13.244'W | Error |
| 19->20 | Restricted area. | 58°07.375'N 5°54.409'W | Error |
| 19->20 | Sensitive sea area. | 58°07.375'N 5°54.409'W | Error |
| 19->20 | Military practice area. | 58°07.375'N 5°54.409'W | Error |
| 19->20 | Restricted area. | 58°31.478'N 5°12.517'W | Error |
| 19->20 | Sensitive sea area. | 58°31.478'N 5°12.517'W | Error |
| 19->20 | Caution area. | 58°37.409'N 5°02.779'W | Error |
| 19->20 | Military practice area. | 58°37.409'N 5°02.779'W | Error |

**Figure 13:** Safety check of waypoint 19 to waypoint 20 showing 15 errors

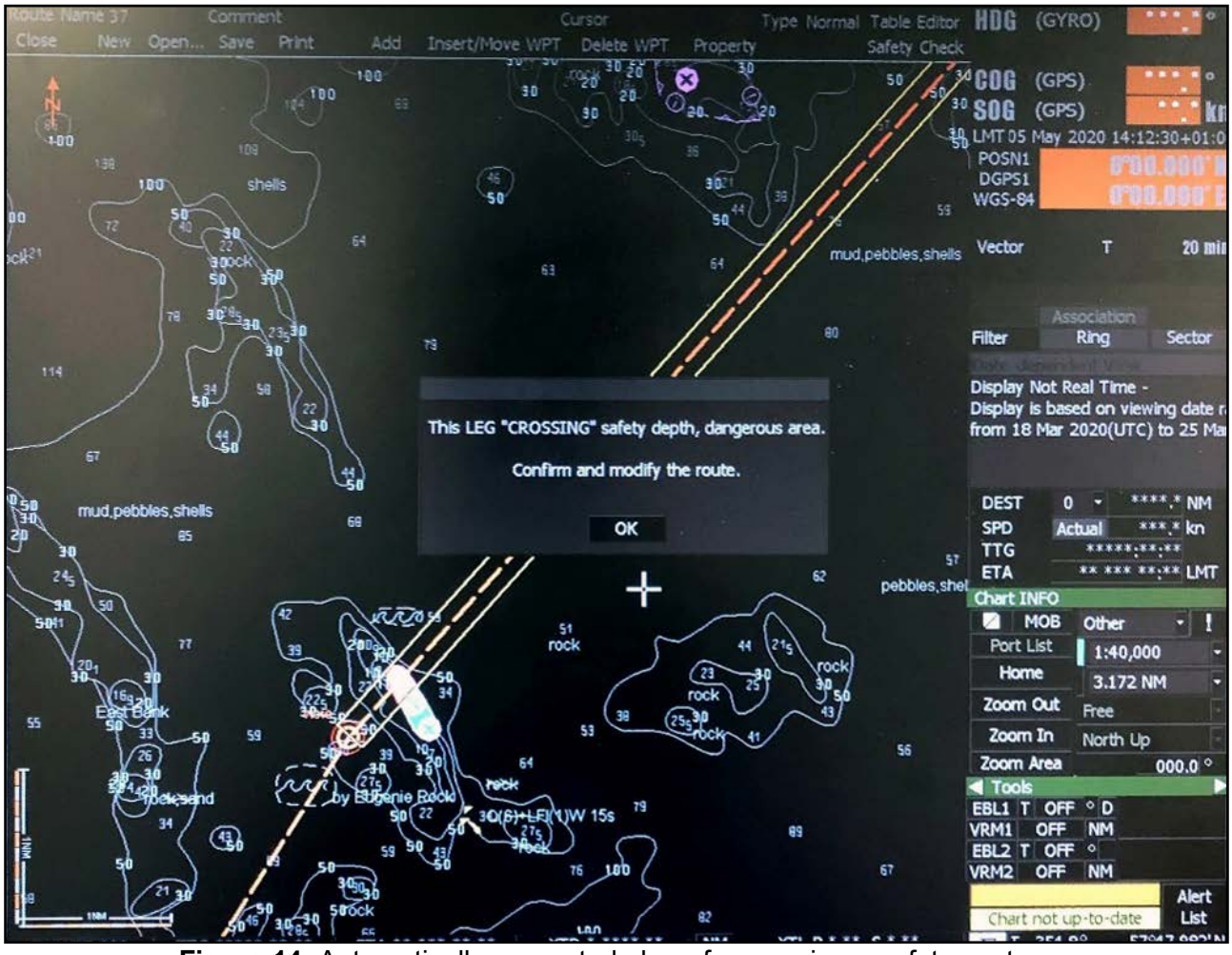



**Figure 14:** Automatically generated alarm for crossing a safety contour

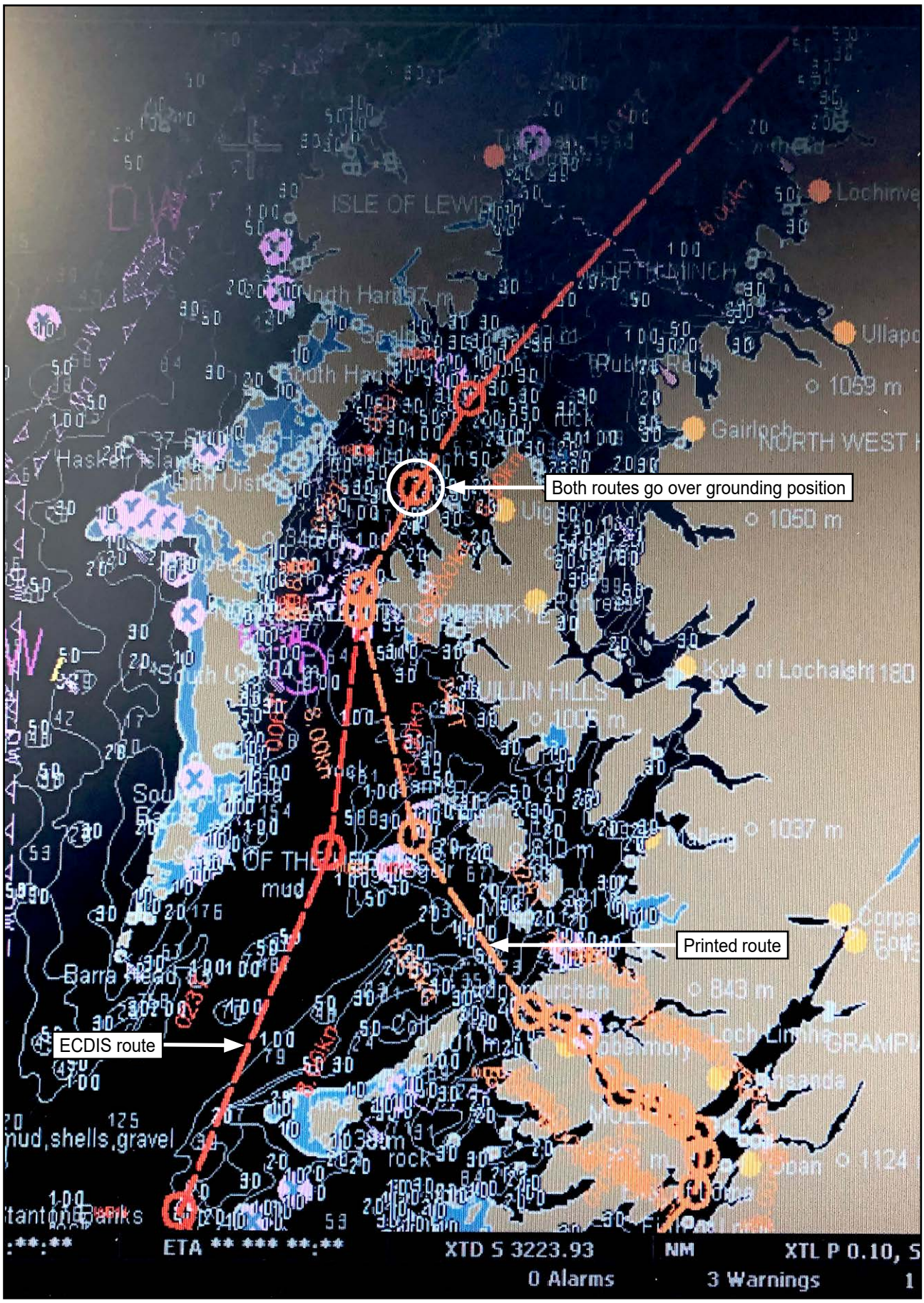



**Figure 15:** Different routes due to weather routeing

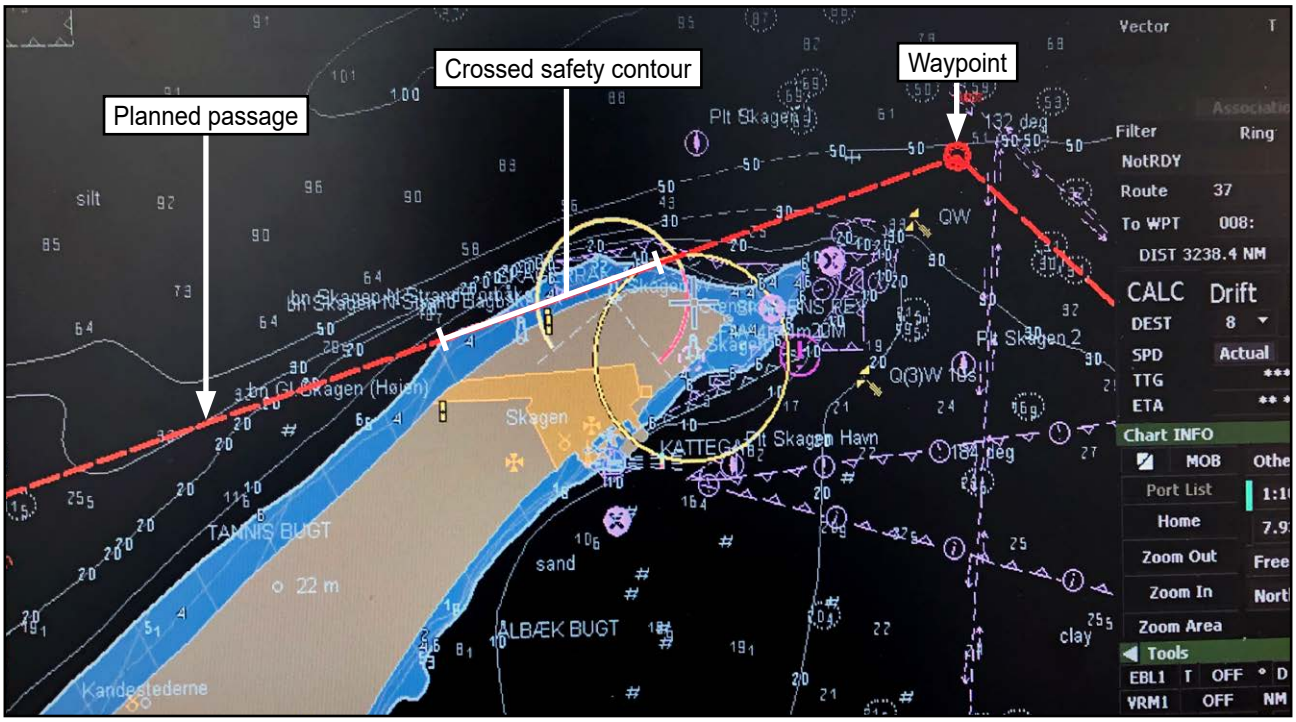



**Figure 16:** Route 37 crossing the safety contour before the Kattegat waypoint

### 1.8.3 Fatigue management

DNV GL carried out a renewal inspection for Misje Rederei AS's International Safety Management Document of Compliance (DOC) on 10 January 2020. During the inspection, the observation was made that it was not possible to verify that Misje Rederei AS had evaluated all aspects of fatigue through a hazard identification process, as detailed in MSC.1/Circ.1598, IMO Guidelines on fatigue.

MSC.1/Circ.1598 Module 2, states that:

*3. Research has established a clear link between fatigue and accidents at sea…*

*5. While it is not possible for the company to regulate and oversee the sleeping habits of every seafarer on every ship, it is within its capability to mitigate the risks of fatigue through ship design, operational and manning policies…*

*14. Adequate resources, including manning, is one of the primary determinants of seafarers' duty hours, workload, duty scheduling, average time off duty, and other key factors that can have an influence or elevate fatigue. The company should ensure that adequate resources are available with a need to proportionally balance varying work and task demands and deal with unexpected surge to reduce the risk of fatigue across shipboard operations.*

## 1.9 THE LITTLE MINCH

### 1.9.1 Overview

The Little Minch is a sea passage between the Inner and Outer Hebrides which affords some shelter from the North Atlantic. Depths within the Little Minch are very irregular. As a result, passage through the Little Minch is restricted to separate traffic routes and a TSS. In addition, in bad weather the Little Minch forms a dangerous sea area due to the wind, tidal streams and uneven nature of the bottom, all combining to produce turbulent seas.

### 1.9.2 Ship reporting systems

Ship reporting systems enhance safety of life at sea, safe navigation and environmental protection by monitoring shipping traffic in designated areas of potential risk. Mandatory schemes are approved by the IMO and vessels are obligated to comply with the reporting requirement as set out in SOLAS Chapter V, Regulation 11. Coastal states may also promulgate voluntary reporting schemes that have similar objectives, and vessels are strongly urged to participate.

The Minches voluntary reporting scheme includes the Off Neist Point TSS **(Figure 17)** and the IMO recommended routes for south and northbound vessels. There is also a deep-water route for laden tankers >10,000gt to the west of the Hebrides avoiding the Little Minch. Details of the system are promulgated in the Admiralty List of Radio Signals Volume 6 (NP286(1)).

### 1.9.3 Coastguard operations

UK coastguard operations are managed by the National Maritime Operations Centre (NMOC) in Fareham, England, and a network of ten regional CGOC. Each of the CGOCs had responsibility for a zone of coastline and adjoining sea area. Zone flexing is a procedure that allowed responsibility for zones to be passed between CGOCs to ensure even workloads across the network. The geographic extent of Stornoway CGOC vessel traffic monitoring (VTM) area (Zone I) can be seen in **Figure 1**.

VTM is a core responsibility for the coastguard, and its policy document stated that its aim was:

> *'to enhance the safety and efficiency of maritime traffic. This includes; improving the response to incidents, accidents or potentially dangerous situations at sea (including search and rescue and maritime security) and contributing to better prevention and detection of pollution by ships.'*

C-Scope was the coastguard's primary VTM system. C-Scope used AIS data to display shipping contacts overlaid on chart information; alert zones could be set around hazards with visual and audible alarms being triggered when vessels crossed the alert zone boundaries. No alert zone was set up in the vicinity of the Sgeir Graidach shoal.

On the night of the incident, AISWeb was in use by the Maritime Operations Officer (MOO) alongside C-Scope due to personal preference.

The Operational Management System (OMS) provided guidance to watch officers on procedures to follow in response to potential emergencies. When a vessel was observed heading into danger, the OMS advised use of the following terminology when issuing an alert using voice communications:

> *'Warning, according to my coastguard equipment, on your present course you appear to be running into danger. What are your intentions? Over'*

All coastguard officers were trained in VTM procedures and CGOCs had the necessary manpower and equipment to fulfil the VTM responsibility, with zone flexing available to sustain manageable workloads across the network.

Reproduced from Admiralty Chart 1794 by permission of HMSO and the UK Hydrographic Office

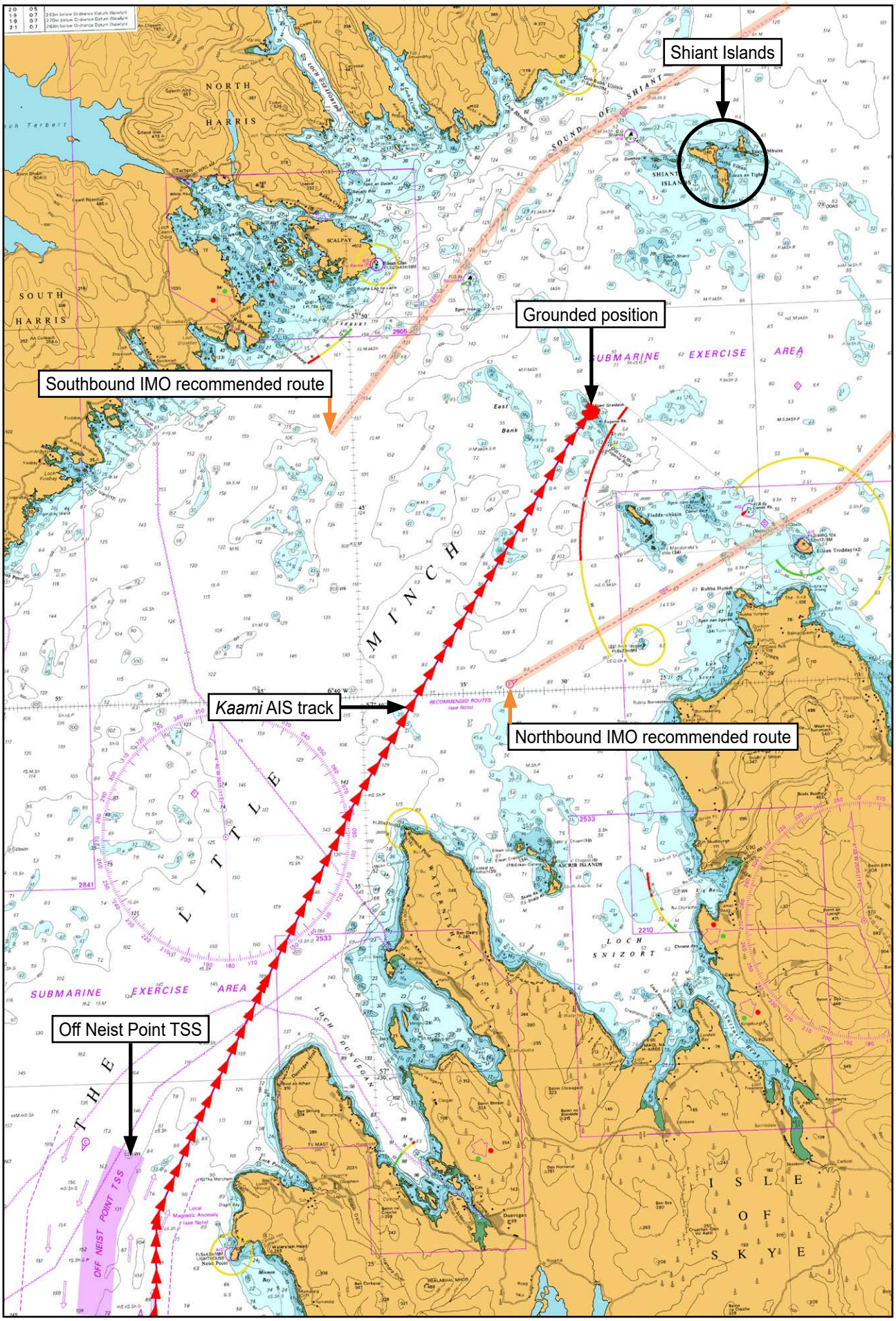



**Figure 17:** BA 1794 showing the Shiant Islands and *Kaami*'s track

### 1.9.4 Stornoway CGOC

The on-duty team consisted of a senior maritime operations officer (SMOO) and two MOOs. OMS VTM guidance is for VTM and VHF channel 16 watch functions to be combined. This role would then be regularly rotated between the watchkeepers so as to maintain their alertness levels.

One of the MOOs on watch on the night of the incident had not completed the latest round of VTM training that had been carried out at Stornoway CGOC. As a result, the VTM and channel 16 functions were split between the MOOs.

The exchange on VHF channel 16 between *Ocean Harvest* and *Kaami* that took place approximately 6 minutes before *Kaami* grounded was not heard by either MOO. The subsequent tier 3 incident review conducted by HMCG also highlighted that the MOOs on watch were not familiar with the term, 'shoal', so may not have realised the significance of the VHF call between *Ocean Harvest* and *Kaami*.

## 1.10 SIMILAR RELATED ACCIDENTS WITH ECDIS ISSUES

### 1.10.1 *Commodore Clipper*

On 14 July 2014, the Bahamas registered ro-ro passenger ferry *Commodore Clipper* grounded on a charted, rocky shoal in the approaches to St Peter Port, Guernsey (MAIB report 18/2015[8]). The Transas Navi-sailor 4000 ECDIS was the ferry's primary means of navigation and the MAIB investigation identified that it had not been utilised effectively. The investigation report noted that:

- In particular, the safety contour value was inappropriate, the cross track error alarm was ignored, and the audible alarm was disabled.

### 1.10.2 *Muros*

On 3 December 2016, the bulk carrier *Muros* ran aground on Hainsborough Sand (MAIB report 22/2017[9]). The vessel's primary means of navigation was the Maris ECDIS 900. The investigation identified that:

- A visual check of the track in the ECDIS using a small-scale chart did not identify it to be unsafe, and warnings of the dangers over Hainsborough Sand that were automatically generated by the system's 'check route' function were ignored.

- The effectiveness of the second officer's performance was impacted upon by the time of day and a very low level of arousal.

- The disablement of the ECDIS alarms removed the system's barriers that could have alerted the second officer to the danger in time for successful avoiding action to be taken.

[8] www.gov.uk/maib-reports/grounding-and-flooding-of-ro-ro-ferry-commodore-clipper

[9] www.gov.uk/maib-reports/grounding-of-bulk-carrier-muros

### 1.10.3 MAIB/DMAIB ECDIS Safety Study

In 2018 the UK Marine Accident Investigation Branch (MAIB) and Danish Marine Accident Investigation Branch (DMAIB) embarked on a safety study into the practical application and usability of ECDIS that aimed to benefit future ECDIS design, training strategies and development of best practices.

Initial findings, which were presented in a paper to the IMO Navigation subcommittee (NSC) in November 2019, were:

- The huge diversity in spectrum of use meant that it was difficult to establish a single best practice.
- Paper chart/ECDIS skill sets are not compatible.
- Legislation is still biased towards paper chart practices.
- Navigation training syllabuses are heavily biased towards paper chart use.
- Bathymetric data are not yet at a desired level.
- It is questionable that current training and familiarisation is achieving sufficient proficiency in a complex safety critical navigation system.

## 1.11 SIMILAR ACCIDENTS INVOLVING ECDIS AND HMCG VTM ISSUES

### 1.11.1 *Ovit*

On 18 September 2013, the Malta registered chemical tanker *Ovit* ran aground on the Varne Bank in the Dover Strait (MAIB report 24/2014[10]). The vessel's primary means of navigation was the Maris ECDIS 900. The investigation identified that:

- Although training in the use of the ECDIS fitted to the vessel had been provided, the master and deck officers were unable to use the system effectively.
- The passage plan was not properly checked for navigational hazards using the ECDIS check route function and it was not checked by the master.
- Although the lights from the cardinal buoys marking the Varne Bank were seen by the lookout, they were not reported.
- The shortcomings with onboard navigation had not been identified during recent audits and inspections.
- A Channel Navigation Information Service (CNIS) procedure, which should have alerted *Ovit*'s officer of the watch as the tanker approached the Varne Bank, was not followed because the procedure had not been formalised and an unqualified and unsupervised CNIS operator was distracted.

[10] www.gov.uk/maib-reports/grounding-of-oil-chemical-tanker-ovit-on-the-varne-bank-in-the-dover-strait-off-the-south-east-coast-of-england

### 1.11.2 *Priscilla*

At 0443 on 18 July 2018, the Netherlands registered general cargo vessel *Priscilla* ran aground on Pentland Skerries in the eastern entrance of Pentland Firth, Scotland (MAIB report 24/2014[11]). The grounding caused significant hull damage but there was no pollution or injury. The investigation identified that:

- As the primary means of navigation, *Priscilla*'s ECDIS was not utilised effectively; key safety features, including safety corridors and warning zones that could have provided warning, were not in use.

- The duty officers at Shetland CGOC were unaware of the presence of *Priscilla* and the risk of grounding until prompted by the Orkney watchkeeper. This happened because the coastguard officers were not monitoring their C-Scope equipment and *Priscilla* had not transmitted a report when approaching the reporting scheme.

## 1.12 PREVIOUS EFFORTS TO HIGHLIGHT MINIMUM MANNING ISSUES

### 1.12.1 MAIB bridge watchkeeping safety study

The MAIB bridge watchkeeping safety study was published in 2004[12]. In relation to fatigue and manning levels it identified that:

> *'The study has confirmed that watchkeeper manning levels, fatigue and a master's ability to discharge his duties are major causal factors in collisions and groundings, and poor lookout is a major factor in collisions. Endorsed by the MAIB's experiences during accident investigation, it illustrates that the hours of work and lookout requirements contained in STCW 95, along with the principles of safe manning, are having insufficient impact in their respective areas. Recommendations addressing the causal factors of fatigue, inadequate manning, and poor lookout are therefore considered to be justified.'*

A subsequent recommendation was made to the MCA to take the conclusions of the study forward to the IMO with the aim of reviewing:

*2004/206* *The guidelines on safe manning to ensure that all merchant vessels over 500gt have a minimum of a master plus two bridge watchkeeping officers, unless specifically exempted for limited local operations as approved by the Administration.*

Unfortunately, this initiative gained insufficient support from international partners and so was not taken forward at IMO.

### 1.12.2 *Danio*

At 0330 on 16 March 2013, the general cargo vessel *Danio* ran aground off the east coast of England (MAIB report 8/2014[13]). The grounding resulted in serious damage to the hull with several breaches to forward compartments, as well as extensive damage to the propulsion and steering systems.

---

[11] www.gov.uk/maib-reports/grounding-of-general-cargo-vessel-priscilla

[12] www.gov.uk/government/publications/bridge-watchkeeping-safety-study

[13] www.gov.uk/maib-reports/grounding-of-general-cargo-vessel-danio-off-longstone-farne-islands-england

The investigation identified that, inter alia:

- The chief officer, who was officer of the watch, had fallen asleep.
- The chief officer and master were the only two watchkeepers and were working a 6 hours on/6 hours off watch keeping system.

A recommendation was made to the MCA to work closely with the European Commission and EU member states to propose an appropriate paper to the IMO which sought to ensure that all vessels engaged on short sea trades carry a minimum of two navigational watchkeepers in addition to the master.

The MCA partially rejected the recommendation as they felt there was insufficient support from other member states at the IMO.

### 1.12.3 World Maritime University paper on maritime regulations on rest and work hours

In November 2020, the World Maritime University (WMU) published the paper 'A culture of adjustment, evaluating the implementation of the current maritime regulation on rest and work hours[14].' The paper concludes, among other issues, that:

- The root cause of violations and adjustments of records of work and rest hours has been identified mainly in the insufficient safe manning levels approved by Flag States.
- It is suggested that the commercially driven competition among Flag States to keep their ship-owning clients satisfied has serious impacts on manning levels.
- The detailed principles for establishing minimum safe manning are not adhered to in most instances.
- There is an imbalance between the workload and the number of personnel available to complete the numerous and diverse range of tasks required in ship operation, which leads to violations of work/rest hour requirements. The situation is exacerbated during peak workload conditions such as those related to port operations.
- The inadequacies and adverse effects of the much researched "6 hours on/off watchkeeping schedule" that a lot of the Flag States still allow, are reiterated by all stakeholders interviewed.
- The inability to enforce existing rules may seriously affect seafarers' health, safety, and cognitive performance. Consequently, decision making impaired by fatigue may lead to serious accidents and large-scale environmental damage.

[14] World Maritime University (2020) – A culture of adjustment, evaluating the implementation of the current maritime regulatory framework on rest and work hours (EVREST).
(Attributed authors: Baumler, R., De Klerk, Y., Manuel, M.E., and Carballo Piñeiro, L.)

# 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

*Kaami* grounded because the voyage plan took the vessel over a charted hazard, which was not identified in the voyage planning safety check, and the passage monitoring did not use all available means, including the ECDIS, to identify the danger that lay ahead of the vessel. In this section of the report the use of ECDIS, standard of voyage planning and passage monitoring will be analysed. Underlying contributory factors such as manning levels, fatigue, effectiveness of the lookout, safety management and involvement of Stornoway CGOC will also be explored.

## 2.3 VOYAGE PLANNING

### 2.3.1 ECDIS safety contours

The correct setting of safety contours and safety depth are fundamental aspects of ECDIS use. Whether using a two or four colour palette, the setting of the safety contour will present an ENC to the navigator with clearly defined safe and unsafe water. *Kaami* departed Drogheda with a deepest draught of 5.40m and yet the safety contour was set to 5.00m and had not been changed since the current crew joined the vessel a month previously. This indicates a significant lack of understanding of the practical use of ECDIS.

The diligent consideration of the vessel's draught in relation to the available depth of water on the voyage being planned is one of the main elements highlighted in IMO Resolution A.893(21) **(Annex A)**. When taking into account the dynamic factors of vessel's draught, the effects of squat, height of tide and any additional company required safety margin, the planning officer should be able to correctly set the safety contours for the voyage. This is especially critical in coastal waters such as the Little Minch where water depths vary and are inconsistent. There was no calculation for minimum UKC made within *Kaami*'s voyage plan and the safety contour and safety depth settings were left untouched.

In the absence of clear guidance from the IMO or IHO regarding the standard calculation of safety contour settings, the onus lies with the vessel's management to provide guidance and assistance to masters and navigating officers. However, even though the voyage planning SMS section stated that the safety margins selected by the master should take into account the calculated draught and planned water depth below the keel, it did not provide guidance on how to calculate UKC and in turn safety depth. This is indicative of the absence of experience and knowledge of ECDIS operation by the DPA and Misje Rederei AS's management team more widely.

### 2.3.2 ENC scales

It is evident from the route analysis that inappropriate scales were used on ENCs both during voyage planning and passage monitoring. With all information layers selected it is possible for a user's view of the selected ENC to become cluttered on a zoomed-out view. This can lead to the accidental masking of isolated dangers and shallow patches as highlighted in the IHO paper on ENC over-scaling and safety checking. The master had previously identified the maximum level of information on the ECDIS as being 'too much' but had not felt confident enough with the system to change the settings, even after completing generic and type-specific training.

### 2.3.3 ECDIS safety check

The voyage plan was created using the graphic mode where waypoints were dropped on the ENC with the click of a mouse. When using this mode, it is especially important that the position of each waypoint and the route joining adjacent waypoints are reviewed visually on an appropriate scale of ENC, as emphasised by the IHO. As an insurance to the possibility that the visual check does not identify an error, there is also an ECDIS generated safety check function.

However, the safety check of the JRC JAN 2000 on *Kaami* was not selected for automatic function[15]. A post-accident safety check of route 37 identified 479 Errors including those associated with the position of grounding. Route 37 also passed over a shallow contour when approaching the northern coast of Denmark. When a safety check was conducted on the leg between waypoints 19 and 20 in isolation, a specific warning was generated on the ECDIS relating to the crossing of the safety contour immediately prior to the shoal where *Kaami* grounded **(Figure 15)**.

It is highly likely that *Kaami*'s master would have been alerted to the presence of the Sgeir Graidach shoal had the safety check been used more effectively, after the undertaking of a diligent visual check. That he did not carry out the safety check indicates that he lacked knowledge and understanding of the use of the JRC JAN 2000 ECDIS.

### 2.3.4 Voyage planning appraisal

In accordance with IMO Resolution A.893(21), a full and proper appraisal of all pertinent information associated with a voyage will provide the depth of knowledge necessary for a planning officer to correctly brief the master on the hazards present along a route. This will enable the master to put in place his requirements for safety contours, minimum UKC, XTD limits etc to mitigate against these hazards.

The appraisal stage of the voyage plan from Drogheda to Slite was limited to the master's knowledge gained from previous transits of the Little Minch, the weather forecast, and the information displayed on the ENC at the scale of use at the time. As a result, the master did not have enough information available for him to accurately establish appropriate safety margins.

[15] In automatic, the safety check would review each leg between waypoints as they were placed electronically on the ENC and highlight any Errors. In manual function, the safety check could be done for each individual leg or as a whole voyage on the planner's demand.

For example, the ENC cell *(GB 302210)* **(Figure 12)** that covered the IMO recommended route to the north of the Isle of Skye was not on *Kaami*'s ECDIS system. This, and that the ENC cells for the voyage were not ordered until the day of departure from Drogheda, indicate that a full and proper appraisal of the intended voyage had not taken place.

### 2.3.5 Second check

The second check of a voyage plan, traditionally completed by the master, gives the opportunity to spot any errors by the planning officer. It also gives the master the chance to quality assure the plan and to provide mentoring to the planning officer if required.

As stated in SOLAS Annex 23, there should be a cross checking of individual human decisions so that errors can be detected and corrected as early as possible. A single planning officer conducting the appraisal, planning and final check of the voyage plan does not provide independent assurance that the plan is safe, even if that officer is the master.

The second check of *Kaami*'s voyage plan from Drogheda to Slite did not take place. With the C/O busy in port with cargo operations and the voyage plan not completed previously, the master completed the entire task himself. Although the C/O was aware that a second check should be conducted, there was no supporting guidance in the SMS that required him to conduct a check in the event that the master completed the voyage plan. The C/O also did not see it as his place to complete a check given the master had completed the voyage plan.

The extract from the C/O job instructions section in the SMS that encouraged a flexibility of task assignment was used by the company as a convenient clause to ensure their near minimum levels of manning did not impede the vessel's operation. In such a safety critical task as voyage planning this removed a vital safety check and was contributory in an unsafe voyage plan being used.

### 2.3.6 Route anomalies

The printout of the route waypoints differed in two areas from the route loaded in the ECDIS, although it was named the same. This indicates that the route was changed at least once in the ECDIS after the first iteration of the voyage plan had been completed and printed. It is perhaps indicative of a compliance attitude by the master who knew he had to have a printed voyage plan but did not appreciate why he needed to reprint it after alterations to the plan.

The changes to the plan had been made in an attempt at weather routing, but there is no indication of when the changes were made, or if they were communicated to the C/O. Alongside the other planning omissions, it is clear that *Kaami* departed Drogheda without a complete and checked voyage plan.

## 2.4 PASSAGE MONITORING

### 2.4.1 ECDIS monitoring and use of look ahead

Once a safe voyage has been planned, it is the duty of the OOW to ensure the status of the vessel within the plan remains safe, and if necessary, make a departure from the plan, after seeking permission from the master.

Although *Kaami* was kept close to her planned route on the ECDIS, and the voyage plan was strictly followed, the C/O had poor awareness of the maritime environment around him. His ECDIS display provided a safety contour and isolated danger symbology for the area of grounding but no alerts were present on the system either visually or audibly as the alert functions were not selected and the alarm audio buzzers silenced.

The C/O had the option of a look ahead sector and vector, which when set would give advance warning should the vessel be approaching a safety contour or isolated danger. The exploration of *Kaami*'s ECDIS identified that neither feature was selected. The safety contour alarm would have activated on *Kaami*'s ECDIS three minutes before crossing the contour line had the vector look ahead option been selected. By not having either look ahead option selected, and the audible alarm muted, the mandatory alarm, as required by resolution MSC.232(82), had been disabled.

Contrary to the advice given in the ICS BPG, *Kaami*'s ECDIS was not an effective tool for passage monitoring as the ship left the berth in Drogheda with none of the appropriate safety parameters having been set.

### 2.4.2 External warnings

Regardless of the absence of ECDIS alerts, the C/O had other indications that *Kaami* was running into danger. The south cardinal buoy marking Eugenie Rock was fully functioning on the night of the grounding, but neither member of the bridge team appreciated its significance. Additionally, *Ocean Harvest*'s watchkeeper gave a warning on VHF radio, which if it had been understood would have allowed sufficient time for the C/O to take avoiding action and turn *Kaami* away from the Sgeir Graidach shoal. The C/O's decision to stay on the track line and carry out the alteration to starboard in accordance with the navigational plan, and ultimately on to the shoal, was influenced by his confidence in the master's voyage plan. The C/O's intent to follow the planned track, believing it was safe to do so as it had been planned by the master, contributed to him misinterpreting the warning from the *Ocean Harvest* as referring to the Shiant Islands **(Figure 17)**, approximately 7.0nm ahead, not Sgeir Graidach.

### 2.4.3 Effectiveness of the lookout

The AB lookout on *Kaami* had not received a basic familiarisation with the bridge equipment and had not been given clear expectations of his role, either from the SMS or at the start of the watch from the C/O. As a result, his effectiveness as a member of the bridge team was greatly diminished to the extent there was no communication between him and the C/O and no shared mental model of the navigational situation. He was on the bridge in hours of darkness as it was required

by the SMS but, without integration into the bridge team, he was unable to positively contribute to the safe navigation of the vessel. With no useful contribution from the lookout, the C/O became a single point failure.

## 2.5 COMMON ECDIS ISSUES

The safety issues associated with ECDIS use, voyage planning and passage monitoring highlighted in the previous sections are identical with many of those seen in the similar accidents listed in section 1.10 and 1.11. MAIB investigations repeatedly highlight issues in the application of the safety check function, setting of correct safety contour depths and the management of alarms. This raises concerns over the effectiveness of the mandatory training which provides the knowledge and skills necessary for bridge watchkeepers to safely use ECDIS.

The MAIB/DMAIB safety study is intended to pull together many of the common issues found with different ECDIS, their operation and the regulatory framework that governs training, design, and use. From this it hopes to stimulate the discussion as to how best to improve the utilization of ECDIS in the future.

However, the MAIB/DMAIB safety study and other similar studies have yet to deliver a proper change initiative for ECDIS and its use. Until they do, the onus remains on shipping management companies and operators to assure themselves of their crews' competence in the use of ECDIS through structured training and appropriate navigational audits.

## 2.6 COMPANY SMS

### 2.6.1 Internal navigational auditing

The most recent audit carried out by the DPA did not identify the poor navigation practices prevalent onboard *Kaami*, even though ECDIS use, and voyage planning were audit items. This is possibly due to the DPA not having any formal ECDIS training or any experience using ECDIS at sea, as he came ashore before gaining the opportunity to do so. The audit checklist used by the DPA did not cover specific items of ECDIS functionality to be audited, which could have helped cover knowledge gaps.

However, in 2016 Misje Rederei AS had released a Fleet Memorandum in response to concerning audit findings regarding voyage planning and the use of ECDIS. Among the issues identified were UKC within shallow waters, safety depth settings and off course alarms. Unfortunately, both the master and C/O of *Kaami* had joined Misje Rederei AS more recently, and as the learning outcomes of this Fleet Memorandum had not been embedded within the SMS and audit program, similar issues had continued.

The Misje Rederei AS management did not have the necessary level of experience or training with ECDIS. The actual standard of voyage planning on *Kaami* differed greatly from the standard that was expected from the company, but the auditors did not have the requisite tools to identify this in audits. The absence of ECDIS specific guidance in the SMS would also be explained by this lack of ECDIS awareness of the management.

### 2.6.2 ECDIS training/familiarisation

The required level of ECDIS training and familiarisation had been completed by both the master and C/O, but it seems that this did not have the desired effect on either deck officers' competence with the system. Even though they had completed the type-specific training and passed an online assessment, neither officer was able to use the ECDIS safely and effectively to assist in voyage planning or passage monitoring.

Added to this was the master's limited experience of voyage planning with ECDIS. Prior to joining *Kaami* he had operated on a vessel with a second officer, who conducted the voyage planning, and a C/O, which meant that for the previous 6 years he had only carried out the second check of voyage plans and guided the second officer in the overarching principles of voyage planning. Given his approach on *Kaami* it is evident he had previously relied heavily on his second officer's competence and diligence with ECDIS.

### 2.6.3 Bridge team

Good practice, as highlighted in the ICS BPG, indicates that communication and teamwork are essential in a bridge team. The lookout had an important role to play in ensuring the safe navigation of the vessel but in this instance, he contributed little to the bridge team.

It is common in MAIB investigations to find lookouts not standing a watch during the hours of darkness, so it is encouraging on this occasion a lookout was posted. However, the role of a lookout should not be one of presenteeism. The Misje Rederi AS SMS provided minimal guidance on the bridge resource management (BRM) principles expected to be used on their vessels and consequently very little guidance on the role of the lookout.

## 2.7 MANNING LEVELS AND FATIGUE

*Kaami* was crewed in accordance with the BMA issued safe manning document, which required a minimum of two navigating officers, the master and C/O. However, the nature of *Kaami*'s trading pattern was such that the C/O did not have the time to conduct voyage planning, as imagined in Misje Rederi AS's SMS. This led to the master completing the voyage plan in port with no check or verification of the plan by a second navigator. Had a third navigation watchkeeper been on board this would almost certainly have provided the capacity for a separate officer from the master to carry out voyage planning.

The master, C/O and company were all aware that good practice dictated the master was to complete a final check of the voyage plan. However, they used a single sentence in the SMS, intended to promote flexibility in times of high workload, to justify the master completing every voyage plan since he joined the vessel, thus normalising a procedure that was intended for use only in extreme circumstances.

While this accident occurred just before the window of circadian low[16], it was highly likely that the C/O was suffering from the effects of fatigue after long hours worked in Drogheda, followed by reintegration into a watch system during worsening weather

[16] Independent of other factors, fatigue is most likely and, when present, most severe, in the early hours of the morning, coinciding with the strongest drive for sleep. This period typically occurs between the hours of 3 and 5 a.m. and is commonly referred to as the window of circadian low. (MSC Circ. 1598 Section 20.27, Page 9).

conditions. Although the watch schedule on board gave the master and C/O a 7-hour rest period in every 24 hours, the C/O had only slept for around 3 hours prior to the watch in which the incident took place.

As highlighted in MAIB's bridge watchkeeping study, the monotonous nature of watchkeeping tasks can lead to a low level of stimulation for a watchkeeper. This makes maintaining sustained attention a challenge, especially during an individual's circadian low. In light of the above and noting the guidance in MSC.1/Circ.1598, it is likely that the C/O's performance was impaired in the period leading up to the grounding.

This is demonstrated by the C/O's failure to interpret the warning given to him by *Ocean Harvest* and that he did not recognise the significance of the southern cardinal mark on Eugenie Rock, and the information present on the ECDIS at the time. Despite all these indicators, the C/O still chose to stick rigidly to the voyage plan set down by the master and make the planned alteration of course on to Sgeir Graidach.

The link between effective fatigue management and manning levels on board is documented in MSC.1/Circ.1598, but well considered manning levels can also provide the time outside watchkeeping duties to conduct essential tasks, such as voyage planning, to the required standard. While it is likely that the resources on board *Kaami* could have been effectively managed to allow the C/O the time on passage to plan the next voyage, the finding by DNV GL during their recent ISM audit indicated that Misje Rederei AS had not properly evaluated all aspects of fatigue through a hazard identification process including safe minimum levels of manning on their vessels.

The manning situation on board *Kaami* was representative of the issues raised in the MAIB bridge watchkeeping safety study, and in the WMU paper and was indicative of the systematic manning shortfalls prevalent in this sector of the international shipping industry.

In 2004 after the bridge watchkeeping safety study, the MAIB recommended that the MCA raise concerns about inadequate minimum manning levels at the IMO, with the aim of increasing the minimum acceptable manning level of bridge watchkeeping officers to two, plus the master. In 2014, following the MAIB investigation into the grounding of *Danio*, a further recommendation was made to the MCA to work closely with the EU and European Commission to take the same increase of minimum manning to the IMO.

On both occasions insufficient support was received from other member states of the IMO. It is disappointing that neither initiative was successful as it is evident from the accidents investigated by MAIB since 2014 that the problem persists. Unfortunately, the consequences of this accident, albeit that *Kaami* was declared a constructive total loss, are not sufficient to justify making the case again. Even with increased awareness of the issues due to publications like the WMU paper, it is unfortunate that it will likely require a more significant accident to occur before the international community is willing to address this issue.

## 2.8 COASTGUARD INTERVENTION

The watchkeepers at Stornoway CGOC on the night of the incident were responsible for all VTM and monitoring VHF channel 16 activities in their area. The watch prior to the incident was described as routine, with the exception that the usually combined VTM and channel 16 monitoring role was split between the two MOOs on watch. In this case one of MOOs had not received the latest VTM update and it had been decided to split the tasks without fully considering the consequences. Combining the VTM and channel 16 monitoring tasks provides a watchkeeper with a greater awareness of the maritime domain, but no procedures had been put in place for the exchange of information between watchkeepers should the role be split.

A further divergence from established procedure was that C-Scope was not being used as the primary VTM system, contrary to the guidance in the OMS. A similar issue was identified by the MAIB during the investigation of the grounding of *Priscilla*, which highlighted a lack of knowledge or confidence in the C-Scope system by the MOOs.

With the watchkeepers' awareness of marine traffic movements diminished through the incorrect use of monitoring equipment and the non-conventional assignment of personnel, *Kaami*'s progress was not effectively monitored. The watchkeepers did not hear the VHF channel 16 exchange between *Ocean Harvest* and *Kaami* prior to the grounding. A similar lack of traffic awareness in the VTM area was identified in the investigation into the grounding of *Priscilla*. Even if the MOOs had heard the VHF exchange between *Ocean Harvest* and *Kaami*, the urgency of the message may have been missed by the MOOs as neither understood the meaning of the term 'shoal', highlighting a potential shortcoming in the marine training provided to new MOOs.

*Kaami* did not activate any of the pre-set conditions in C-Scope as there was no alert zone set up for Sgeir Graidach. Technology can only assist watchkeepers in their task to a certain extent, with the watchkeepers' own vigilance essential in managing traffic in their VTM area.

There was also a lack of a challenge to *Kaami*'s OOW when the vessel did not follow the IMO recommended route. HMCG's investigation following the accident stated:

> *…if IMO has seen it appropriate to adopt a routeing measure, it is the absolute entitlement of the shore authority to establish whether it is being followed; and if not, why not.*

In this instance, similar to *Ovit*, the MOOs on watch misinterpreted the information in the OMS regarding their role in intervening with vessel's not taking the IMO recommended route, leading to no challenge being issued and contributing to the low level of awareness of the traffic in their VTM area.

# SECTION 3 – CONCLUSIONS

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

1. No minimum UKC calculation was carried out which contributed to the safety contour and safety depth being set incorrectly for *Kaami*'s draught. The safety contour values had remained unchanged since this crew joined *Kaami*. [2.3.1]

2. There was no guidance in the SMS on what the company considered a safe minimum UKC and the preferred method for calculating it. [2.3.1]

3. Voyage planning was undertaken using inappropriately scaled ENCs. [2.3.2]

4. The safety check function was not used by the master to verify his voyage plan. As a result, the route planned by the master through the Little Minch went over a charted isolated danger. [2.3.3]

5. A full and comprehensive appraisal of all relevant information pertaining to the intended voyage plan was not carried out, resulting in *Kaami* commencing a voyage without a completed voyage plan. [2.3.4]

6. An independent check of the voyage plan was not conducted as it was not planned by the C/O. The SMS did not provide any instructions for those occasions when the master completed the voyage plan. [2.3.5]

7. The look ahead functions, which would have alerted the C/O to the danger of grounding, were not activated. Due to the inappropriate set-up and use of several key features, such as audible alarms and safety contours, *Kaami*'s ECDIS was not an effective tool for passage monitoring. [2.4.1]

8. The effectiveness of the AB lookout was greatly diminished due to the lack of communication and teamwork within the bridge team. As the lookout was not integrated effectively into the bridge team the C/O was left as a single point failure. [2.4.3]

9. The Misje Rederei AS management did not have the necessary level of experience or training with ECDIS to enable them to conduct audits effectively. [2.6.1]

10. Opportunities to learn from previous audit findings had been missed as the lessons had not been embedded within the SMS and auditing checklists. [2.6.1]

11. ECDIS training undertaken by the ship's master and deck officers had not equipped them with the level of knowledge and skill necessary to operate the system effectively. [2.6.2]

12. Even though *Kaami* was manned in accordance with the Safe Manning Document, the minimum levels of manning led to the master conducting the voyage planning and a high likelihood that the C/O was becoming fatigued. [2.7]

13. It was highly likely that the C/O was suffering from the effects of fatigue, which would have diminished his cognitive and behavioural performance and his ability to correctly perceive the navigational situation, even after the warning from *Ocean*

*Harvest*. [2.7]

14. The finding by DNV GL during the ISM audit in January 2020 indicated that Misje had not properly evaluated all aspects of fatigue through a hazard identification process including a safe minimum level of manning on their vessels. [2.7]

## 3.2 OTHER SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT

1. The safety issues associated with ECDIS use, voyage planning and passage monitoring highlighted in this report are identical with many of those seen in similar accidents investigated by MAIB. Although the issues surrounding the use of ECDIS are being explored, the overarching legislation and guidance remains unchanged. In the meantime, the onus remains on shipping management companies and operators to assure themselves of their crews' competence in the use of ECDIS through structured training and appropriate navigational audits. [2.5]

2. Neither the 2004 nor 2014 recommendations made by the MAIB were successful in driving a change in minimum manning levels for navigating officers on short sea trade vessels. It is unfortunate that it will likely require a more significant accident to occur before the international community is willing to move on this topic. [2.7]

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

1. The contents of HMCG's OMS with respect to recommended route monitoring and VTM were misunderstood by the watchkeepers at Stornoway CGOC on the night of the incident. [2.8]

2. C-Scope was not used as the primary VTM tool by the watchkeeper at Stornoway CGOC. Alert zones in C-Scope were also not set up around Sgeir Graidach, reducing the system effectiveness. [2.8]

3. The watchkeepers at Stornoway did not hear the Ch 16 exchange between *Kaami* and *Ocean Harvest*, but even if they had the urgency of the message may have been missed as neither MOO understood the term 'shoal'. [2.8]

# SECTION 4 – ACTIONS TAKEN

## 4.1 MAIB ACTIONS

The **MAIB** has:

Conducted a safety study, in collaboration with the Danish Maritime Accident Investigation Board, to provide further research on the reasons why seafarers are utilising ECDIS in ways that are often at variance with the instructions and guidance provided by the system manufacturers and regulators. The overarching objective of the study is to provide comprehensive data that can be used to improve the functionality of future ECDIS systems by encouraging the greater use of operator experience and human centred design principles.

## 4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

**Misje Rederi AS** has:

- Released Fleet Memo 01 2020, voyage planning and ECDIS use for voyage planning. This contains basic guidance on the safety check function, setting of safety contours and activation of look ahead features;

- Following the audit finding in January 2020, implemented a fatigue management plan to the satisfaction of DNV GL classification society.

- Revised the ECDIS guidance within the SMS and management within the fleet to reflect learnings from this accident, including:

    - a new voyage plan form requiring two checks.
    - focus on ECDIS use and voyage planning during all internal audits.
    - voyage plans and ECDIS alarms revised for the whole fleet and voyage plans and images from ECDIS can be requested at any time for review.

**The Maritime and Coastguard Agency** has:

- Completed a Tier 3 Detailed Incident Review;

- Conducted Operator Behaviour training at Stornoway CGOC, focussing in particular on the challenging of vessels exhibiting unusual behaviours, poor seamanship, noncompliance with IMO routeing measures and the use of C-Scope;

- Carried out a nationwide review of C-Scope use, resulting in the establishment of additional alert zones and increasing operator engagement;

- Reiterated to all watchkeepers the priorities of their roles and the relevant sections within the OMS.

- Started a review, and update of the coastguard competency framework including a focus on how the organisation delivers maritime knowledge training.

- Expanded the VTM training course from two days to one week in order to reflect the importance of the role. The expanded course also includes further maritime knowledge aspects.

## SECTION 5 – RECOMMENDATIONS

**Misje Rederi AS** is recommended to:

**2021/112** Review the numbers of watchkeeping officers on vessels in its fleet with the specific aim of ensuring there are sufficient personnel to conduct essential tasks effectively during periods of high workload and to protect the watchkeepers against the effects of fatigue, taking into account the guidance contained in IMO Resolution A.1047(27) Principles of Minimum Safe Manning.

**2021/113** Review and amend the guidance contained in its safety management system regarding voyage planning using ECDIS to ensure that:

- a company standard for safe under keel clearance and safety depth and the method for calculation is present and followed;
- the correct application of safety contours and alert limit settings is positively confirmed on all company vessels;
- if the voyage planning must be conducted by the master then a second check by a different navigating officer must take place;
- support is given to the navigating officer to ensure they have the time to develop the voyage plan and check it for Errors.

**2021/114** Confirm fleetwide compliance with acceptable navigational procedures, specifically with ECDIS by:

- ensuring all staff auditing the fleet have an appropriate level of knowledge, through training and experience, to enable the effective audit of the use of ECDIS on board;
- engaging an independent navigational audit provider, until such time as their internal audit team is appropriately trained;
- employ a system that ensures that relevant learning opportunities are followed up and implemented.

**2021/115** Ensure that lookouts in the fleet are being fully integrated into bridge teams using the good practice principles highlighted in the ICS Bridge Procedures Guide, and to amend the safety management system to provide the appropriate level of supporting guidance.

Marine Accident Report

INVESTORS IN PEOPLE