



SAFETY INVESTIGATION REPORT

201706/036

REPORT NO.: 13/2018

June 2018

The Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 prescribe that the sole objective of marine safety investigations carried out in accordance with the regulations, including analysis, conclusions, and recommendations, which either result from them or are part of the process thereof, shall be the prevention of future marine accidents and incidents through the ascertainment of causes, contributing factors and circumstances.

Moreover, it is not the purpose of marine safety investigations carried out in accordance with these regulations to apportion blame or determine civil and criminal liabilities.

NOTE

This report is not written with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The report may therefore be misleading if used for purposes other than the promulgation of safety lessons.

© Copyright TM, 2018

This document/publication (excluding the logos) may be re-used free of charge in any format or medium for education purposes. It may be only re-used accurately and not in a misleading context. The material must be acknowledged as TM copyright.

The document/publication shall be cited and properly referenced. Where the MSIU would have identified any third party copyright, permission must be obtained from the copyright holders concerned.

MV FREYJA

Grounding while on passage from Florø to Svelgen, Norway

28 June 2017

SUMMARY

On 28 June 2017, in daylight, fine weather and good visibility, the Maltese registered chemical tanker *Freyja* ran aground on the rocks, Northwest of Svartevatnet, Norway.

Freyja's grounding damaged the underside of the hull and her watertight integrity was breached. There were no reports of injuries and pollution. The vessel was refloated at high water on 30 June 2017 and

safely moored at a lay-by berth in Florø, Norway.

The safety investigation determined that the immediate cause of the accident was an unintended deviation from the planned course.

In addition to the safety actions already taken by *Freyja's* safety managers, the MSIU has issued two recommendations to the Company.



FACTUAL INFORMATION

Vessel

Freyja is a chemical tanker of 1,655 gt, owned by Freyja AS, and operated by Fjord Shipping AS, Norway. The vessel was built by J G Hitzler, Germany in 1974 and is classed by RINA. The vessel has a length overall of 77.12 m. Propulsive power is provided by a 6-cylinder, 4 stroke, single acting MAK 6M452AK diesel engine, producing 1,324 kW, driving a single controllable pitch propeller. This gives a service speed of about 14.5 knots. The vessel is also fitted with a fixed propeller and a bow thruster.

Freyja's navigational equipment consists of a magnetic and gyro compass, autopilot, X and S band radars / ARPA, AIS, a GPS receiver and a long-range identification and tracking system. She is also equipped with a dual ECDIS.

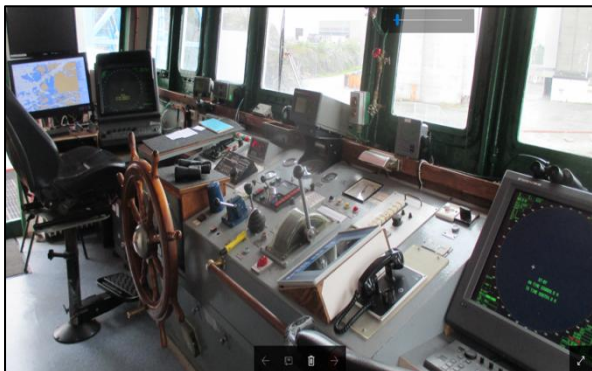


Figure 2: Layout of navigational equipment

Crew Complement

The manning was in accordance with the Minimum Safe Manning Certificate issued by the flag State Administration. At the time of the accident, *Freyja* had a crew complement of 11.

The master was a 69 year old Norwegian national, holding a Class 1 Certificate of Competency and a valid pilotage exemption certificate for the Norwegian waters. He had extensive experience as a master on chemical ships. He joined *Freyja* on

10 June 2017, where he had been serving as a master since 2010. He had recently completed IMO Model Course 1.27 and type-specific training on ECDIS.

The Ukrainian chief and second mates had also attended type specific training in ECDIS and completed IMO Model Course 1.27.

Passage plan

During the intermediate survey of the vessel in March 2017, an approved ECDIS was fitted to replace paper charts. ECDIS was used as the primary means of navigation. A passage plan from Florø to Svelgen, Norway was prepared by the second mate and approved by the master. The plan showed safety depth and a shallow contour was set between 4.56 m and 5.58 m.

Watch Arrangements and Watch Keeping Schedule

The Company's SMS procedures on navigation and bridge management classify navigation in port and restricted waters as watch condition no. 2. In watch condition no. 2, the required manning level was:

- master or his deputy;
- officer of the watch (OOW);
- pilot (if compulsory);
- lookout in accordance with Rule 5 of the COLREGS¹; and
- helmsman.

Watch condition no. 1 was meant to address navigation at sea in clear weather, with little or no traffic and navigational equipment operating satisfactorily. The required minimum safe manning level was:

- OOW;

¹ According to the SMS, either the master or the OOW determine whether the OOW can be the sole lookout in daylight, provided that the situation has been carefully assessed and that assistance is immediately available to the bridge.

- lookout in accordance with Rule 5 of the COLREGs; and
- pilot (if compulsory).

A daily working schedule for watch and non-watchkeeping duties at sea is reproduced in Table 1.

Table 1: Schedule of duty at sea

Rank	At Sea	
	Watch keeping duty	Non-watch keeping duty
Master	0800-1200	
	1300-1700	
Chief mate	0600-0800	0800-1000
	1000-1200	
	1800-2400	
Second mate	0000-0600	1300-1600
	1200-1300	
	1600-1800	
AB 1	2000-2400	0800-1200
AB 2	0000-0400	1200-1600
AB 3	0400-0800	1600-2000
OS		0800-1200
		1300-1700

Environment

The weather on 28 June 2017 was clear with visibility up to 20 nautical miles. The wind's speed was about six knots and the sea was calm. The air temperature was 14 °C. The height of the tide was reportedly 1.35 m. Tidal stream, if any, at the time of grounding had not been logged.

Narrative

At 0500² on 28 June 2017, *Freyja* berthed at Gunnhildevagen Terminal, Florø in Norway. By mid-day, she was ready to sail for Svelgen, a coastal passage of about 25 nautical miles (nm). She had on board 300 metric tonnes of microsilicia slurry.

² Unless otherwise stated, all times are local time (UTC +2).

Her departure drafts were 2.6 m forward and 4.8 m aft.

The unmooring operations commenced at 1230. The master piloted the vessel out of the port South of Maseholmen, heading West. The X and S band radars were switched on three and six nm range respectively. The route was displayed on the ECDIS with waypoints and courses to steer.

At about 1250, the second mate arrived on the bridge and made his way to the chartroom to write the logbook. At the time, the master had the con. Approximately one minute later, *Freyja*, was in the open water segment of the voyage, approaching waypoint no. 3. The next course to steer was 316° (Figure 3 and 4).

The course was altered to starboard and the master switched on the autopilot. The vessel's speed was increased to 10 knots. Gently turning to starboard, *Freyja* settled on a heading of 336°. A few minutes later, the master called the second mate to check the soundings. As the latter reported the water depths, the master became concerned, switched to manual steering and strived to steer the vessel clear of the shallows.

At 1255/20s, *Freyja* ran aground in position 61° 35.83' N 004° 58.13' E (Figure 4).

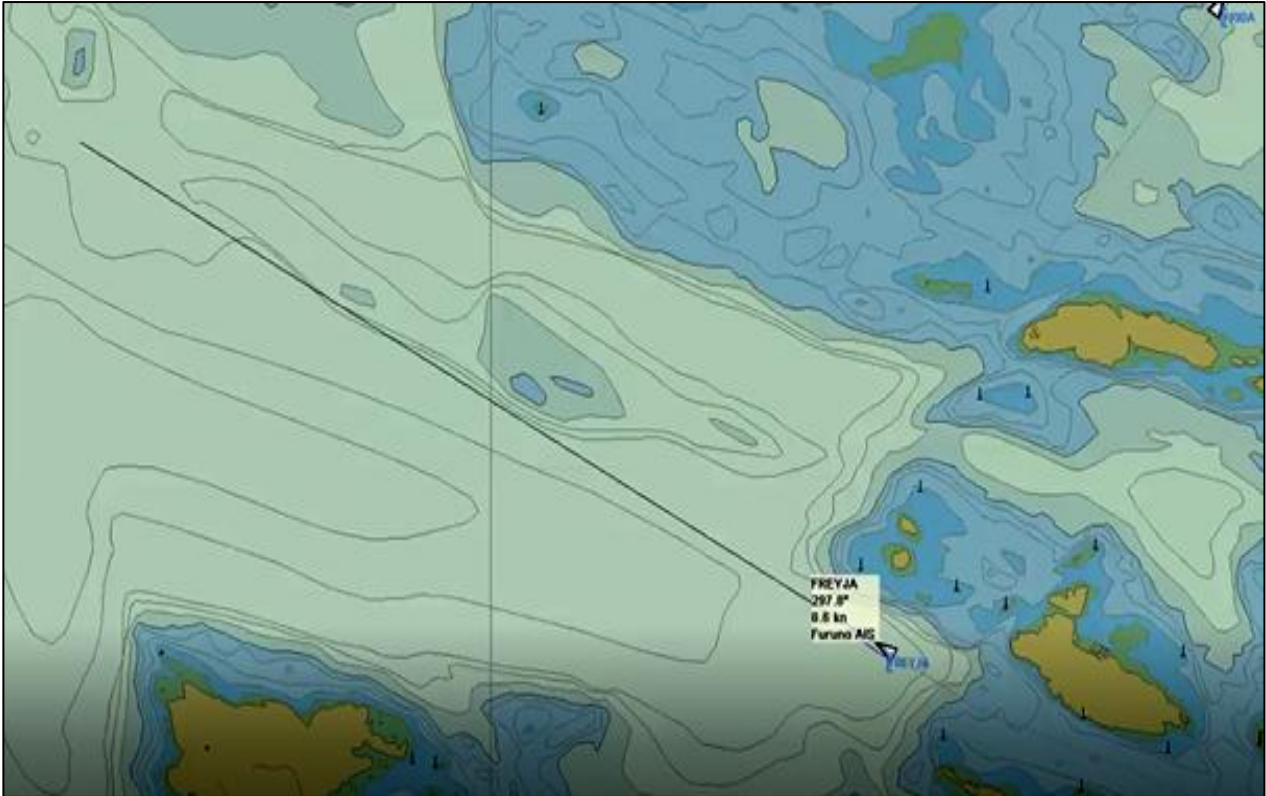


Figure 3: Image from ECDIS replay showing position of *Freyja* at 1251

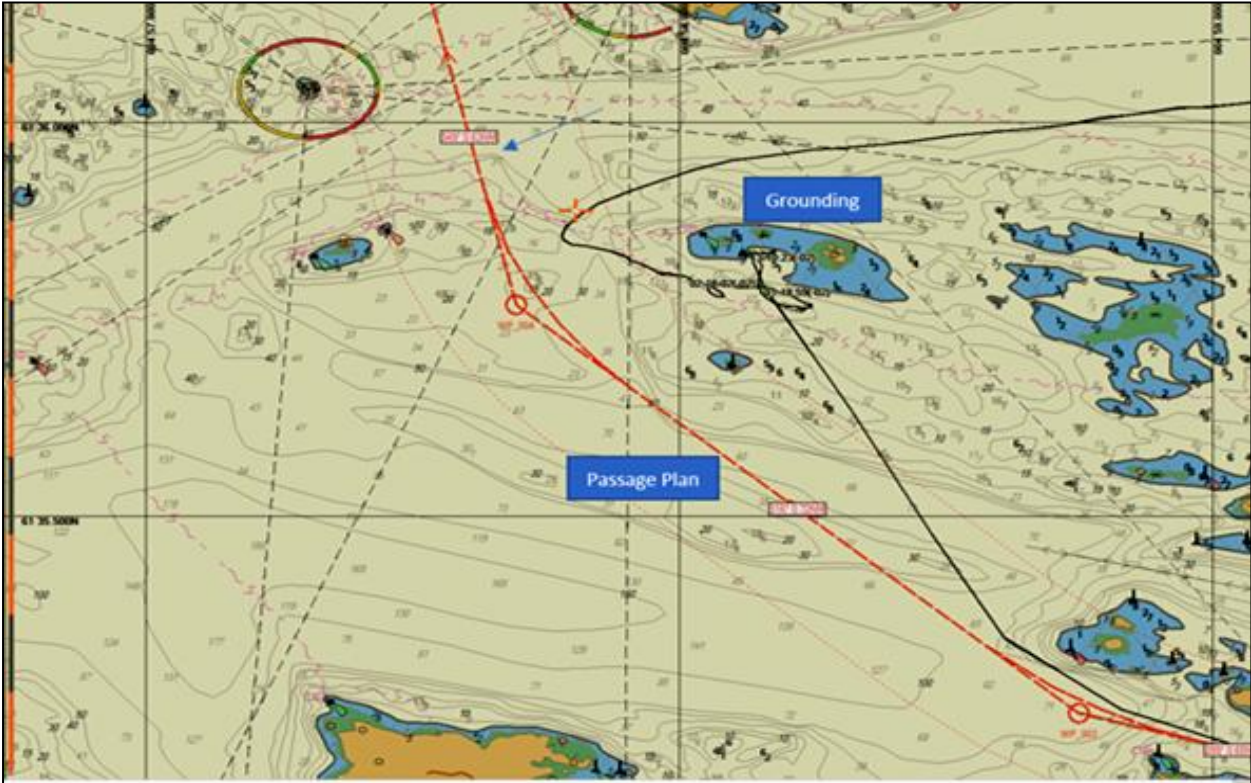


Figure 4: Image from ECDIS display showing passage plan (in red), vessel track and position of grounding (in black)

Post grounding events

The master reported the grounding to the Company and the crew set about sounding water around the ship. It was immediately evident that the bow thruster compartment and the engine-room had been breached. The cargo tanks were checked but were found intact. The ballast water was adjusted to lift the bow out of the water. Eventually, portable pumps were rigged to pump out the water from the bow thruster and the engine-room.

Eventually, booms were deployed around the ship. Divers sealed the fracture in way of the engine-room³. Attempts to refloat the vessel using the assistance of a tug and under the control of a pilot were futile. A salvage company was subsequently engaged and on 30 June 2007, *Freyja* was pulled off the rocks at high water with the assistance of two tugs. The vessel was taken to a lay-by berth in Florø.

Structural damages

A damage survey by Class reported:

- Bottom shell plating in way of the forepeak, longitudinal girder and transverse frames cracked and deformed;
- Collision bulkhead between the fore peak and bow thruster room found cracked;
- Transversal floors in the forward part of the bow thruster room was found damaged, bottom aft area found cracked, and water tightness impaired;
- No. 1 port and starboard ballast tanks at frame 107 was found breached in way of the bow thruster and ballast tank no. 1 port side; the transverse flooring and longitudinal stiffeners between frame 104 and 106 damaged;

³ Ship's propeller and rudder were reportedly clear of the seabed.

- A crack of about 0.30 m in the engine-room side shell plating on port side was observed and a number of indentations were observed between frames nos. 8 and 14 on port and starboard sides; and
- Damaged emergency fire pump suction pipe.

ANALYSIS

Aim

The purpose of a marine safety investigation is to determine the circumstances and contributory causes of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future.

Hours of rest, drugs and alcohol

The MSIU was informed that following the accident, no alcohol and drug tests were carried out. Nonetheless, the master's behaviour on the bridge was not suggestive of intoxication.

Examination of the 'Hours of Rest' document showed that the master's rest period in the seven days preceding the accident was three hours short of the prescribed 77 hours. It was not excluded that the long hours worked on board were correlated with the short voyages and frequent port calls. Whilst this had contravened the relevant Maritime Labour Convention (MLC) regulation on hours of work and rest, he had no less than 12 hours of rest prior to reporting for duty on 28 June. Thus, fatigue was not considered a contributing factor to this accident.

Bridge organisation

Freyja's SMS on safe navigation required that every effort had to be made to anticipate the resources needed for full situational awareness. The watch conditions in the SMS provided guidance on the levels of bridge manning.

Exemption from pilotage, vast experience of sailing on *Freyja*, and familiarity of local waters all appear to be influential factors for the master not to call for additional support on the bridge. The master alone, piloting the vessel out to sea, suggested a pattern of navigation commonly practiced on board, notwithstanding the recommended bridge manning in the ship's SMS. Nonetheless, once the vessel was on leg no. 3 of the sea passage, *Freyja* was compliant with the manning requirements of watch condition no. 1.

Conflicting evidence

Despite numerous requests by the safety investigation for a clarification of events and actions, none had been forthcoming from the master. Instead, the Company transcribed the following:

"...for some reason the vessel course altered to starboard and the vessel was now deviating from the passage route and heading toward underwater rocks, North of Gronflua.

"The second mate was attending the ECDIS and the Captain was giving sailing instruction.

"When it was noticed that the vessel was heading towards the underwater rocks, the autopilot was switched to helmsman [manual] and the captain start turning the vessel away from the rocks."

It was reported that the master had the con and as he was shortly due for watch, he continued handling the ship even after the second mate had arrived on the bridge.

The International Chamber of Shipping (ICS) Bridge Procedures Guide highlights the importance of communication and to establish who has effective control to avoid any misunderstanding when there is more than one person on the bridge. Moreover, the Guide recommends an entry in the logbook when the con is handed over. The safety investigation found evidence neither of the master passing over the con to the

second mate, nor of monitoring of *Freyja*'s progress on the ECDIS. In fact, the second mate stated that the master was in command and he was hastily called by the latter to report the water depths while he was in the chartroom writing the log.

ECDIS alarms and replay

As indicated elsewhere, there were no paper charts on board *Freyja* and the ECDIS was the primary means of navigation. It was therefore vital that the ECDIS was set up properly for safe navigation.

MARIS ECDIS 900 provided navigational warnings to assist watchkeepers in the navigation of the ship. The alarm panel on the ECDIS display 'alert dialog' allows watchkeepers to set alarms for different navigational conditions. One principal alarm for safe navigation during route monitoring was the guard zone alarm. The guard zone alarm is set ahead of the ship for early warning of navigational hazards.

The extent of the guard zone is defined by a set of values for angle and time/distance, which define a cone across the bow. Any navigational features in the guard zone endangering safe navigation will set off an alarm to warn the watchkeeper that appropriate action is required. Other safety alarms can be set for waypoint approach, cross track distance (XTD) and safety contour/depths. The safety investigation found no evidence of ECDIS being configured for safety alarms.

Interpretation of the events leading to the grounding

Freyja's track information extracted from a copy of the ECDIS replay is reproduced in Table 2.

Table 2: Navigational information

Local Time hh mm ss	Planned Course °	Dist to WP nm	Hdg °	Speed Knots	Observations
12 50 00	288.8	-	288	8.5	Vessel approaching waypoint 3. Next planned course 316°.
12 51 00	315.9	0.7	297	8.5	Speed increased to 10 knots. Hand steering switched to autopilot.
12 52 00			325	8.5	Vessel turning to starboard.
12 53 00			336	9.6	Vessel settled on a heading of 336°.
12 53 30			336	10.3	
12 54 00			334	10.4	
12 55 00			340	10.4	
12 55 20			333	2.8	Vessel aground.

Although the master did not submit any clarifications on his actions on the bridge, it was evident that the Track Control System⁴ (TCS) and ‘back on track’ option⁵ on the ECDIS had not been activated.

Moreover, it seemed that the autopilot gyro setting had neither been adjusted nor aligned with the planned course. The vessel turned to starboard, settled on a gyro heading of 336° and headed towards the rocks. The ECDIS display and radar were centred around the helm console position and there was no clear explanation as to why the master could not monitor the vessel’s GPS position, use line of position, parallel indexing or clearing range to define the vessel’s safe passage.

⁴ When TCS function is on and track steering is activated, waypoint and course change alerts are generated.

⁵ Back on track option create a temporary route and makes possible for the vessel to join the planned route.

It is the view of the safety investigation that these missing (or deactivated) barrier systems contributed to a situation whereby the master’s mental model of the situation and the actual situation outside the bridge window were not aligned.

CONCLUSIONS

1. The grounding was caused by the vessel deviating from the planned course;
2. The master was unaware of the vessel’s heading into shallow waters until the very last moments;
3. On departure from port, the bridge was not manned in accordance with the SMS procedures on navigation;
4. *Freyja*’s trading pattern were challenging for the master (also acting as pilot), to satisfy the MLC requirements of hours of rest on board;
5. The safety depth/contour and safety alarms were either not set or not activated on the ECDIS;

6. Line of position, parallel indexing, radar range and bearings were not used by the master;
7. TCS function and ‘back on track’ option on the ECDIS had not been activated;
8. Missing (or inactivated) barrier systems contributed to a situation whereby the master’s mental model of the situation and the actual situation outside the bridge window were not aligned.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION⁶

Following an internal meeting, a Fleet Circular was issued and circulated on board Company ships.

It was also agreed to carry out *en route* ISM audits and for Company representatives to frequently sail on board Company ships to verify compliance with the on board navigation procedures. Moreover, where required, officers will be offered re-training and undergo familiarisation on ECDIS, bridge team management and leadership.

RECOMMENDATIONS

Fjord Shipping AS is recommended to:

13/2018_R1 Conduct a thorough review of vessel’s trading pattern and ensure that the master is adequately rested and the bridge is manned in accordance with the ship’s SMS.

13/2018_R2 Bring this safety investigation report to the attention of the master and navigational officers and provide a clear guidance on configuration of ECDIS and ECDIS safety alarms.

⁶ **Safety actions and recommendations should not create a presumption of blame and/or liability.**

SHIP PARTICULARS

Vessel Name:	<i>Freyja</i>
Flag:	Malta
Classification Society:	RINA
IMO Number:	7392610
Type:	Chemical Tanker
Registered Owner:	Freyja AS
Managers:	Fjord Shipping AS
Construction:	Steel
Length Overall:	77.10 m
Registered Length:	72.00 m
Gross Tonnage:	1665
Minimum Safe Manning:	9
Authorised Cargo:	Chemical

VOYAGE PARTICULARS

Port of Departure:	Florø, Norway
Port of Arrival:	Svelgen, Norway
Type of Voyage:	Coastal
Cargo Information:	300 tonnes of microsilicia slurry
Manning:	11

MARINE OCCURRENCE INFORMATION

Date and Time:	28 June 2017	1255/20s (LT)
Classification of Occurrence:	Serious Marine Casualty	
Location of occurrence:	61° 35.83' N 004° 58.13' E	
Place on board	Ship/Other	
Injuries / fatalities:	None	
Damage/environmental impact:	None reported	
Ship Operation:	On passage	
Voyage Segment:	Transit	
External & Internal Environment:	Sea was calm with no swell. The wind was variable 6 knots. The visibility was very good.	
Persons on board:	11	