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“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 such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame.”

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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This investigation has been conducted with the co-operation and assistance of the Bahamas Maritime Authority.

Grounding of **FRI OCEAN**

2½ miles south of Tobermory

14 June 2013

SUMMARY

At 0322 (UTC¹⁺²) on 14 June 2013, the general cargo vessel *Fri Ocean* (**Figure 1**) ran aground at about 10.5 knots, 2½ miles south of Tobermory, Isle of Mull, while on passage from Corpach in Scotland to Varberg in Sweden.

The vessel's bow shell plating and frames were damaged, which resulted in flooding to the bow thruster room. The crew carried out a temporary repair, and the vessel was re-floated at 2120. After inspection at Oban, *Fri Ocean* proceeded to Liverpool for permanent repair.

The investigation identified that the second officer, who was alone on watch, fell asleep, largely through lack of stimulation possibly exacerbated by fatigue, shortly after making a course alteration at 0256.

¹ Universal Co-ordinated Time



Figure 1: *Fri Ocean*

None of the alarms fitted to the GPS² and ECS³ were loud enough to wake the sleeping officer, and a bridge navigational watch alarm system (BNWAS) that could have alerted the crew to the second officer sleeping was probably not in use.

Recommendations have been made to the vessel's manager, Kopervik Ship Management AS, designed to enhance its safety management system (SMS) with regard to: the use of lookouts and the BNWAS; fatigue management and navigational requirements; and improving the auditing and verification of its navigational policy.

FACTUAL INFORMATION

Vessel

Fri Ocean was a 2,218gt general cargo vessel managed by Kopervik Ship Management AS. At the time of the accident, the navigation equipment in use included:

- Relevant paper charts (the primary means of navigation).
- An ECS with a cross-track limit for deviation from the planned route set at 0.3 mile.
- A GPS with a cross-track limit for deviation from the planned route set at 0.5 mile and a distance-to-waypoint alert set at 0.2 mile.

Manning and watchkeeping

Fri Ocean had a complement of seven crew members in accordance with her Minimum Safe Manning Document.

The master was Russian and 50 years old. He had joined Kopervik Ship Management AS in 2010 as a chief officer. This was his second trip as master. He held a Russian STCW⁴ II/2 Master Unlimited Certificate of Competency.

The second officer was Polish and 48 years old. He had worked for Kopervik Ship Management AS for about 17 years, initially as a third officer. He had served previously on *Fri Ocean* and most recently joined the vessel in May 2013. He held a Polish STCW II/1 OOW⁵ Unlimited Certificate of Competency.

Two able seamen (ABs) were assigned 4 hours on / 4 hours off lookout duties on the bridge at sea, and 6 hours on / 6 hours off cargo watches in port.

The master, chief officer and second officer worked 4 hours on / 8 hours off navigation watches at sea. The second officer was assigned the 0000-0400 and 1200-1600 watches.

In port, the chief and second officers shared cargo watches with the second officer assigned the 0000-0600 and 1200-1800 watches.

The chief engineer and the AB/cook were not assigned watches.

² Global Positioning System

³ Electronic Chart System

⁴ International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended

⁵ Officer of the Watch

Environment

At the time of the accident, the wind was south-westerly force 3, the sea was calm and the visibility was good. The outside air temperature was 11°C⁶. The temperature inside the wheelhouse was about 17°C.

Narrative

Alongside in Belfast

Fri Ocean arrived in Belfast at just after 0800 on 11 June 2013. Unloading was carried out during the day, suspended overnight, resumed at 0900 the following morning and completed by midday. At 1505, *Fri Ocean* departed, in ballast, for Corpach.

Voyage to Corpach

During the voyage to Corpach, the master, chief officer and second officer maintained their normal navigation watches. There is conflicting evidence as to whether the AB assigned to the 0000-0400 watch was engaged as lookout or the second officer maintained the watch alone.

At 0400 on 13 June 2013, the chief officer took over the duties of the bridge watchkeeper, and the second officer went to his cabin. He went to bed at about 0430 and fell asleep at about 0500.

Fri Ocean arrived alongside in Corpach at 1100. Noise from the mooring winches woke the second officer about 20 minutes earlier than his normal routine. He got out of bed, had lunch, and then went to the main deck to start his cargo watch.

Alongside in Corpach

Between 1200 and 1600, a cargo of wood chips was loaded and stowed in *Fri Ocean's* cargo hold by shore stevedores under crew supervision. The chief officer then proceeded ashore to complete a draught survey.

The vessel was shifted along the berth, the hatch covers were closed, and the second officer, chief engineer, 2 ABs and AB/cook then fitted stanchions on either side of the hatch in preparation for loading and securing a deck cargo of logs. With the stanchions in place, loading of the logs was started by shore stevedores at 1640.

During the afternoon, the second officer completed a passage plan and prepared the bridge equipment for the intended voyage from Corpach to Varberg. Between 1730 and 1800, the crew ate dinner together.

Loading was completed at 1930, and the crew started to secure the deck cargo while the chief officer proceeded ashore to complete a second draught survey. There is conflicting evidence as to whether or not the second officer assisted in securing the deck cargo and was then sent to rest at some time between 1930 and 2000.

By 2230, the deck cargo had been secured and the chief officer had gone to rest. At 2245, the second officer was woken by his alarm clock, having slept for about 30 minutes. He and an AB proceeded to the forward mooring station to prepare for the vessel's departure. At that time, the second AB and the AB/cook were stationed aft, and the master was on the bridge. *Fri Ocean* sailed from Corpach at 2300, as planned.

⁶ Celsius

Events following departure from Corpach

The master decided that the AB assigned to the 0000-0400 watch would not be required for lookout duties, and so the two ABs and the AB/cook were stood down for the night. At 2355, the second officer went to the bridge to relieve the master. He felt normal and capable of keeping his watch. After plotting the vessel's 0000 GPS position on the chart, the master handed the watch to the second officer.

The master remained on the bridge to complete some paperwork and to monitor the vessel's transit through the Corran Narrows⁷. The second officer then engaged the autopilot, and between 0030 and 0040 the master left the bridge to rest. There is conflicting evidence as to whether or not the master switched on the BNWAS with a 6-minute reset period and removed the key before he left the bridge.

At 0256, *Fri Ocean* reached a waypoint adjacent to Eileanan Glasa, and the second officer adjusted the vessel's course to 311°(T). He then went out to the starboard bridge wing to get some fresh air. When he returned to the wheelhouse, he secured the starboard bridge door in the fully open position and sat in the port bridge chair.

Shortly afterwards, the second officer fell asleep. The vessel passed the next planned waypoint and maintained her course for just over 2½ miles, at about 10.5 knots, until the second officer then woke up.

Sensing the close proximity of land, the second officer immediately moved the engine control to neutral, and then full astern, before *Fri Ocean* grounded at 0322 (**Figure 2**).

Events after the grounding

The master, who had been woken by the resulting noise and vibration, was already on his way to the bridge when the second officer attempted to call him using the vessel's talk-back system. The BNWAS audio alarm was not sounding and there is conflicting evidence as to whether or not the master switched off the BNWAS when he arrived on the bridge. In any event, he used the talk-back system to muster the crew.

The crew mustered with lifejackets and survival suits, and were ordered to launch the rescue boat so the master could carry out an external inspection of the vessel. While the rescue boat was being launched, the master informed the management company that *Fri Ocean* was aground, and other members of the crew were sent to open and ventilate the forepeak tank.

After completing his external inspection from the rescue boat, the master returned on board and internally inspected the forepeak tank and duct keel. At the time of this inspection, there was no water ingress to the vessel. However, with the rising tide, the bow thruster space began to flood through a damaged weld on the emergency fire pump sea suction pipe.

At 0710, a member of the public reported that *Fri Ocean* was aground to Stornoway Coastguard, who then tasked the Tobermory RNLI⁸ lifeboat to assist.

During the day the crew carried out a temporary repair to stem the flooding, and *Fri Ocean* was re-floated at 2120. *Fri Ocean* was inspected at Oban and found to have sustained significant bottom plate and frame damage to the forward part of the hull. Following the inspection, the vessel proceeded to Liverpool to be repaired.

⁷ The Corran Narrows is a stretch of water about 0.1 mile wide.

⁸ Royal National Lifeboat Institution

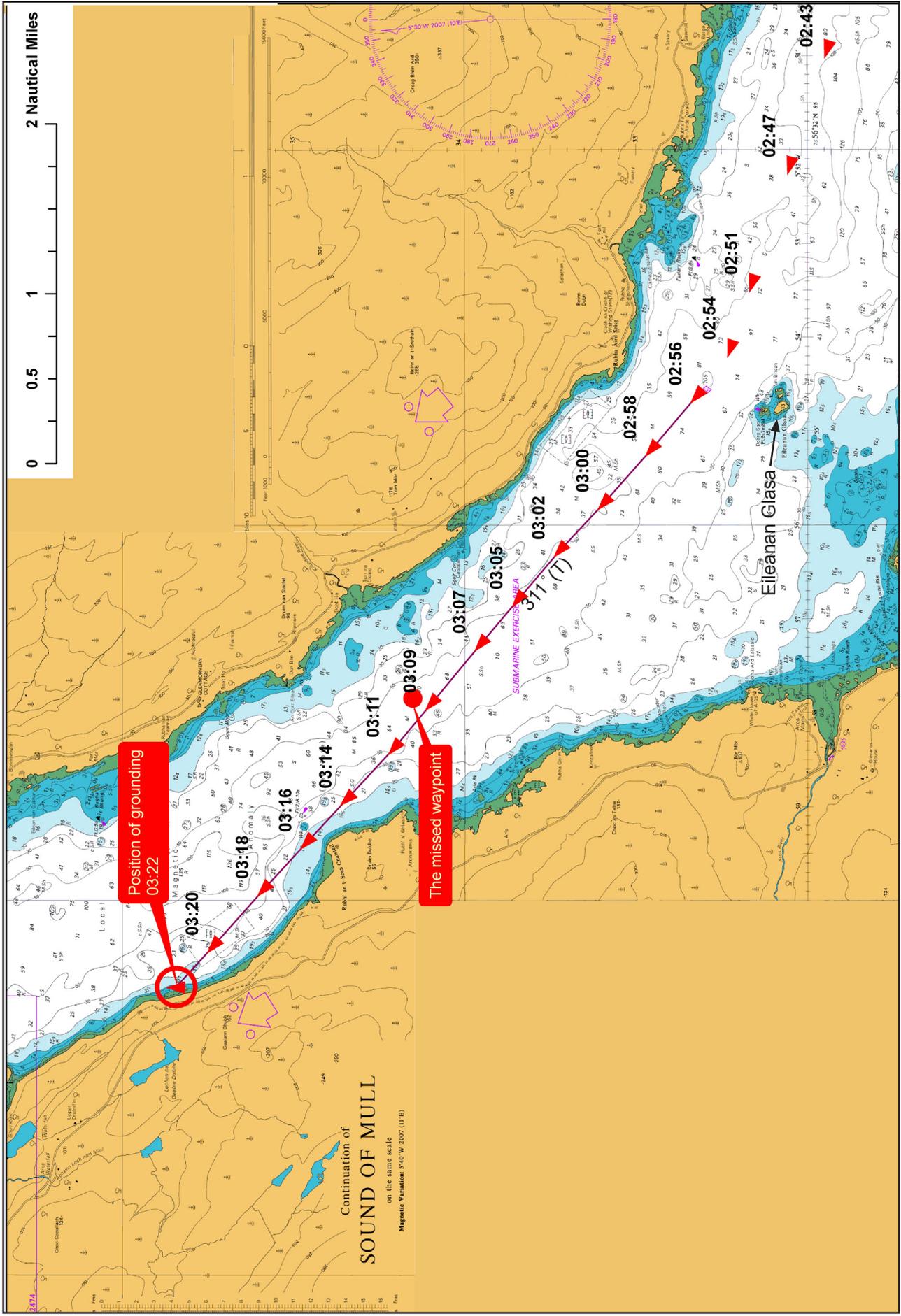


Figure 2: Fri Ocean's position AIS history track

Bridge navigational watch alarm system

Fri Ocean had been fitted with a BNWAS in anticipation of it becoming a mandatory carriage requirement on 1 July 2013. Following the accident there was conflicting evidence about its use, but the indications are that the system was not activated during watches when a lookout was present on the bridge. At the time of the accident the company's SMS did not contain instructions on the use of the BNWAS.

As part of the MAIB investigation, the first and second stage BNWAS audible alarms were tested and found to be operating correctly.

Safety management

Kopervik Ship Management AS held a valid document of compliance, and *Fri Ocean* had been issued with a valid safety management certificate, as required by the International Safety Management (ISM) Code.

The company had carried out an internal SMS audit on *Fri Ocean* on 28 October 2012 during which no non-conformities were raised. The effectiveness of bridge navigational watch procedures was not assessed during the audit.

STCW

The STCW states that the OOW may be the sole lookout in daylight provided "*the situation has been carefully assessed and it has been established without doubt that it is safe to do so, full account has been taken of all relevant factors... and assistance is immediately available to be summoned to the bridge when any change in the situation so requires*". Most Flag administrations understand from this that at all times when a vessel is underway at night, a separate dedicated lookout is required in addition to the OOW.

Similar accidents

In 2004, the MAIB published a Bridge Watchkeeping Safety Study, which confirmed that watchkeeper manning levels, fatigue and a master's ability to discharge his/her duties are major causal factors in collisions and groundings. The study highlighted a number of accidental groundings in which no lookout had been posted, the autopilot was engaged, a BNWAS was either not fitted or not used and the unaccompanied watchkeeper had fallen asleep. Since 2004, the MAIB has regularly investigated groundings of small cargo vessels, most recently that of *Beaumont*⁹, in which similar causal factors have been identified.

⁹ Grounding of MV *Beaumont* on Cabo Negro, Spain Report No 14/2013.

ANALYSIS

The second officer sat down in the port bridge chair and fell asleep. He then remained asleep and, consequently, did not make a planned alteration of course. This resulted in *Fri Ocean* maintaining course until the vessel grounded.

Factors contributing to the second officer falling asleep

Bridge design

Fri Ocean's bridge layout was designed to enable an OOW to monitor the vessel's position using electronic navigational aids while seated in the port bridge chair. It was also possible to adjust the vessel's course, using either manual or automatic steering, without leaving the chair.

While ergonomically efficient, the design enabled the second officer to conduct much of his watch sitting down, which increased the potential for him to fall asleep.

Method of navigation

Paper charts were declared to be the primary means of navigation on board *Fri Ocean*. The company's SMS required "*the vessels position to be plotted with regular interval and recorded in 'the deck logbook', minimum twice per watch*" [sic]. In accordance with this requirement, the second officer routinely plotted the vessel's GPS position on the paper chart and recorded it in the log book every 2 hours. With regard to navigating within "*close waters*", the SMS stated that the "*officer in charge shall use all available navigational aids to ensure the safest navigation of the water*".

Traditional navigation techniques using charts as a primary means of navigation require an OOW to regularly plot a series of historical positions from which to project the vessel's track. The ECS was provided to assist with passage planning, and to increase the situational awareness of the OOW by displaying the vessel's charted position at any time without the need for frequent plotting. In practice, the second officer routinely monitored the vessel's position using the ECS and GPS, relying on the cross-track limit alarm to alert him to an unacceptable deviation from the planned route, and the distance-to-waypoint alarm to warn him to alter course in accordance with the passage plan.

This method of navigation provided little stimulation and allowed the second officer to remain inactive for extended periods of time which further increased the potential for him to fall asleep.

Lookout

The company's SMS stated "*it is the masters responsibility to ensure that adequate watches are set at all time in port and at sea*" [sic]. Although all navigation watches were assigned an AB, contrary to the requirements of both STCW and the company's SMS, the master considered that a lookout was unnecessary for the 0000-0400 watch following the vessel's departure from Corpach.

There is conflicting evidence with regard to how routinely lookouts were employed on navigational watches at night. It is therefore possible that a lookout had not been employed at night on previous occasions.

The master felt justified in not employing a lookout for the 0000-0400 watch on departure from Corpach because he considered that the close proximity of land and challenging navigational conditions would sufficiently energise the second officer to prevent him from falling asleep.

Routine absence of a lookout on watch at night without incident would have reinforced a belief that it was safe to operate the vessel in that way, and would have influenced the master's decision not to employ a lookout on this occasion.

A lookout should be considered an integral part of the bridge team and should be utilised to the fullest extent. The lack of a lookout in this accident removed a valuable control measure in that his interaction with the second officer might have prevented the latter from falling asleep.

The vessel's policy of assigning two ABs lookout duties on a 4 hours on / 4 hours off basis was contrary to STCW hours of rest requirements. The inclusion of the AB/cook on the duty roster, even if his lookout responsibilities were less than those of the other ABs, would have provided more flexibility and helped ensure the crew achieved the required periods of rest.

Environmental conditions

Gentle vessel movement, as a result of the calm sea conditions, and the warm temperature inside the wheelhouse would have exacerbated any tendency for the second officer to fall asleep. Although the second officer had gone out to the starboard bridge wing for some fresh air, and had then secured the starboard bridge door in the fully open position, his actions were insufficient to prevent him from falling asleep shortly after he had sat in the port bridge chair.

Fatigue

In the days leading up to the accident, the second officer's work and rest pattern complied with STCW hours of rest requirements.

However, his normal sleeping routine had been disturbed during the vessel's call at Belfast. Although the second officer had an opportunity to rest during the evening in Corpach, disruption of his circadian rhythm may have contributed to his not sleeping for more than 30 minutes in the evening before being woken in preparation for the vessel's departure. Additionally, his extended working hours and physical activity during the day in Corpach meant that, despite feeling normal and capable of keeping his watch, the second officer was possibly fatigued when he arrived on the bridge at 2355.

Fatigue management

The chief officer and the two ABs remained on duty throughout the vessel's stay in Corpach. This resulted in them working prolonged hours, the second officer being called at 2245 for the vessel's planned departure at 2300, and the AB assigned to the 0000-0400 watch being stood down.

The cargo was being loaded by shore stevedores under crew supervision, which largely required the crew to monitor progress. This could have been achieved with one officer and one AB, working 6 hours on / 6 hours off in accordance with their assigned port cargo watches. More crew could then have been employed when additional resources were actually needed, such as closing hatch covers, fitting stanchions, and securing cargo.

Had the assigned port cargo watches been maintained, and additional crew resources effectively managed, the second officer's and 0000-0400 watch AB's fitness for duty might have been assured to enable the vessel to depart at the planned time. The master was faced with a challenge to juggle his available resources to avoid delays to the vessel. When this became impossible, he should have felt empowered to stop the ship to allow his crew to receive the rest they needed. However, the SMS did not provide clear guidance on fatigue management and, without the benefit of unequivocal support from the company, the master will always find this a difficult decision to make.

Factors contributing to the second officer remaining asleep

BNWAS

There is conflicting evidence with regard to how routinely the BNWAS was switched on. At the time of the accident, there was no requirement for a BNWAS to be fitted to *Fri Ocean* and it is reported that the BNWAS was not necessarily switched on when a lookout was present on the bridge in addition to the OOW.

The BNWAS audio alarm was not heard before or after the grounding and there is conflicting evidence as to whether or not the BNWAS was switched on prior to the accident. *Fri Ocean*'s position as shown by the AIS¹⁰ history track indicates that at least 12 minutes passed between the second officer falling asleep and the vessel running aground which would have required the BNWAS to be reset at least twice. This indicates that if the BNWAS was switched on during this period, either the second officer reset it or the alarm did not function.

To reset the BNWAS from his seated position, the second officer would have had to lean forward, reach across the console and press the reset button (**Figure 3**). It is unlikely he would have achieved this while asleep.

As the alarms were working correctly, it is concluded that the BNWAS was probably not switched on during the period leading up to the grounding.

In view of the reported irregularity of its use and the absence of any specific instructions about the operation of the BNWAS in the company's SMS, the master might have either not appreciated the value of having the BNWAS switched on or have simply forgotten to switch it on given that a lookout would normally have been present.

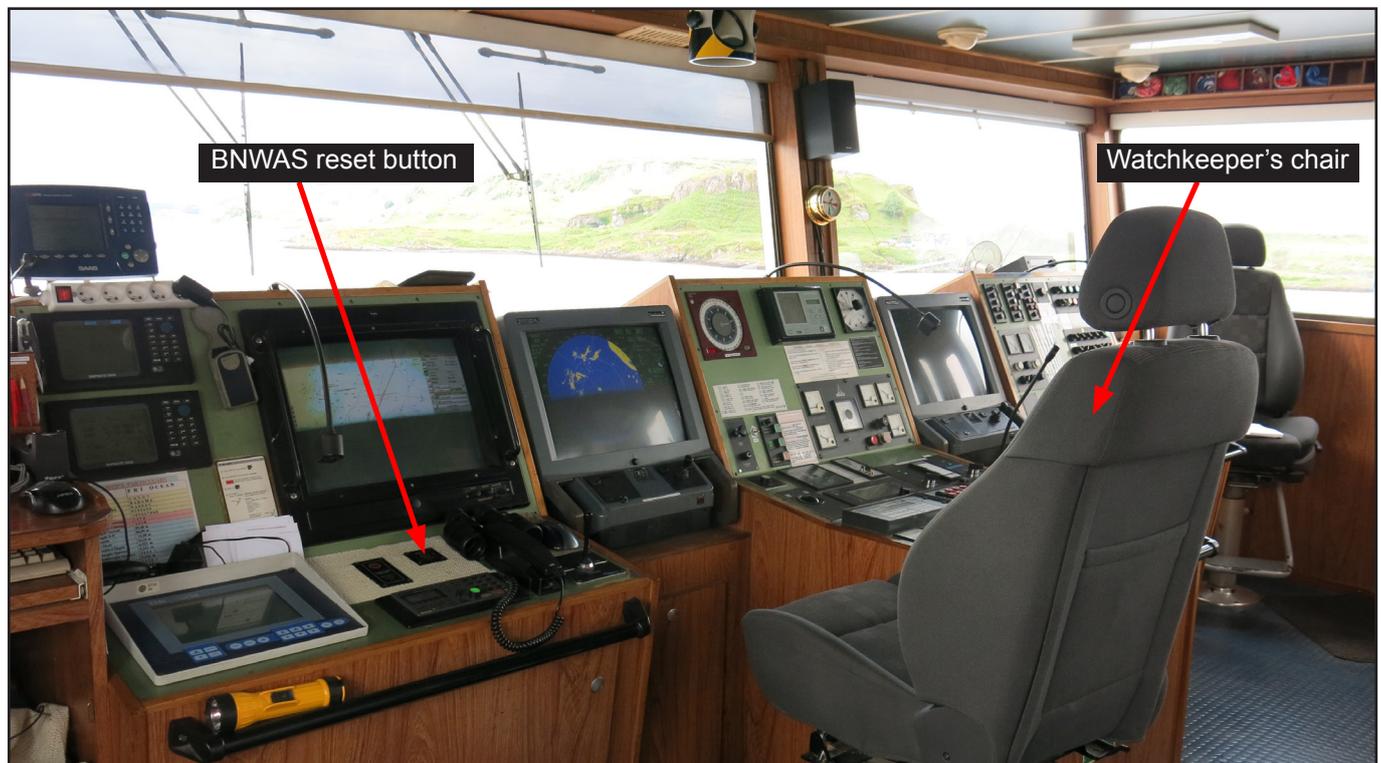


Figure 3: *Fri Ocean*'s wheelhouse

¹⁰ Automatic Identification System

Lookout

If a lookout had been present on the bridge as an integral part of the bridge team, and had normally interacted with the second officer, he would probably have identified that the second officer had fallen asleep and that the vessel had passed the next planned waypoint. He would then have been in a position to immediately wake the second officer and, if necessary, alert the master.

Bridge alarms

Prior to the second officer falling asleep, all course alterations had been made on time and in accordance with the passage plan. The GPS audible alarm set to sound when the cross-track limit was reached and when the vessel passed the distance-to-waypoint trigger point, was designed to grasp the attention of an alert watchkeeper, but it was insufficiently loud to wake the sleeping second officer.

As the ECS was not the primary means of navigation, it was not required to meet ECDIS¹¹ performance standards. Therefore, rather than having an external audible alarm fitted, the cross-track limit alarm was generated by an internal speaker fitted to the personal computer running the ECS software, which was also insufficiently loud to wake the sleeping second officer.

Notification of the grounding

The master's omission to immediately inform the Coastal State of the grounding was contrary to international maritime requirements¹². An immediate report is important because it gives the Coastal State the maximum time in which to arrange for assistance to the vessel and her crew, and to put in place contingency plans for both salvage and the prevention of pollution.

CONCLUSIONS

- While ergonomically efficient, the bridge design encouraged the second officer to sit down which increased the potential for him to fall asleep.
- The second officer's method of navigation provided little stimulation and allowed him to remain inactive for extended periods of time which further increased the potential for him to fall asleep.
- Although the second officer had gone out to the starboard bridge wing to get some fresh air, and had then secured the starboard bridge door in the fully open position, his actions were insufficient to prevent him from falling asleep.
- The lack of a lookout removed a valuable control measure in that his interaction with the second officer might have prevented the latter from falling asleep. Additionally, if a lookout had been present on the bridge, he would have been in a position to immediately wake the second officer.
- Routine absence of a lookout on watch at night without incident would have reinforced a belief that it was safe to operate the vessel in that way, and would have influenced the master's decision not to employ a lookout on this occasion.
- The second officer was possibly fatigued when he arrived on the bridge for his watch.
- The second officer's and 0000-0400 watch AB's fitness for duty might have been assured had the assigned port cargo watches been maintained and additional crew resources effectively managed.

¹¹ Electronic Chart Display and Information System

¹² International Convention for the Prevention of Pollution from Ships

- The BNWAS was probably not switched on during the period leading up to the grounding, and the ECS and GPS audible alarms were insufficiently loud to wake the sleeping second officer.
- The master might have either not appreciated the value of having the BNWAS switched on or have simply forgotten to switch it on given that a lookout would normally have been present.
- The SMS did not provide guidance on fatigue management.

RECOMMENDATIONS

Kopervik Ship Management AS is recommended to:

2013/247 Improve its safety management system by:

- Emphasising the value of lookouts, and to specifically require that a lookout is present on the bridge at night while the vessel is at sea.
- Providing guidance on fatigue management and the effective use of crew.
- Instructing masters to detail their own specific requirements with regard to passage planning and monitoring, including the extent to which particular electronic navigational aids should be used.
- Providing instructions on when, and the manner in which, the BNWAS should be used while the vessel is at sea.

2013/248 Monitor the implementation and effectiveness of its navigational policy through an enhanced regime of auditing and verification.

SHIP PARTICULARS

Vessel's name	<i>Fri Ocean</i>
Flag	Bahamas
Classification society	Lloyd's Register of Shipping
IMO number	9195690
Type	General cargo vessel
Registered owner	Fri Ocean AS
Manager(s)	Kopervik Ship Management AS
Year of build	2000
Construction	Steel
Length overall	89.4m
Registered length	Not applicable
Gross tonnage	2,218
Minimum safe manning	7
Authorised cargo	General cargo

VOYAGE PARTICULARS

Port of departure	Corpach
Port of arrival	Varberg
Type of voyage	International
Cargo information	Wood chips in hold, logs on deck
Manning	7

MARINE CASUALTY INFORMATION

Date and time	14 June 2013, 0322 (UTC +2)
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Sound of Mull, UK
Place on board	Not applicable
Injuries/fatalities	None
Damage/environmental impact	Plate and frame damage, no pollution
Ship operation	On passage
Voyage segment	Mid-water
External & internal environment	South-westerly force 3 wind; calm sea; good visibility; external air temperature 11°C Internal wheelhouse temperature ~17°C
Persons on board	7