ACCIDENT REPORT

Report on the investigation of

the grounding of

Danio

off Longstone, Farne Islands, England

16 March 2013

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SERIOUS MARINE CASUALTY REPORT NO 8/2014 APRIL 2014

Extract from

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.

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

For all enquiries:
Marine Accident Investigation Branch
Mountbatten House
Grosvenor Square
Southampton
United Kingdom
SO15 2JU

Email: maib@dft.gsi.gov.uk
Telephone: +44 (0) 23 8039 5500
Fax: +44 (0) 23 8023 2459

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AB	-	Able Bodied Seaman
AIS	-	Automatic Identification System
ALB	-	All-weather lifeboat
BNWAS	-	Bridge Navigational Watch Alarm System
CG	-	Coastguard
COLREGS	-	International Regulations for the Prevention of Collisions at Sea 1972 (as amended)
DMA	-	Danish Maritime Authority
EC	-	European Community
ECDIS	-	Electronic Chart Display and Information System
ECS	-	Electronic Chart System
EMSA	-	European Maritime Safety Agency
EU	-	European Union
GL	-	Germanischer Lloyd
IEC	-	International Electrotechnical Committee
ILO	-	International Labour Organization
IMO	-	International Maritime Organization
ISM Code	-	International Management Code for the Safe Operation of Ships and for Pollution Prevention
m	-	metre(s)
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MEHRA	-	Marine environmental high-risk area
MoU	-	Memorandum of Understanding
MSC	-	Maritime Safety Committee
MSMC	-	Minimum Safe Manning Certificate
MSN	-	Merchant Shipping Notice

nm	-	Nautical mile
PSC	-	Port State Control
RNLI	-	Royal National Lifeboat Institution
SMS	-	Safety Management System
SOLAS	-	International Convention for the Safety of Life at Sea
SOSREP	-	The Secretary of State's representative for maritime salvage and intervention
STCW	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

Times: All times in this report are UTC unless otherwise stated

Image courtesy of Sea Houses RNLI station

Danio

SYNOPSIS

At 0330 on 16 March 2013, the general cargo vessel *Danio* grounded in the Farne Islands nature reserve, off the east coast of England while on passage from Perth to Genk, Belgium. The chief officer, who was the officer of the watch, had fallen asleep. Salvage operations were hampered by poor weather and *Danio* remained aground for 12 days until the vessel was successfully refloated and towed clear of the area. *Danio* sustained breaches to forward ballast and void compartments, and extensive damage to the starboard propulsion and steering systems, but fortunately there was no pollution.

The chief officer had served on board *Danio* for 3 months. In addition to supervising cargo work operations in port, he worked a 6 hours on / 6 hours off watchkeeping regime at sea with the master, who was the only other deck officer. The very high workload placed on the two deck officers was typical of that found on many near coastal vessels trading in European waters. However, the causes and circumstances of this accident and others reported to the MAIB demonstrate the severe risks that cumulative fatigue can pose in this sector.

A number of important safety barriers had been routinely circumvented, although none of these had been identified during the company's internal audits of the vessel's safety management system: *Danio* was equipped with a fully functional Bridge Navigational Watch Alarm System, but this was permanently switched off; there was no lookout posted on the bridge as required by international rules; and the bridge watchkeepers relied on an unapproved electronic navigation system when navigating the vessel despite the designated primary means of navigation being paper charts.

A recommendation has been made to the owner of *Danio* designed to amend the company's internal auditing regime to ensure there is verification that its documented procedures match the actual practices on board, with particular reference to: the use of lookouts and watch alarms; compliance with hours of rest regulations; and adherence to fundamental principles of safe navigation.

In response to a recommendation from the MAIB contained in its 2004 Bridge Watchkeeping safety study, the United Kingdom attempted to secure an international mandate for a minimum of three watchkeepers on commercially operated cargo vessels, but this initiative received insufficient support from international partners. Ten years on, more, potentially disastrous accidents around the coast of Europe appear inevitable unless the scourge of fatigue, which appears to be endemic among the crews of vessels engaged in short sea trades, is eradicated. Consequently, a recommendation has been made to the Maritime and Coastguard Agency to work closely with the European Commission and EU member states to propose an appropriate paper to the IMO which seeks to ensure that all vessels engaged on short sea trades carry a minimum of two navigational watchkeepers in addition to the master.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *DANIO* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Danio*
Flag	Antigua & Barbuda
Classification society	Germanischer Lloyd
IMO number	9218533
Type	General cargo vessel
Year of build	2001
Registered owner	Reederei Frank Dahl e.K.
Manager(s)	Cuxship Managment GmbH
Construction	Steel
Length overall	80.25 metres
Gross tonnage	1499
Minimum safe manning	6 (5 if master or chief officer holds valid engineer's certification)
Authorised cargo	Yes
VOYAGE PARTICULARS	
Port of departure	Perth (Scotland)
Port of arrival (intended)	Genk (Belgium)
Type of voyage	Short International
Cargo information	Timber
Manning	6
MARINE CASUALTY INFORMATION	
Date and time	16 March 2013, 0330
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Longstone, Farne Islands, England | 55º 38.4' N 001º 36.7' W
Place on board	Entire vessel
Injuries/fatalities	None
Damage/environmental impact	Starboard rudder and propeller; internal bulkheads and frames; forward ballast tank breached; hull steel damage
Ship operation	In passage
Voyage segment	Mid-water
External & internal environment	Wind: westerly, force 3 | Sea: calm, slight westerly swell | Visibility: good | High water at North Sunderland: 0515 | Height of tide at high water: 4.5m | Height of tide at grounding: 3.5m | Sunrise at Seahouses: 0559
Persons on board	6

1.2 BACKGROUND

The general cargo vessel *Danio* grounded at Longstone, one of the Farne Islands off the coast of Northumberland, England. The Farne Islands are a nature reserve and one of the 32 marine environmental high-risk areas (MEHRA)[1] around the UK coast. They are also a European special protection area and support a significant tourism industry. The main lighthouse on Inner Farne Island has a range of 24 nautical miles. The visibility at the time of the accident was good.

Danio made ten port calls in the 6 weeks preceding the accident. At the time of grounding, it was on passage from Perth, Scotland to Genk, Belgium and had 1500 tonnes of timber cargo on board along with 27 tonnes of gas oil and 2 tonnes of lubricating oils.

The master and chief officer shared the navigation watches on a 6 hours on / 6 hours off basis. In port, the chief officer was responsible for cargo work. The master did not share the cargo work with the chief officer; he dealt with all other matters on the ship including surveys, inspections and communication with the owners and charterers.

1.3 NARRATIVE

1.3.1 Events prior to grounding

At 1800 on 14 March 2013 *Danio* arrived in Perth. The chief officer, who had been on watch until then, monitored the cargo loading which started shortly after berthing and continued until 2300. Cargo work resumed at 0600 the next day and the vessel sailed for Genk at 1725.

After departure, the chief officer retired to his cabin at around 1800 and slept for up to 4 hours. The master, who was on watch from 1700-2300, remained on the bridge. At 2000, the pilot disembarked west of the fairway buoy in the river Tay and the master set a course of 143º on the autopilot. The master was alone on the bridge and the Bridge Navigational Watch Alarm System (BNWAS) was not switched on.

At around 2255 the master made a minor adjustment to the autopilot heading as the vessel had been set to the east of the intended track. At 2300, the chief officer came up on the bridge to take his watch. No lookout was posted.

By 2307 the vessel's heading was steady at 147º and the chief officer did not adjust this during his watch. Reportedly, he spent his watch completing paperwork, transferring waypoints for the voyage beyond UK territorial waters from the electronic chart system (ECS) to the paper chart. He also reported plotting the ship's position on the paper chart and he updated the bridge logbook at 0100.

At some point during the watch, the chief officer reportedly sat on the sofa on the bridge to administer some antiseptic eye drops as he was suffering from an eye infection. In order to ensure the medicine stayed in his eyes, he rested his head on the backrest of the sofa, and subsequently fell asleep. It has not been possible to determine the time at which he did this.

[1] Marine Environmental High Risk Areas (MEHRAs) are a UK national initiative first proposed by the Donaldson Report (1994) commissioned following the pollution from the grounding of the crude oil tanker *Braer* off the Shetland Islands in 1993

At 0330 on 16 March, *Danio* ran aground on the rocky coast of Longstone Island **(Figure 1)** at a speed of 8 knots. The chief officer was woken by the impact, and on realising the vessel was aground immediately put both engines to half astern.

1.3.2 Post-grounding

The master and the chief engineer were also woken by the grounding and immediately came to the bridge. The master stopped the engines and then asked the chief officer and the chief engineer to check all the tank soundings. They reported that none appeared to have been breached, and at around 0400 the master called the vessel's owner to inform him of the grounding. The owner instructed him not to use the engines and to fully ballast the vessel in an attempt to hold it aground, minimising the potential for further damage. This was completed over the next two tidal cycles.

Between 0406 and 0530, the vessel swung to starboard and moved approximately 100m on the tide before settling with a heading of 260º **(Figure 2)**. At 0431, the master used the very high frequency radio (VHF) to inform Aberdeen coastguard (CG), who passed on the responsibility for the incident to Humber CG. Humber CG tasked the Royal National Lifeboat Institution (RNLI) all-weather lifeboat (ALB) from Seahouses to attend the vessel. A local fishing vessel, having heard the radio communication between the vessel and the CG, came to the scene and offered assistance, but the master declined the offer.

At 0516 Seahouses ALB arrived on scene. The height of tide at the time was approximately 1m higher than at the time of grounding. The ALB attempted to tow the vessel clear, but was unsuccessful. In accordance with a request from Humber CG, the ALB remained on scene until 2000 that evening, when it was relieved by the Berwick ALB. Seahouses ALB returned at 0530 on 17 March to maintain watch until noon that day. The weather then deteriorated, with gale force winds prevailing until 27 March. The Secretary of State's Representative for Maritime Salvage and Intervention (SOSREP) decided that no salvage would be attempted until the weather conditions improved.

1.3.3 Damage

An external inspection of the vessel by the crew of the Seahouses ALB following the first low tide after the accident, found that the void space forward of the collision bulkhead and the forward ballast tank had been breached. Both rudders and propellers were undamaged at this time.

The next day, when the crew of *Danio* carried out an external inspection of the vessel, they noticed that the starboard propeller and rudder were damaged **(Figure 3)** along with several corresponding frames and internal bulkheads.

Reproduced from Admiralty Chart BA 1407-0 by permission of the Controller of HMSO and the UK Hydrographic Office.

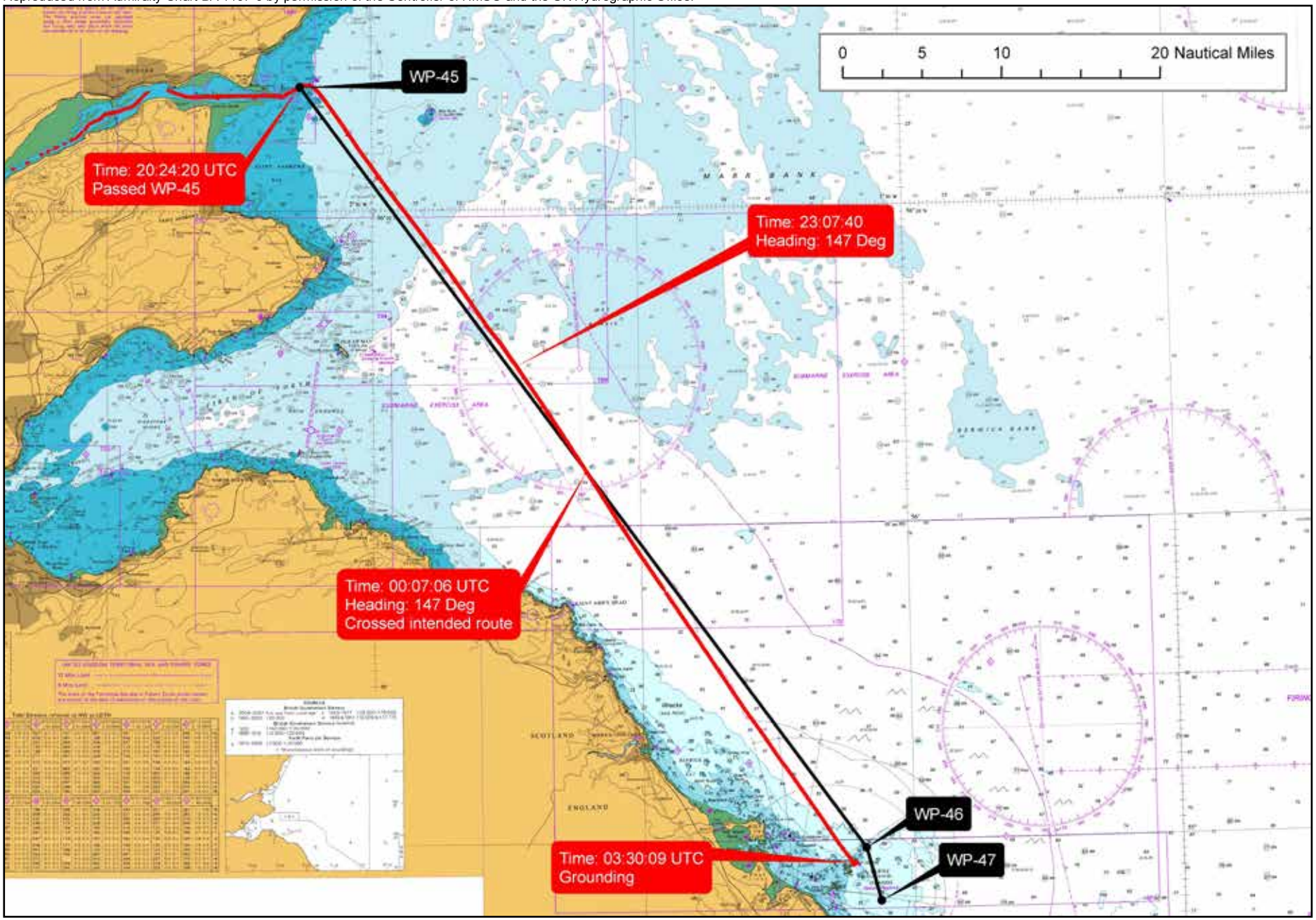
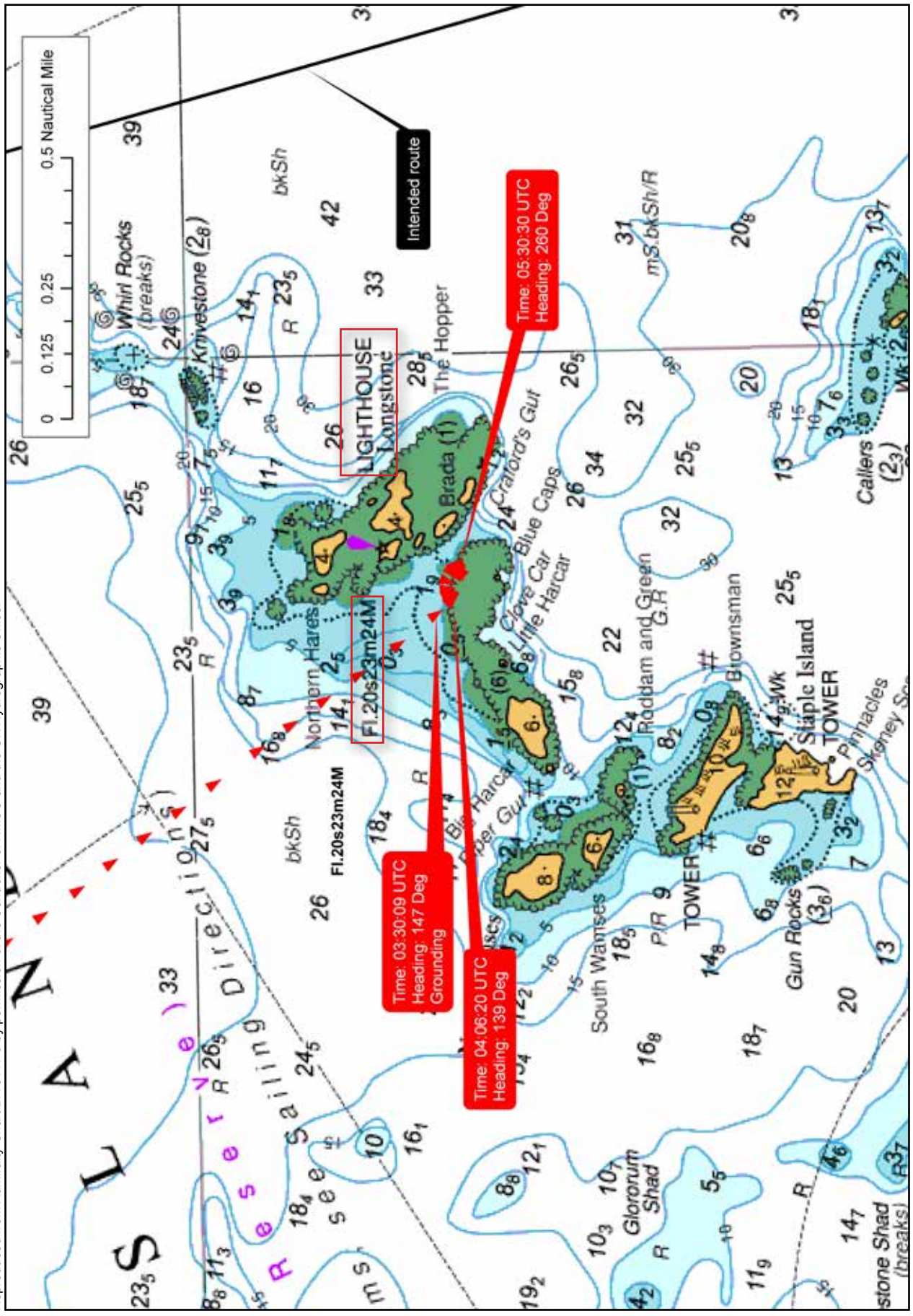


Figure 1: AIS track with ECS waypoints up to the point of grounding



Reproduced from Admiralty Chart BA 0111-0 by permission of the Controller of HMSO and the UK Hydrographic Office.

Figure 2: Grounded at Longstone, Farne Islands

Figure 3: Damage to starboard propeller and rudder (inset: internal damage)

1.3.4 Salvage, detention and repair

The SOSREP authorised salvage on 28 March, which coincided with a spring tide. At 0300 the vessel was de-ballasted and towed by a tug to Blyth, where it was detained for major deficiencies in the Safety Management System (SMS) and non-compliance with the *Safe manning, hours of work and watchkeeping regulations, 1997*. The inspection report listed 15 deficiencies, several of which pertained to damage caused by the accident. However, six specifically related to safe navigation of the vessel:

- *Manning specified by the minimum safe manning: Only one III/4* [sic] *navigation watch rating on board (ISM)*
- *Magnetic compass: Not readable from conning position*
- *Passage plan: not enough information, no tidal stream info (ISM)*
- *Navigation records: Log book positions, chart positions and electronic records do not tally (ISM)*

- *Monitoring of passage plan: Only two hour check between chart plots on paper charts. No visual radar or echo sounder used to verify GPS positions (ISM)*

- *Bridge operation: Single handed watch. Night time & coastal. No use of BNWAS (ISM)*

On 23 April, *Danio* was dry docked at a shipyard in Poland, where approximately 40 tonnes of steelwork were renewed. Both rudders and propellers were also replaced, along with one main engine gearbox. The vessel remained in dry dock until the end of August 2013.

1.4 COMPANY AND CREW

1.4.1 Company

Reederei Frank Dahl, based in Cuxhaven, Germany, was a family owned company with a fleet of eight cargo vessels. An in-house management company carried out the technical and commercial management of these vessels. Reederei Frank Dahl also held interests in two further vessels, mostly involved in carrying heavy and large volume cargoes for the offshore wind energy sector.

1.4.2 **C**rew

The crew on board *Danio* comprised the master, chief officer, chief engineer, cook and two able bodied seamen (AB). The chief officer was Russian and one of the ABs was Filipino; the rest of the crew were Polish.

It was the company's normal policy to ensure that either the master or the chief officer of every vessel was a long-serving employee. However, due to *Danio*'s usual crew not being available, both the master and the chief officer were on their first contract with the company.

The 59 year old master held an International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW) II/2 Unlimited Master's Certificate issued by the Polish maritime administration, and had worked as master on board ships similar to *Danio* since 2002. He joined *Danio* on a 3-month contract in December 2012.

The chief officer was 44 years old. He held a restricted STCW II/2 Master's Certificate, issued by the Russian maritime administration, allowing him to work as master on board vessels up to 3000gt. He had served in the rank of chief officer for 12 years and joined *Danio* in December 2012 on a 4-month contract. In addition to his watchkeeping duties, he was the vessel's safety and security officer and carried out cargo work in port.

Neither of the bridge watchkeeping officers had received any formal training in the use of ECSs or electronic chart display and information systems (ECDIS). However, since the primary means of navigation on board was paper charts, no such training was required.

Of the three ratings on board *Danio*, the two ABs held STCW II/4 Certificates of Competency, enabling them to act as navigational watch lookouts. The master was not aware that one of the ABs held this qualification until after the accident.

1.5 REQUIREMENTS FOR SAFE MANNING

Article 11 of International Labour Organization (ILO) Convention 180 stated:

> *When determining, approving or revising manning levels, the competent authority shall take into account:*
>
> *(a) the need to avoid or minimize, as far as practicable, excessive hours of work, to ensure sufficient rest and to limit fatigue; …*

The vessel's minimum safe manning certificate (MSMC), issued by the Antigua and Barbuda administration on 17 June 2011, required a total of six crew, or five if either the master or chief officer held a valid engineer's licence. There was no requirement for a third deck officer.

The minimum safe manning requirements of the Antigua and Barbuda administration were identical to those of the UK for near costal trading, as stated at Annex C of MSN 1767 (M) **(Annex A)**. However, the UK administration would have required the same vessel to be manned with an additional watchkeeping officer when engaged in unlimited trading.

1.6 HOURS OF WORK AND REST

1.6.1 Requirements

Both the UK and Antigua and Barbuda had adopted the requirements of the ILO Convention 180 with regard to hours of work and rest for all seafarers. Article 5 of this convention stated:

> *1. The limits on hours of work and rest shall be as follows:*
>
> *(a) maximum hours of work shall not exceed:*
>
> *(i) 14 hours in any 24 hour period; and*
>
> *(ii) 72 hours in any seven-day period;*
>
> *or*
>
> *(b) minimum hours of rest shall not be less than:*
>
> *(i) 10 hours in any 24-hour period; and*
>
> *(ii) 77 hours in any seven-day period.*
>
> *2. Hours of rest may be divided into no more than two periods, one of which shall be at least six hours in length, and the interval between consecutive periods of rest shall not exceed 14 hours.*

1.6.2 Records

The practice on board Danio was to retrospectively enter the hours of work and rest onto a spreadsheet **(Figure 4)** which had built-in macros to calculate if the ILO requirements had been complied with. If the hours entered were in excess of the allowed limits, the spreadsheet cell would change colour to red, indicating an alarm. The crew would then adjust the recorded hours to clear the alarm, before transferring the information to another report that was then signed, dispatched to the office and filed on board.

The recorded hours of work and rest for the chief officer on 14 March indicated that he had worked two 6-hour watches and a 2-hour period in port from 1900-2100. His actual working hours on the day were two 6-hour watches and a 5-hour period in port, totalling 17 hours. The records for the cook and AB, the two nominated lookouts, revealed that neither of them had carried out these duties. The master's records indicated that during the vessel's stay at Perth, he continued sea watches. In fact, he carried out day work during this period **(Annex B)**.

In April 2009, a port state inspection of *Danio,* carried out at Blythe, recorded a deficiency based on the falsification of hours of work and rest records.

1.6.3 Project Horizon

From 2009 to 2012, the MAIB participated in the European Union funded Project Horizon **(Annex C)**. The aim of this project was to carry out an empirical study into seafarer fatigue with a special focus on comparing the impact of the two most common watchkeeping systems: 4 hours on / 8 hours off, and 6 hours on / 6 hours off. The conclusions of this study were:

- Highest levels of sleepiness in watchkeepers were recorded during the first watch of the day, peaking towards the end of the watch.

- Longer watches result in increased sleepiness.

- Disturbances during rest periods increases sleepiness.

    - Higher levels of sleepiness were observed in those keeping the 6 hours on / 6 hours off watches.

    - There was an average delay of 50 minutes before a watchkeeper fell asleep after finishing a night watch.

1.7 BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM

1.7.1 Regulations

A BNWAS was required to be fitted on all new and existing ships in accordance with the amendments made to SOLAS Chapter V Regulation 9 through the IMO's Maritime Safety Committee (MSC) resolution 282(86), adopted on 5 June 2009. The deadline for fitting such a system was 1 July 2013 for vessels under 3000gt or not later than the first annual survey thereafter.

MV Danio - V20F8

Workingtime Sheet

last \ first name: [redacted] **Rank:** Chief Mate

birth: **19/ April 1968** **Month:** **March 13**

Workingtime

Dat	Day		ART	00 - 06	ART	06 - 12	ART	12 - 18	ART	18 - 24	G	R	Ü	t WH	RH	10h24D/ h	6hi P	RBW
1	Fri	WS	W	0 - 6		8 - 10		12 - 18		-	14	12	14	14	10	OK	OKAY	OKAY
2	Sat	SA		0 - 6		-		12 - 18		18 - 20	14	0	14	14	10	OK	OKAY	OKAY
3	###	WS		0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
4	###	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
5	Tue	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
6	###	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
7	Thu	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
8	Fri	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
9	Sat	SA	W	0 - 6		-		-		-	6	0	6	6	18	OK	OKAY	OKAY
10	###	SO		-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
11	###	H		-		6 - 12		13 - 18		-	11	8	3	11	13	OK	OKAY	OKAY
12	Tue	H		-		6 - 12		13 - 18		-	11	8	3	11	13	OK	OKAY	OKAY
13	###	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
14	Thu	WS	W	0 - 6		-	W	12 - 18		18 - 23	17	12	5	17	7	ALARM	OKAY	OKAY
15	Fri	H		-		6 - 12		13 - 18		-	11	8	3	11	13	OK	OKAY	OKAY
16	Sat	SA	W	0 - 6		-	W	12 - 18		-	12	0	12	12	12	OK	OKAY	OKAY
17	###	SO	W	0 - 6		-	W	12 - 18		-	12	0	12	12	12	OK	OKAY	OKAY
18	###	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
19	Tue	WS	W	0 - 6		-	W	12 - 18		-	12	12	0	12	12	OK	OKAY	OKAY
20	###			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
21	Thu			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
22	Fri			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
23	Sat			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
24	###			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
25	###			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
26	Tue			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
27	###			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
28	Thu			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
29	Fri			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
30	Sat			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
31	###			-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
										TOTAL hours :	216	156	72					
											G	R	Ü					

G total hours
R periodical
Ü overtime

tWH = total Workhours
RH =Resthours
10h24D/h = 10h in 24 day/hours
6hiP = 6 hours in Piece
RBW = Rest before Watch

postion \ date : _____

_____ Master / 1.Off.

_____ Crewmember

Figure 4: Hours of work and rest spreadsheet

At the time of the accident, *Danio* was not required to be fitted with a BNWAS. However, the system had been fitted, and therefore was subject to the guidance in MGN 79 (M+F)[2] which states that such equipment must be maintained *in the same proper condition as statutory equipment*.

The performance standards set out in MSC.128 (75) and the associated technical and test standards in IEC 62616:2010(E) required that the BNWAS should have three modes of operation: 'manual ON' (in operation constantly), 'manual OFF' (does not operate under any circumstances) and 'automatic' (activation based on input from the vessel's heading or track control system). The IEC standard required that access to the controls for selecting the operational mode, and the duration of the dormant period, be restricted to the master only and protected from unauthorised access by a *password or a key-lock*.

1.7.2 Watch alarm on board

Danio had been fitted with a watch alarm from build. In July 2012, the owners replaced the original watch alarm with a Unielec BW-800 unit that was compliant with the BNWAS performance standards. This system had a key to secure the controls and prevent changes to the settings; however it was standard practice on board for the key to be left in the panel **(Figure 5)**.

The master and chief officer were not familiar with the unit and neither recalled the BNWAS ever being used. There were no written policy statements about the BNWAS from the owners of the vessel, and its use was not mandated by the vessel's SMS.

Figure 5: Watch alarm on the bridge

[2] MGN 79 (M+F) Safety Equipment and Pollution Prevention Equipment Carried in Excess of Statutory Requirements.

1.8 LOOKOUT

1.8.1 International requirements

Section A-VIII/2.14 of STCW addresses the requirements for a navigational watch, including the keeping of a lookout. It states:

> *A proper lookout shall be maintained at all times in compliance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended, …*

The International Regulations for the Prevention of Collisions At Sea, 1972 (as amended) (COLREGS) state that:

> *every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.*

STCW Section A – VIII/2.17 allows the master to exercise his discretion not to have a lookout during the hours of daylight, after carrying out a careful assessment and taking full account of all relevant factors, including, but not limited to:

- the state of the weather and visibility
- traffic density and proximity of other navigational hazards
- operation in traffic separation schemes, and

However, during the hours of darkness no such allowances are permitted.

1.8.2 Flag and coastal state requirements

In circular letter no. 01-002-98 the Antigua and Barbuda administration stated that:

> *Any vessel in UK territorial waters with the officer of the navigation watch acting as sole look-out during periods of darkness will be deemed to be in contravention of Regulation 11 of the Merchant Shipping (Safe Manning, Hours of Working and Watchkeeping) Regulations 1997.*

Additionally, its ‘Fitness for Duty and Watchkeeping Directive 2012’ (Directive 004-12) required:

> *Every Antigua and Barbuda ship which is a commercial ship shall ensure that there is at all times during the hours of darkness, a lookout positioned on the bridge to assist the officer of the watch …*

The Merchant Shipping (Safe Manning, Hours of Working and Watchkeeping) Regulations 1997, required all commercial vessels to comply with the relevant sections of STCW within UK waters.

1.8.3 Company requirement

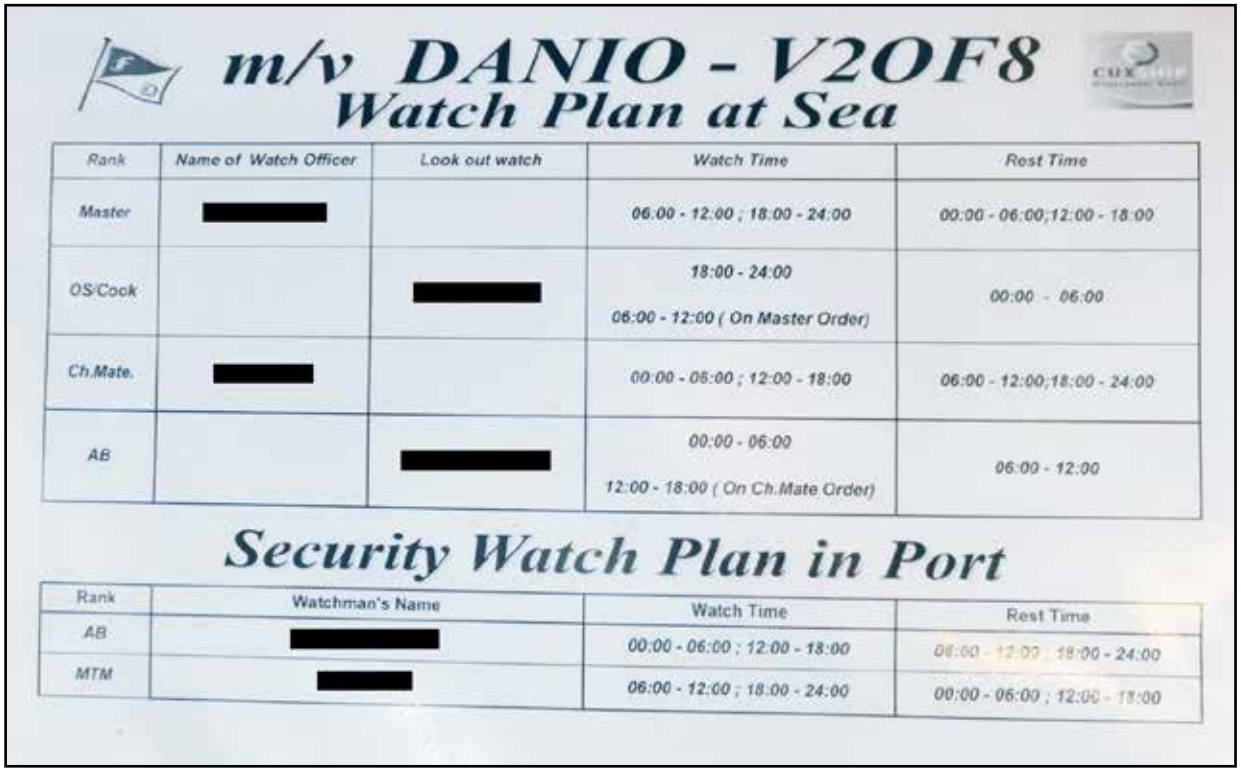
There were no explicit instructions on board *Danio* regarding the use of lookouts. However, the onboard risk assessment, required by the SMS to be updated annually, included the use of a lookout as one of the control measures against grounding or collision. The SMS made no reference to the need to comply with international, coastal state or flag state requirements for the use of a lookout during navigation.

1.8.4 Onboard practice

A notice displayed on *Danio*'s bridge **(Figure 6)**, indicated the names of watchkeepers and lookouts allocated to each watch. The master and chief officer were designated their respective 6 hours on / 6 hours off watches, while one AB and the cook were the named lookouts for the 1800-2400 and 0000-0600 watches. The use of lookouts during the hours of daylight was left to the discretion of the watchkeeping officers.

Both of the ABs on board held the required certification to act as lookouts (STCW II/4). However, the cook was not qualified to act as lookout.

In practice, a lookout was never used on *Danio.*



m/v DANIO - V2OF8

Watch Plan at Sea

Rank	Name of Watch Officer	Look out watch	Watch Time	Rest Time
Master	[redacted]		06:00 - 12:00 ; 18:00 - 24:00	00:00 - 06:00;12:00 - 18:00
OS/Cook		[redacted]	18:00 - 24:00 06:00 - 12:00 (On Master Order)	00:00 - 06:00
Ch.Mate.	[redacted]		00:00 - 06:00 ; 12:00 - 18:00	06:00 - 12:00;18:00 - 24:00
AB		[redacted]	00:00 - 06:00 12:00 - 18:00 (On Ch.Mate Order)	06:00 - 12:00

Security Watch Plan in Port

Rank	Watchman's Name	Watch Time	Rest Time
AB	[redacted]	00:00 - 06:00 ; 12:00 - 18:00	06:00 - 12:00 ; 18:00 - 24:00
MTM	[redacted]	06:00 - 12:00 ; 18:00 - 24:00	00:00 - 06:00 ; 12:00 - 18:00

Figure 6: Watch plan displayed on the bridge

1.9 NAVIGATION

1.9.1 Electronic Chart Systems

Danio's ECS was a navigation information system that electronically displayed vessel position and relevant nautical chart data and information on a display screen. However, it did not meet all the IMO requirements for ECDIS and was not intended to satisfy the SOLAS Chapter V requirements to carry a navigational chart.

An ECDIS is an ECS that has been tested, approved and certified as compliant with the relevant IMO performance standards and the ECDIS chart carriage requirements in SOLAS Chapter V. Where an ECDIS is to be used as the primary means of navigation, the navigating officers are required to attend a generic ECDIS training course. Navigating officers serving on UK registered vessels are also required to have been trained in the operation of the specific ECDIS equipment fitted to the vessel.

There are no restrictions on using an ECS as an aid to navigation. However, an ECS is not suitable or permitted to be used as the primary means of navigation.

1.9.2 Passage planning and navigation

Paper charts were the primary means of navigation on board *Danio.* Additionally, the vessel was equipped with a Transas NaviFisher ECS. This ECS contained route plans for voyages already completed by the vessel, and a copy of an earlier plan from Perth to Genk was in use on the day of the accident. The chief officer had created the passage plan for the voyage by manually transferring the waypoints from the ECS's earlier route plan to the passage plan document on the ship's computer. This document was signed by the master and filed without further alteration.

The chief officer added an additional leg **(Figure 7)** on the ECS during his watch. This routed the vessel nearer to the coast, after passing the Farne Islands. Neither the intended route on the paper chart nor the passage plan was altered.

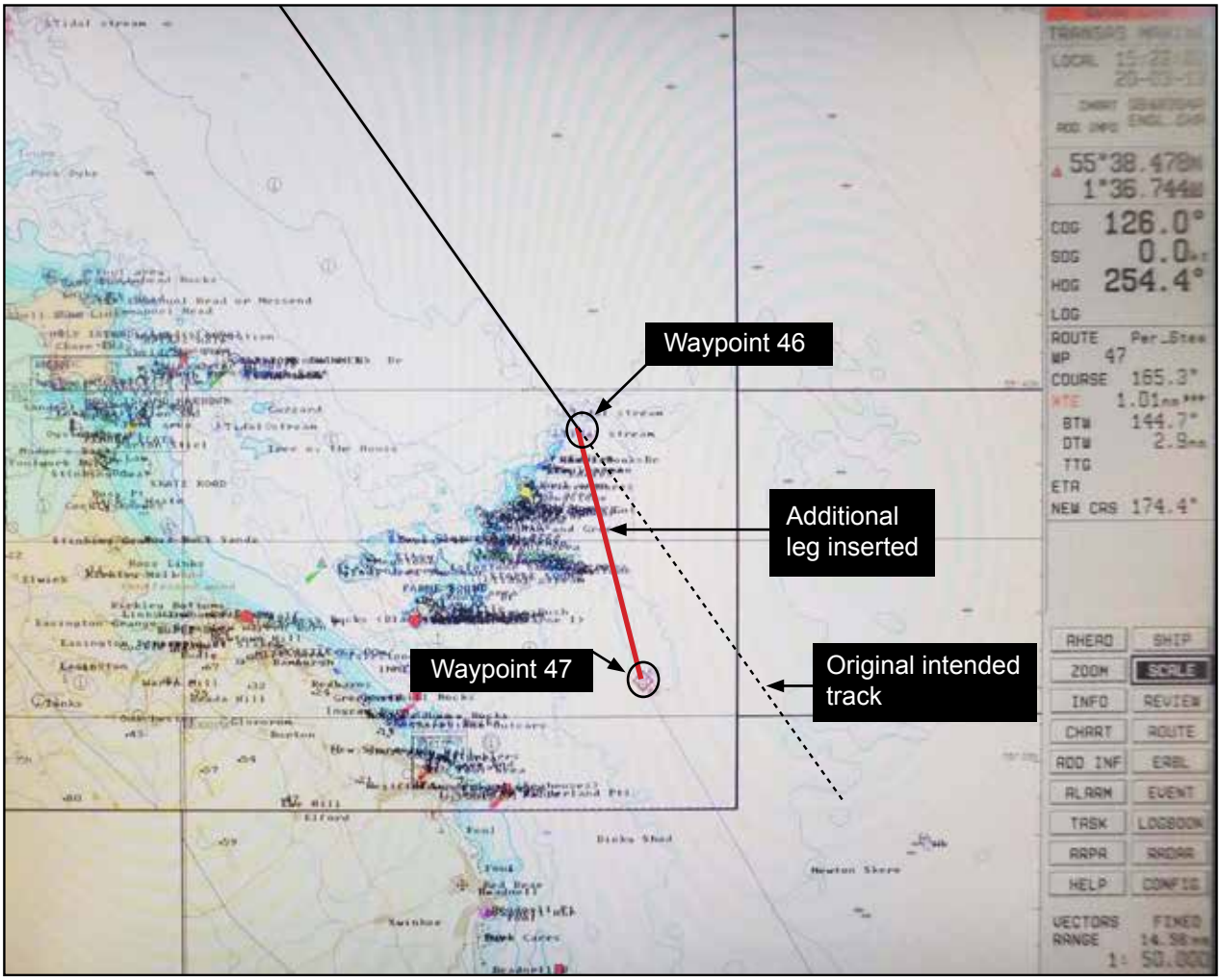


Figure 7: Additional leg inserted in the passage plan on ECS

The ship's positions at 0100 and 0300[3] on 16 March, plotted on the paper chart, were respectively 0.94nm and 2.7nm east of the actual track of the vessel as recorded by the vessel's AIS track **(Figure 8)**. The chief officer admitted to having plotted the 0300 position after the accident. Although the waypoints were marked on the chart as per the passage plan, they did not correspond to the waypoints on the ECS **(Figure 9)**.

The Admiralty sailing directions for North Sea (West) Pilot (NP54) advises mariners that, during poor visibility or at night, *vessels should not attempt to pass east of Longstone in depths of less than 65m which occur about 3 miles E of the islet*. The intended passage plan from Perth to Genk, as found on the ECS of *Danio,* routed the vessel 2 miles east of Longstone. Since the accident, the UK Hydrographic Office (UKHO) has revised this advice to remove the reference to depth.

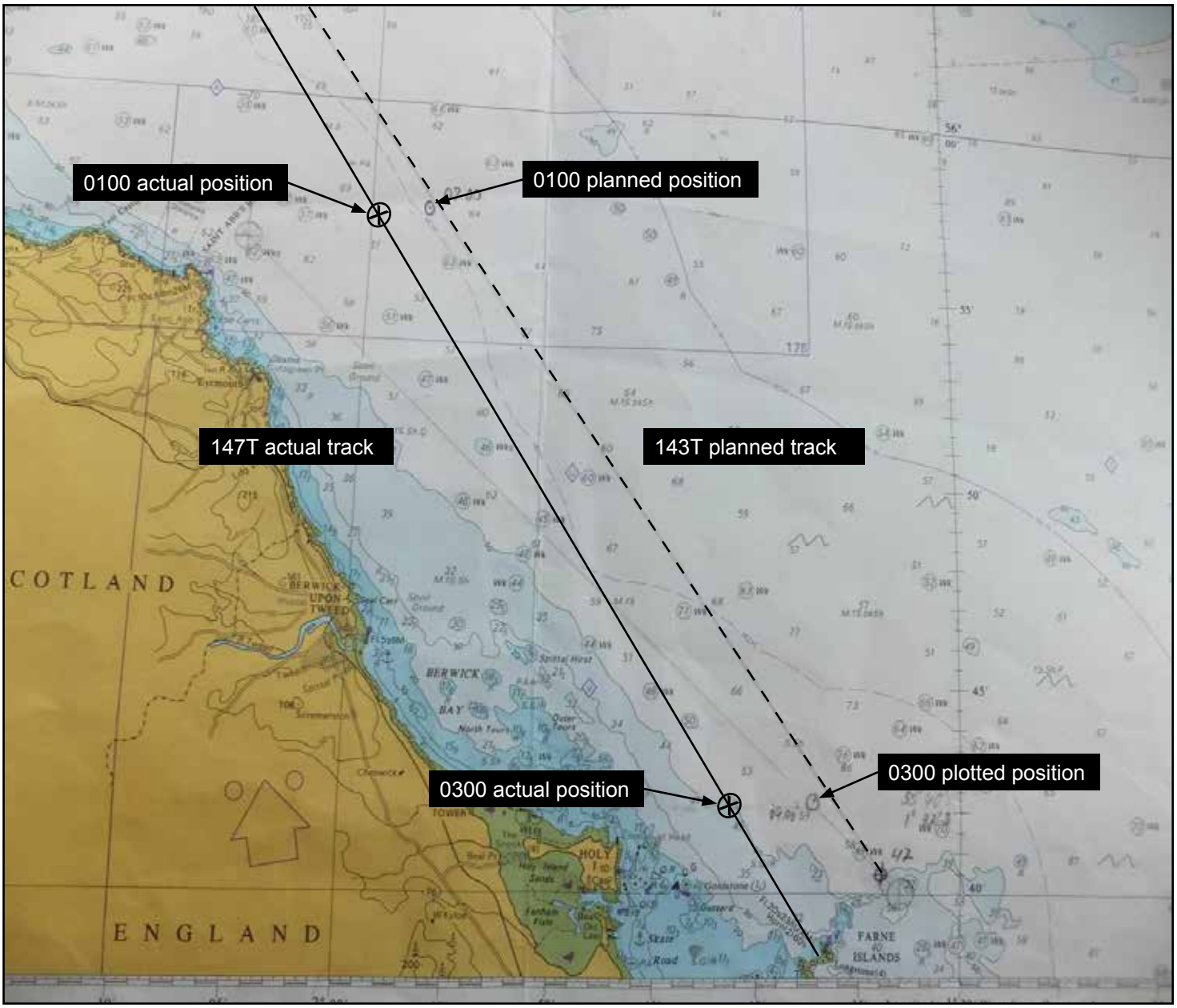


Figure 8: Inconsistent positions

[3] These are UTC times, whereas the times indicated on the chart in pencil at **Figure 8** are ship's time (UTC+1).

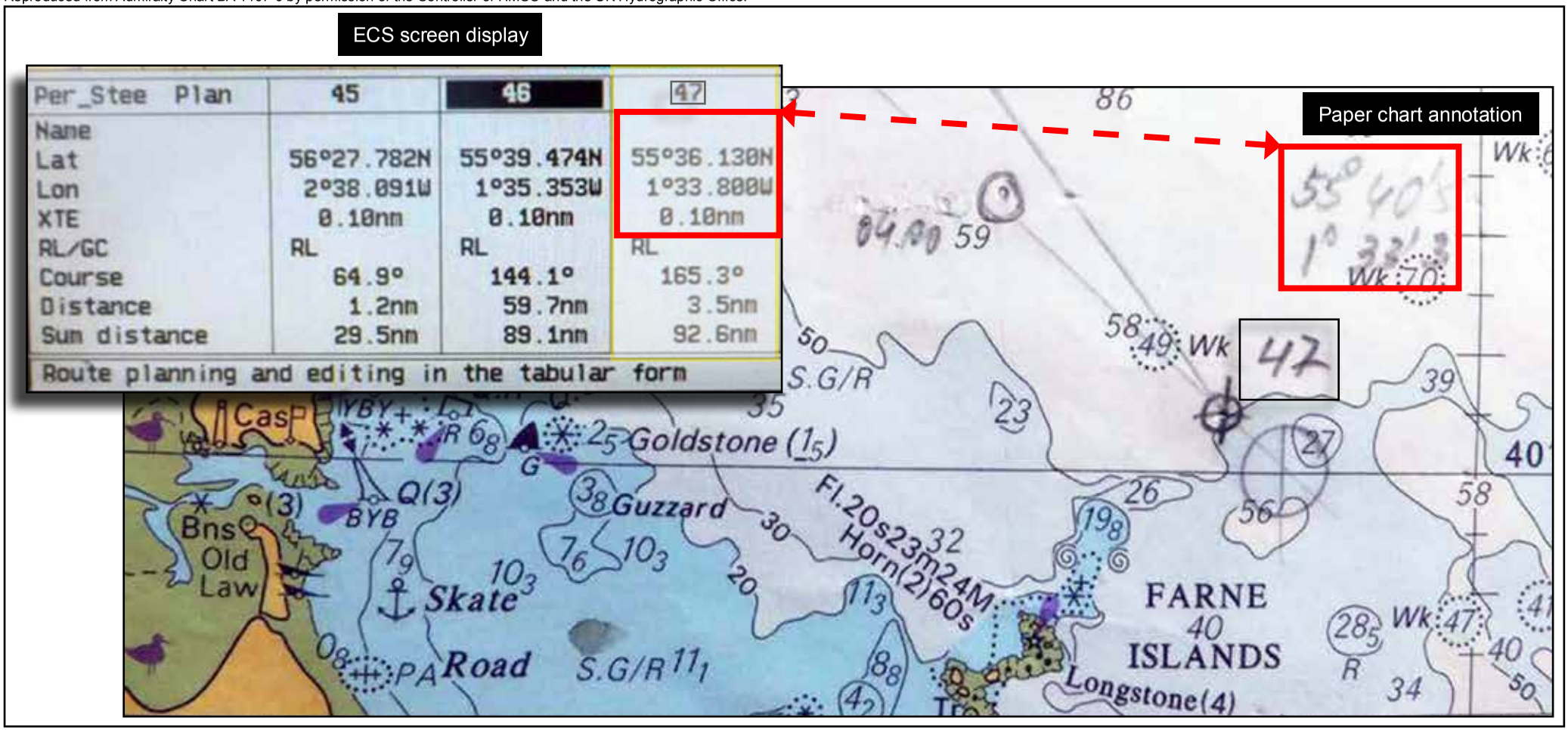


Figure 9: Discrepancies between ECS and chart waypoints (compare waypoint 47 on paperchart and ECS)

1.10 SAFETY MANAGEMENT SYSTEM

1.10.1 Audit

An International Safety Management Code (ISM) renewal audit was carried out by Germanischer Lloyd (GL) on 10 December 2010 and verified again on 27 May 2011. No non-conformities or observations were recorded during these audits.

An internal ISM audit carried out by the ship owner's representative on 21 February 2013 did not find any deficiencies. This audit report stated:

> *The Audit confirmed that the SMS is on all levels implemented. The Master and crewmembers being on board have a sufficient understanding and knowledge about the company SMS.* [sic]

1.10.2 Risk assessment

The risk of grounding or collision during navigation was considered in a risk assessment document that formed part of the SMS. This had been updated in December 2012. The control measures identified included:

b. Read & follow the master's standing & night orders

d. Proper look out is posted and maintained all the times from sunset to sunrise and vice versa

g. Check the proper course is being steered whether in hand or auto pilot

l. Position checked frequently by radars, GPS position, bearings of charted objects, light houses, points of land and position fixing by sun, moon, stars, by SatNav position, sextants, ecdis, etc

k. Ensure that all courses, proper tracks laid down should be monitored and maintained

q. Dead man alarm should be used and activated [sic]

1.10.3 Contingency plan for grounding or stranding

The SMS contained detailed instructions to be followed in the event of grounding or stranding. These included the requirements to transmit a "Pan Pan" message, inform the coastguard, and display lights or flags to indicate the vessel was aground. The master was unaware that the SMS contained these procedures.

The standing orders and night order book on the bridge showed that the last entry had been made in January 2011.

1.11 ADMINISTRATIVE BURDEN

In October 2013, the IMO, through Resolution A. 1043(27), concluded a public consultation with the purpose of identifying administrative requirements which were considered to be burdens.

In July 2013, the Danish Maritime Authority (DMA) published a summary report entitled 'Administrative Burdens in the Maritime Sector'. It defined an administrative burden as:

> *administrative work which in the opinion of the stakeholder is not adding value proportionate to the resources the stakeholder will have put into the work to comply with specific rules and requirements.*

The report proposed that in order to address the issue of administrative burdens without compromising safety and efficiency, the maritime sector should:

- Review and reduce the number of procedures that seafarers are expected to comply with.
- Increase co-operation and dialogue between all stakeholders including seafarers, ship owners, classification societies and customers.
- Develop digital solutions to reduce paperwork and time consuming manual workflows.

At the time of writing, the European Maritime Safety Agency (EMSA) was running a pilot scheme called Blue Belt **(Annex D)**, the purpose of which is to explore ways of reducing the administrative burden on seafarers in European short sea shipping.

1.12 BRIDGE WATCHKEEPING STUDY

The MAIB published the Bridge Watchkeeping Study in 2004 after a series of very similar accidents. The study analysed accidents involving merchant vessels greater than 500gt, underway and without a pilot, which had been the subject of either a Full Investigation or a Preliminary Examination between 1994 and 2003.

Initially, a review of the data identified three principal areas of concern:

- A third of all groundings involved a fatigued officer alone on the bridge at night.
- Two thirds of vessels involved in collisions were not keeping a proper lookout.
- A third of all accidents that occurred at night involved a sole watchkeeper on the bridge.

An analysis of the data for 23 vessels involved in grounding incidents shows a striking resemblance to that of *Danio*:

- Nearly 50% (11 cases) occurred between 0000 and 0600 and, of these, fatigue was considered a contributory factor in nine cases.
- In eight of the nine fatigue related accidents, the vessels:
  - carried only two watchkeeping officers
  - had not posted a lookout

- were being steered by autopilot
- were not fitted with, or were not using a watch alarm
- had an unaccompanied watchkeeper who had fallen asleep.

The study collated the underlying human factors involved in the accidents and considered the commercial and operational pressures placed on the crews of vessels trading in north-west European waters. It concluded that varying voyage lengths and operational demands prevented individuals working 6 hours on / 6 hours off from being able to enjoy uninterrupted periods of rest, due to continual disruptions to sleep patterns and their circadian rhythms. This, in turn, led to an accumulation of fatigue the longer the individuals were subjected to this regime.

One of the three recommendations of this study was for the MCA to take the conclusions forward to the International Maritime Organization (IMO) with the aim of reviewing:

Recommendation 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.*

1.12.1 Actions by the MCA

The MCA, in response to the MAIB recommendation, proposed to the EU and IMO that a requirement be introduced which would make it mandatory, for vessels trading in near-coastal waters, to carry two watchkeeping officers on board in addition to the master. To date, this proposal has not received sufficient international support for such a change to have been progressed.

The MCA is the leader of a Paris MoU[4] task force engaged to run a concentrated inspection campaign from September 2014 to November 2014. The specific objective of this campaign is to verify that the hours of work and rest records are being maintained accurately and that bridge lookout watches are kept and recorded.

1.13 ACCIDENTS SINCE THE BRIDGE WATCHKEEPING STUDY

Between publication of the Bridge Watchkeeping Study in 2004, and June 2013, using the same selection criteria, the MAIB has investigated 12 further grounding accidents on merchant vessels greater than 500gt, in which fatigue was considered to be the main cause for the bridge watchkeeper to have fallen asleep. In 9 of these 12 groundings, the watchkeeper who fell asleep had been working a 6 hours on / 6 hours off watch.

[4] MoU – memorandum of understanding

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 GROUNDING

Danio ran aground because the chief officer, who was the lone watchkeeper on the bridge, had fallen asleep. It has not been possible to establish precisely when he fell asleep. However, the Farne Islands lighthouse had a visibility range of 24nm, the visibility was good, and the light would have been visible to an alert watchkeeper for almost 3 hours before the grounding. The chief officer saw the lighthouse only after the vessel had grounded. There was no evidence that he had made any course alteration at all during his watch **(Figure 10)**. Furthermore, although the course alteration made by the master brought the vessel back on to the planned track by 0007, the chief officer did not correct the vessel's heading at that time to maintain the intended track as planned on the ECS.

Therefore, it is probable that he had fallen asleep within the first hour of his watch and woke only when the vessel grounded at 0330.

2.3 FATIGUE

2.3.1 Watchkeeping routine

It is very likely that the chief officer was suffering from the cumulative effects of fatigue due to the combination of the 6 hours on / 6 hours off watch routine and the frequent disruptions to this routine when he was required to monitor the cargo work in port.

He had slept for nearly 4 hours before his watch and 5 hours on the previous night. However, on 14 March, the day *Danio* called in at Perth, he worked 17 hours in a 24-hour period. This pattern of disruption to his daily work and rest routine would have been repeated, on average, every fourth day for the 6 weeks prior to the accident and possibly for the 3 months that he had been on board. Therefore, his circadian rhythm would have been disrupted and this would have adversely affected the quality of his sleep.

The empirical observation of Project Horizon, that following a watch there is an average time delay of 50 minutes before a night watchkeeper falls asleep, is also very significant. Furthermore, the time required to eat and attend to personal hygiene further erodes the time available for rest. It is doubtful if the ILO convention's requirement to achieve 6 contiguous hours of rest in 24 hours, can ever be achieved in this watch pattern.

This accident, along with the 12 other fatigue related groundings investigated by the MAIB since 2004, further validates the finding of the 2004 MAIB Bridge Watchkeeping Study, that the 6 hours on / 6 hours off watch pattern leads directly to cumulative fatigue. When examined in conjunction with Project Horizon's conclusion

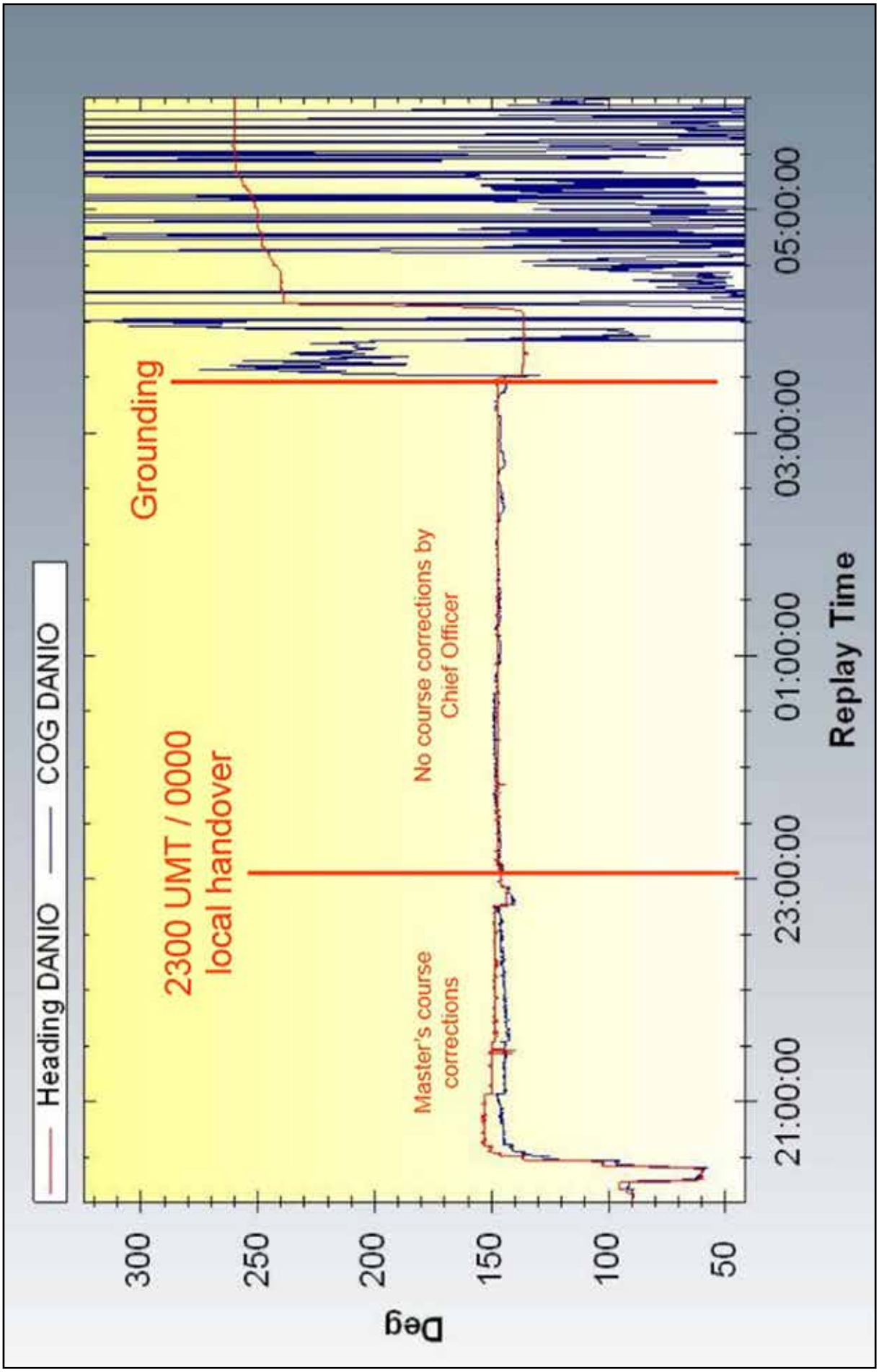


Figure 10: Comparison of heading and course over ground

that those keeping the 6 hours on / 6 hours off watch were predisposed to higher sleepiness levels, the continued use of the 6 hours on / 6 hours off watch pattern can no longer be considered safe.

2.3.2 Safe manning requirement

In the past, the coastal trade was slower paced and vessels had much longer port stays, primarily due to slower cargo-handling facilities. It is possible that the UK administration's stance of permitting the use of just two watchkeepers on vessels involved in coastal trade, but not on vessels engaged in unlimited trading, may be based on this. It would have been reasonable to expect two watchkeeping officers to manage navigation and port duties without being overly fatigued when time in port was much longer and ships' staff involvement in cargo work was limited. However, coastal trading is now significantly more arduous and, when combined with the increased demands for ships' crews to participate in audits, cargo work, inspections, surveys and increasing volumes of paperwork, make it difficult to ensure that sufficient rest can be taken.

While establishing a vessel's safe manning requirement, a realistic assessment should be made of the workload placed on watchkeeping officers, taking into account the individual's additional non-watchkeeping duties, particularly for those operating on coastal trades. In this context, the efforts of the IMO, DMA and EMSA to reduce the administrative burden on seafarers are laudable. This accident and several others in the past clearly demonstrate that until significant changes can be achieved to the workloads placed on watchkeeping officers, it can no longer be considered safe to permit such vessels to operate with only two bridge watchkeepers. Therefore, there is an urgent need to re-evaluate the minimum safe manning permitted on vessels operating on short sea trades.

2.3.3 Barriers against the effects of fatigue

A number of systems were available on board to mitigate the effects of fatigue in watchkeepers.

Hours of work and rest records

Hours of work and rest records, if used appropriately, can enable ships' crews to identify when it is necessary for the vessel to be held in port, or at anchor, to enable watchkeepers to get adequate rest. However, the crew of *Danio* falsified their hours of work and rest records because their actual hours exceeded the permitted maximum. The chief officer's record for 14 March, which indicated that he worked only 14 hours when he had actually worked 17 hours, was a clear example of this falsification. It is unfortunate that although the falsification of the hours of work and rest records was identified during the port state inspection in 2009, the owners of the vessel did very little to address the problem of crews working excessive hours. This inaction could have led to a perception of acceptance of this behaviour by ships' staff, and the owners need to take action to ensure that ships' staff understand the need for adhering to the requirements, and keep accurate records.

The proposed concentrated inspection campaign by the MCA, focusing on hours of work and rest, is to be commended as it should highlight the difficulty crews have in complying with the hours of work and rest regulations on vessels with similar manning. Until this is recognised within the shipping industry, such accidents are likely to be repeated.

Watch alarm

Danio was delivered in 2001 with a functioning watch alarm, which was upgraded to a BNWAS compliant system in July 2012. The owners were fully aware of the benefits of a navigational watch alarm, however they did not mandate its use through a written policy but relied on their senior officers to ensure that it was used as intended. Unfortunately, as both the senior deck officers were new to the company, they were unaware of the owner's wishes and preferred to keep the BNWAS switched off despite keeping lone watches.

Had the BNWAS been left in the 'automatic' mode, it would have switched itself on as soon as the autopilot was engaged. Moreover, had the key from the control panel been removed, it would have made it very difficult for anyone to bypass the system. When the chief officer fell asleep, the BNWAS would have sounded an alarm after the pre-set dormant period and would have probably woken him up. If not, the repeater alarm in the master's cabin would have woken up the master, enabling him to take preventative action. Unfortunately, neither the master nor the chief officer had fully appreciated the functionality of the system or the protection to their safety that it could provide.

Lookout

There was a prominent notice displayed in *Danio's* bridge, which implied that a lookout was being maintained during the hours of darkness and, if required, during daylight hours. However, in reality, no lookouts were ever used. This was in direct contravention of international, flag and coastal State requirements. A cursory examination of the hours of work and rest records would have immediately revealed that lookouts were not being maintained on the vessel. It is disappointing that the internal audit carried out by the ship owners in February 2013 did not identify this discrepancy. However, it is almost certain that the owners of *Danio* were aware that lookouts were not being maintained on board.

In common with the large number of previous grounding accidents where the absence of a lookout was a contributory factor, this accident might have been prevented had there been a lookout on the bridge as required.

2.4 SAFETY MANAGEMENT

2.4.1 Audit

Following the accident, *Danio* was detained for a number of major deficiencies in the vessel's SMS identified during the PSC inspection at Blyth on 28 March. However, the internal ISM audit carried out less than a month before the accident, had found the SMS to be completely satisfactory. There were several examples of safety management shortcomings on *Danio* that should have been identified during an internal audit. These include:

- Deliberately switching off a fully functional and compliant BNWAS.
- Displaying notices which gave the appearance that lookouts were being maintained, when this was not the case.
- Relying completely on the ECS for navigation although paper charts were the primary means of navigation.
- Falsifying hours of work and rest despite this being identified during a PSC inspection in 2009.
- Ignoring the written risk mitigation measures pertaining to grounding, which was updated as recently as December 2012.

It is disappointing that none of the above deficiencies were identified during the company's internal audit in February 2013. The crew of *Danio*, possibly like many other crews of similar vessels involved in near coastal trade, felt compelled to operate their vessel with only a pretence of compliance. Inadequate adherence to the company's SMS, coupled with failures in the auditing process indicates that *Danio*'s owners should take urgent steps to improve the company's safety culture.

2.4.2 Risk assessments

The written risk assessments updated less than 3 months before the accident clearly identified the risk of running aground. The control measures included the posting of a navigational lookout, frequent position checks by a variety of different means, proper implementation and monitoring of agreed tracks and the use of a watch alarm. However all these control measures were ignored, which again point to the absence of a robust safety culture on board *Danio*.

2.5 NAVIGATION

Danio's navigating officers were over reliant on the ECS for both passage planning and watchkeeping. The vessel's primary means of navigation was paper charts, which were the only safe option available on board for passage planning and monitoring. The master's approval of a passage plan based on the ECS and without reference to the appropriate paper charts demonstrates a culture of poor navigation practice. This was further evidenced by the chief officer's subsequent deviation when he inserted extra waypoints in to the ECS passage plan, a change that was not notified to the master for approval.

The only two positions marked on the paper chart in use at the time of the grounding were 2 hours apart, and were considerable distances away from the vessel's actual positions recorded by the AIS. It is almost certain that the 0100 position, like the 0300 position, was marked on the chart after the accident.

There was no evidence recorded on the chart that the vessel's position had been verified using radar or visual bearings. The master's night order book was not completed, leaving the chief officer with no instructions on how to track the vessel's progress. In fact, the fundamental tenets of safe navigation were disregarded and watchkeeping was reduced to the un-stimulating activity of watching the vessel's progress on the ECS. In this context it is not surprising that, combined with the effects of fatigue and sleep debt, the chief officer fell asleep.

2.6 POST-GROUNDING ACTIONS

When the vessel grounded, the master's immediate action was to proceed to the bridge, stop the engine and subsequently ask his crew to check the watertight integrity of the vessel. These actions were correct and expected of a competent master. However, he did not inform the coastguard that *Danio* had grounded until an hour after the accident. Neither did he display any signals to alert other traffic that the vessel was aground. These lapses were contrary to the instructions in the vessel's SMS pertaining to grounding accidents, of which he was unaware. Furthermore, his failure to inform the Coastal State immediately after the grounding was contrary to international maritime rules[5].

It is extremely fortunate *Danio*'s hull was not breached in way of the fuel tanks so there was no water pollution. The consequences of pollution in an area as ecologically sensitive as the Farne Islands would have been devastating and long lasting. Moreover, it would have also impacted heavily on the local economy, which relies on the tourism industry. Experienced shore emergency response teams are normally far better equipped than ships' crews to react to the potential consequences of grounding, including the assessment and mitigation of any structural damage and environmental pollution. However, they need to be informed of an accident before they are in a position to take action.

In the interest of the safety of their crew and the environment, it is imperative that masters follow appropriate post-accident procedures.

[5] IMO MARPOL Protocol I

SECTION 3 - CONCLUSIONS

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

1. *Danio* ran aground because the chief officer, who was the lone watchkeeper on the bridge, had fallen asleep. It is probable that he had fallen asleep during the first hour of his watch and woke only when the vessel grounded. [2.2]

2. It is very likely that the chief officer was suffering from the cumulative effects of fatigue due to the combination of the 6 hours on / 6 hours off watch routine and frequent disruption to this routine when the vessel was in port. [2.3.1]

3. This accident, and several others in the past, clearly demonstrates that until significant changes to the workloads placed on watchkeeping officers can be achieved, it can no longer be considered safe to permit such vessels to operate with only two bridge watchkeepers. [2.3.2]

4. Hours of work and rest records on *Danio* were regularly falsified. Despite this being identified during a port state control inspection in 2009, the vessel's owners did very little to address the problem of crews working excessive hours. [2.3.3]

5. Although *Danio* had a fully functional and compliant BNWAS, it was kept switched off even though the master and chief officer kept lone watches on the bridge. Neither of them fully appreciated the functionality of the system or the protection to their safety that it could provide. [2.3.3]

6. *Danio*'s bridge had a prominent notice that implied that a lookout was being maintained during the hours of darkness and, if required, during daylight hours. However, in reality, no lookouts were ever maintained. [2.3.3]

7. Following the accident, several shortcomings in *Danio*'s safety management system were identified during a Port State Control inspection. However, none of these had been identified during the company's internal audit in February 2013. [2.4.1]

8. Although the written risk assessments on board *Danio* identified several control measures to prevent grounding, they were all disregarded in practice. [2.4.2]

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

1. Although the primary means of navigation was paper charts, the navigating officers of *Danio* relied entirely on the ECS for planning and monitoring the vessel's passage. Many of the fundamental tenets of safe navigation were disregarded and watchkeeping was reduced to the un-stimulating activity of watching the vessel's progress on the ECS. [2.5]

2. *Danio*'s master did not inform the coastguard until an hour after the vessel had grounded, and did not display any signals to alert other traffic that the vessel was aground. These lapses were contrary to international maritime rules and the instructions in the vessel's SMS. [2.6]

SECTION 4 - ACTION TAKEN

4.1 ACTIONS TAKEN BY OTHER ORGANISATIONS

The **UK Hydrographic Office** has:

- Corrected the 'Admiralty sailing directions for North Sea (West) Pilot (NP54)' amending the advice to vessels passing east of Longstone.

Reederei Frank Dahl e.K. has:

- Implemented a policy which requires all senior officers who are new to the company to visit the company's office in Germany before joining a vessel.
- Carried out an additional ISM audit on board *Danio* after completion of repair work in dry dock.
- Sent a circular letter/standing order to masters of all the vessels in its fleet informing them of the company's requirements to have a lookout during hours of darkness and to use the BNWAS.
- Labelled the ECS units on all vessels to indicate that they are aids to navigation and should not be used as the primary means of navigation.

SECTION 5 - RECOMMENDATIONS

The **Maritime and Coastguard Agency** is recommended to:

2014/110 Working closely with the European Commission and EU member states, make a proposal to the International Maritime Organization that all vessels engaged in short sea trades be required to carry a minimum of two watchkeepers in addition to the master.

Reederei Frank Dahl e.K. is recommended to:

2014/111 Review and amend its internal auditing regime to ensure its auditors verify that documented procedures are being followed by its crew. In doing so, particular emphasis should be given to:

- compliance with hours of work and rest regulations
- adherence to the fundamental principles of safe navigation
- an understanding of the requirements for notifying coastal states
- the appropriate use of lookouts and watch alarms at sea.

Annex A

UK guidance on manning levels – deck officers (Annex C of MSN 1767 (M))

ANNEX C

GUIDANCE ON APPROPRIATE MANNING LEVELS - DECK OFFICERS

Trading Area	Size of Ship (gt)	Number of Officers to be carried - STCW 95 Regulation			
		Reg II/2-Master	Reg II/2-Ch.Mate	Reg II/1-OOW	Reg II/3-OOW
Unlimited	3000 or more	1	1	2	–
Unlimited	500 or more but less than 3000	1	1	1	–
Unlimited	less than 500	1	–	2(a)	–
Near-coastal	3000 or more	1	1	1	–
Near-coastal	500 or more but less than 3000	1	1	1(b)	–
Near-coastal	Less than 500	–	–	–	2(c)

Key:

(a) may be 1 if the master keeps watch;

(b) need not be carried if the master keeps watch;

(c) one of these II/3 certificates must have an endorsement for the capacity of master.

Annex B

Hours of work and rest records for the master of *Danio*

MV Danio - V20F8

Workingtime Sheet

last \ first name: [redacted] Rank: Master

birth: 0. January 1900 Month: March 13

Workingtime

Dat	Day		ART	00 - 06	ART	06 -12	ART	12-18	ART	18 - 24	G	R	U	tWH	RH	10h24D/h	6hiP	RBW
1	Fri	WS		4 - 6		6 - 12		-		18 - 24	14	12	14	14	10	OK	OKAY	OKAY
2	Sat	SA		-		6 - 12		-		18 - 24	12	0	12	12	12	OK	OKAY	OKAY
3	Sun	SO		-		6 - 12		-		18 - 24	12	0	12	12	12	OK	OKAY	OKAY
4	###	WS		-		6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
5	Tue	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
6	###	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
7	Thu	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
8	Fri	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
9	Sat	SA		-	W	6 - 12		-		-	6	0	6	6	18	OK	OKAY	OKAY
10	Sun	SO		-		-		13 - 16		-	3	0	3	3	21	OK	OKAY	OKAY
11	###	H		-		8 - 12		13 - 18		-	9	8	1	9	15	OK	OKAY	OKAY
12	Tue	WS		-		8 - 12		-	W	18 - 24	10	12	-2	10	14	OK	OKAY	OKAY
13	###	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
14	Thu	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
15	Fri	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
16	Sat	SA		-	W	6 - 12		-	W	18 - 24	12	0	12	12	12	OK	OKAY	OKAY
17	Sun	SO		-	W	6 - 12		-	W	18 - 24	12	0	12	12	12	OK	OKAY	OKAY
18	###	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
19	Tue	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
20	###	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
21	Thu	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
22	Fri	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
23	Sat	SA		-	W	6 - 12		-	W	18 - 24	12	0	12	12	12	OK	OKAY	OKAY
24	Sun	SO		-	W	6 - 12		-	W	18 - 24	12	0	12	12	12	OK	OKAY	OKAY
25	###	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
26	Tue	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
27	###	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
28	Thu	WS		-	W	6 - 12		-	W	18 - 24	12	12	0	12	12	OK	OKAY	OKAY
29	Fri	H		-		8 - 12		13 - 18		19 - 22	12	8	4	12	12	OK	OKAY	OKAY
30	Sat	SA		-		8 - 12		13 - 18		19 - 20	10	0	10	10	14	OK	OKAY	OKAY
31	Sun	SO		-		-		-		-	0	0	0	0	24	OK	OKAY	OKAY
										TOTAL hours :	340	244	108					
											G	R	U					

At Perth

G total hours
R periodical
U overtime

tWH = total Workhours
RH =Resthours
10h24D/h = 10h in 24 day/hours
6hiP = 6 hours in Piece
RBW = Rest before Watch

postion \ date : port of Blyth 31.03.13

[redacted]

Master / 1.Off.

[redacted]

Crewmember

Annex C

Project Horizon (brochure)

Performance is also being assessed on liquid cargo handling simulators at Warsash Maritime Academy Picture: Andrew Linington

A total of 90 volunteer experienced seafarers are taking part in the simulations, which run for seven days at a time. The candidates will be recruited in exactly the same way as if they were going to sea to fulfil the same functions that will be required under simulated conditions. They will be checked for their health and suitability for the research.

Data collected from the experiments will be analysed using mathematical and regression modelling techniques to determine the effects of fatigue on the cognitive performance of maritime watchkeepers under different watch patterns.

Applied to all of this will be the overlay of significance of operation — enabling an assessment to be made of the seriousness of impact of lost performance, and whether it can be tolerated or mitigated.

The results of this data analysis will lead to the development of a fatigue management toolkit for use by interested parties such as ship managers, maritime regulators, flag states, port states and the International Maritime Organisation.

Developed and led by Warsash Maritime Academy, the project brings together academics from Southampton Solent University in the UK, Chalmers University of Technology in Sweden, the Stress Research Institute from Stockholm University and Bureau Veritas Marine Division, along with representatives from the European Community Shipowners' Associations, the European Transport Workers' Federation, the European Harbour Masters Committee, the International Association of Independent Tanker Owners, the Standard P&I Club, the UK Marine Accident Investigation Branch, and the UK Maritime & Coastguard Agency.

Project Horizon aims to build on existing knowledge, delivering academically rigorous and scientifically sound data, setting the following objectives for its work:

- to provide a realistic, high fidelity, voyage scenario in which watchkeeper cognitive performance can be measured
- to provide various watchkeeping patterns which will lead to fatigue in the watchkeeping officers
- to capture empirical data on the cognitive performance of the watchkeepers undertaking these watchkeeping patterns
- to analyse this empirical data to determine the effect of fatigue on the cognitive performance of the watchkeepers
- to develop a fatigue management toolkit for use by ship managers, maritime regulators, flag states, port states and the International Maritime Organisation
- to derive a set of recommendations that maritime regulators and ship managers can use to improve the safety and reliability of vessels

Contacts: Project Coordinator Graham Clarke
graham.clarke@inchmery.eu
www.project-horizon.eu

Produced by Nautilus International / ETF on behalf of Project Horizon

SEVENTH FRAMEWORK PROGRAMME

HORIZON

Investigating the impact of fatigue on the cognitive performance and decision-making of ships' watchkeeping officers

www.project-horizon.eu

Shipping is a 24/7 industry, and seafarers work long hours to keep their ships running to schedule.

There is growing concern about the role of fatigue in maritime accidents — with sleepiness cited as a factor in some major disasters, such as the Exxon Valdez and the Shen Neng 1.

Fatigue, not alcohol, was a key cause of the Exxon Valdez disaster in 1989
Picture: US Coast Guard

Project Horizon is a major multi-partner European research study that brings together 11 academic institutions and shipping industry organisations with the aim of delivering empirical data that will provide a better understanding of the way in which fatigue can affect ships' watchkeepers.

The €3.78m European Commission-funded project is making extensive use of bridge, engine and liquid cargo handling simulators in Sweden and the UK to examine the decision-making and cognitive performance of officers during a range of real-time, realistic scenarios.

Due to be completed on 30 November 2011, the 30-month research programme seeks to improve safety at sea by developing a fatigue management toolkit for the industry, as well as recommendations for improving work patterns at sea.

Alarm about the effect of fatigue at sea has been fuelled by a number of high-profile accidents. Project Horizon aims to build upon a growing body of evidence of seafarer fatigue problems gained from accident investigations and academic studies.

A study by the UK Marine Accident Investigation Branch indicated that fatigue was involved in around one-third of accidents over a 10-year period. In 2003, Swedish researchers found that 73% of officers taking part in a closed voting session admitted to having fallen asleep one or more times whilst on watch.

A 2004 report by UK Marine Accident Investigation Branch showed that one-third of the incidents it investigated between 1994 and 2003 involved a fatigued watchkeeper alone on the bridge at night, whilst a US Coast Guard study showed fatigue to have contributed to some 16% of critical vessel casualties and 33% of personal injuries.

A six-year research programme carried out by Cardiff University produced some disturbing findings, with one in four seafarers saying they had fallen asleep while on watch.

Similar research in Sweden has also reinforced the way in which work patterns at sea — and the six-on/six-off rota in particular — can result in dangerous levels of sleepiness. being built up by seafarers.

Seafarers work long hours to keep ships running to schedule
Picture: Danny Cornelissen

Project Horizon involves some of Europe's leading fatigue and stress experts, who are working in a six-stage project to assess the impact of fatigue on the decision-making performance of watchkeepers and to determine the best ways of minimising risks to ships and seafarers.

The project began with a research, design and development study, drawing on experience from other sectors. A range of fatigue measurement tools and procedures were examined and selections made.

Bridge simulator trials at the Chalmers University of Technology in Sweden
Picture: Mike Gerber

Experimental scenarios have been designed to enable the observation of certificated watchkeepers, undertaking watchkeeping routines, under test conditions in bridge, engineroom and liquid cargo handling simulators.

The project is replicating seagoing conditions, with sufficient experiments and candidates to ensure the statistical validity of the results. Researchers are using various means of measuring fatigue and the performance degradation it causes, and relating them to the operating circumstances of the candidates.

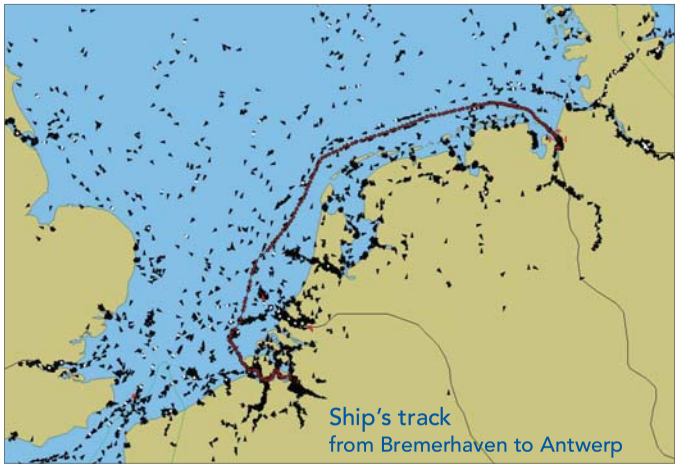
Annex D

Project Blue Belt (brochure)

VESSEL TRAFFIC MONITORING SHIP VOYAGE INFORMATION

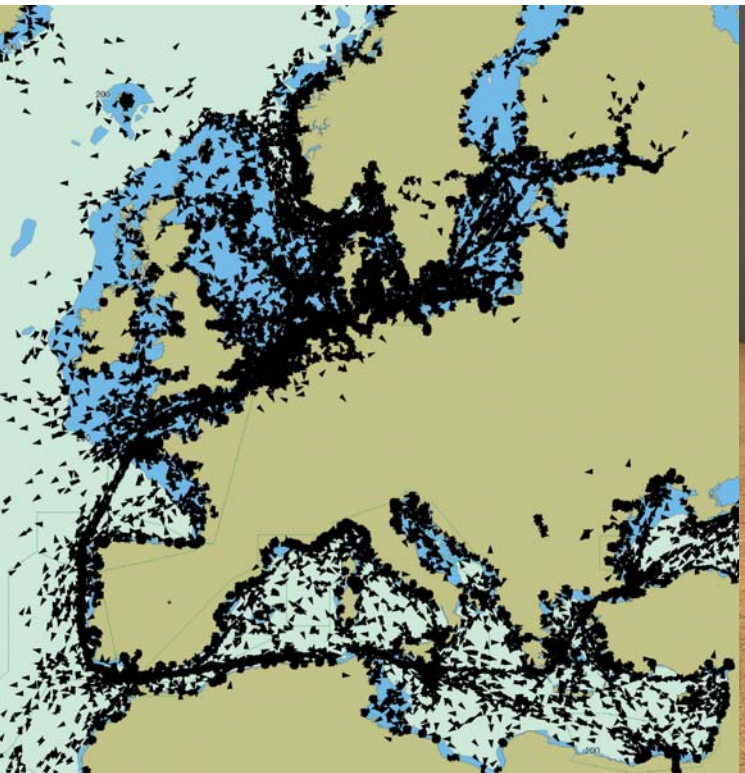
ABOUT SAFESEANET

The SafeSeaNet system was developed to support the requirements of Directive 2002/59/EC, as amended by Directive 2009/17/EC, establishing a Community vessel traffic monitoring and information system. The system is accessible to the national administrations of all the Member States of the European Community and of the European Free Trade Association States. SafeSeaNet is operated by the European Maritime Safety Agency (EMSA).



Blue Belt Pilot Project

BLUE BELT PILOT PROJECT



BLUE BELT PILOT PROJECT

Information notice for customs officials, ship owners, masters, agents and operators of ships calling at EU ports and participating in the Blue Belt pilot project.

EMSA

www.emsa.europa.eu

www.ec.europa.eu

BLUE BELT PILOT PROJECT

THE BLUE BELT PILOT PROJECT

The aim of the Blue Belt pilot project is to explore new ways to promote and to facilitate Short Sea Shipping in the European Union by reducing the administrative burden for intra-Community trade.

WHAT IS THE BLUE BELT PILOT PROJECT?

The Blue Belt pilot project starts in May 2011. It was introduced by the Belgian EU Presidency and endorsed by the EU Council of Transport Ministers on 2 December 2010.

HOW WILL IT WORK?

Around 250 ships, termed blue ships, have been selected to participate in the Blue Belt pilot project. Shipowners, supported by the European Community Shipowners' Associations and the World Shipping Council, have participated on a voluntary basis by identifying ships belonging to their fleet which are engaged in intra-EU trade.

The movements of blue ships will be monitored via the SafeSeaNet system operated by the European Maritime Safety Agency. Through the Blue Belt pilot project, customs authorities of EU Member States will receive a timely notification report before the arrival of a blue ship to an EU port.

BENEFITS

Customs will benefit from an added degree of certainty with regard to the ship's voyage concerning participating vessels. This will be possible by using existing customs tools in combination with information from the EU vessel traffic monitoring and information system SafeSeaNet.

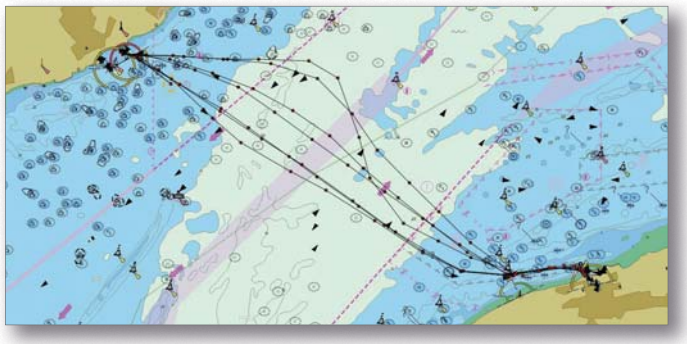
Customs authorities will receive reliable information on the current and past voyages of blue ships.

Ships' masters and agents will benefit from faster processing of goods through Customs when arriving at port.

THE CONTENT OF THE NOTIFICATION REPORT

Customs authorities will receive information on the current and previous voyages of blue ships, including expected or actual arrival and departure times, previous and next ports of call, and other pertinent voyage information.

The Blue Belt report will also provide additional information on vessel behaviour, such as unexpected stops, at sea encounters, etc.



AS A CUSTOMS OFFICER, WHAT SHOULD I DO WITH THE BLUE BELT REPORT?

The Blue Belt report will be sent to customs officers, providing extra information on the voyage of the ship and previous ports of call. Customs officials can use this information as input for risk assessment and for prioritization of controls.

AS A SHIP'S MASTER , WHAT CAN I DO TO PREPARE?

The Blue Belt pilot project will not duplicate or replace existing customs formalities and procedures. The ship's master should ensure that the AIS equipment is always turned on, and that all the relevant information is correctly filled in.

Marine Accident Report