Report on the near-miss grounding of The Bahamas flagged passenger vessel Norwegian Prima off Reykjavík on 26 May 2023

The investigation was conducted in accordance with:

- IMO Casualty Investigation Code (CIC),
- Bahamas Merchant Shipping Act
- Icelandic Transportation Accident Investigation Act number 18/2013

Case nr: 2023-036 S 019

Date: 26 May 2023

Location: Reykjavík harbour

Description: Near miss grounding

1. Summary

On 26 May 2023 at 21:50 UTC the passenger vessel Norwegian Prima departed Reykjavík, Iceland. The vessel manoeuvred off the berth and out of the harbour astern, to turn outside the breakwater with a tug's assistance. When the turn was almost complete the wind speed increased significantly. With wind in excess of 50 knots on the port beam, the vessel could not regain its planned track – it drifted outside the navigable channel, overran a buoy and came within 10 meters of rocks with a charted depth of 0.4 m. After then passing within 25 m of a shoal with a drying height, the vessel managed to regain the planned track and depart the harbour without further incident.

There were no injuries or pollution. Norwegian Prima suffered no damage as a result of overrunning the buoy but the tug suffered minor damage due to prolonged pushing whilst it helped the vessel avoid grounding.

The marine incident was not reported to coastal or flag State authorities at the time. Iceland's Safety Investigation Authority opened an inquiry when it became aware of the incident and asked The Bahamas to join its marine safety investigation shortly afterwards. Iceland was Lead Maritime Investigating State and The Bahamas was Substantially Interested State.

While conducting the investigation, investigators used data from Norwegian Prima's voyage data recorder and footage from CCTV cameras to recreate the event using specialist software. Information was also taken from The Icelandic Coast Guard, records from the Associated Icelandic Ports. Interviews were conducted with the master of Norwegian Prima, the pilot and other persons that could help put the events into context.

2. **Narrative** All times in this report are local time (UTC)

On the morning of 25 May 2023, The Bahamas flagged passenger vessel Norwegian Prima arrived at Reykjavík pilot station after an eight-day passage from Sydney, Canada, (via Akureyri in the north of Iceland). During the passage to Reykjavík the vessel had maintained higher than normal levels of treated wastewater in its holding tanks to increase stability and counter wind heeling during a period of adverse weather. As such, it had limited holding capacity, but sufficient for the planned two day stay at Reykjavík.

The pilot boarded and the passage to the berth was uneventful – Norwegian Prima moored bow in at the passenger terminal – necessitating a swing during departure.

During the day of 26 May, updated weather forecasts received onboard indicated wind speed of over 25 knots could be expected that evening. The master considered delaying departure and researched availability of trucks to pump excess grey/black water ashore but decided to sail as planned with a tug booked to assist.

At 21:00 the pilot boarded, and he and the master conducted the master/pilot exchange. As part of the exchange, the pilot shared the latest weather forecast, and raised the option of delaying sailing but the master did not consider this necessary. They discussed the best way to depart – the master would handle the vessel with the pilot assisting, The tug, Magni, would stand by on the port side until directed to move to starboard bow to push. Norwegian Prima was considered too long to swing off the berth, so the manoeuvre was planned to be conducted outside the breakwater.

At 22:05 Norwegian Prima was unmoored and manoeuvred off the berth with Magni, on the port side. At 22:15, the breakwater was on Norwegian Prima’s starboard beam with the stern approaching the charted swinging area - the master started the swing (bow to port) with Magni still standing by on the port bow.

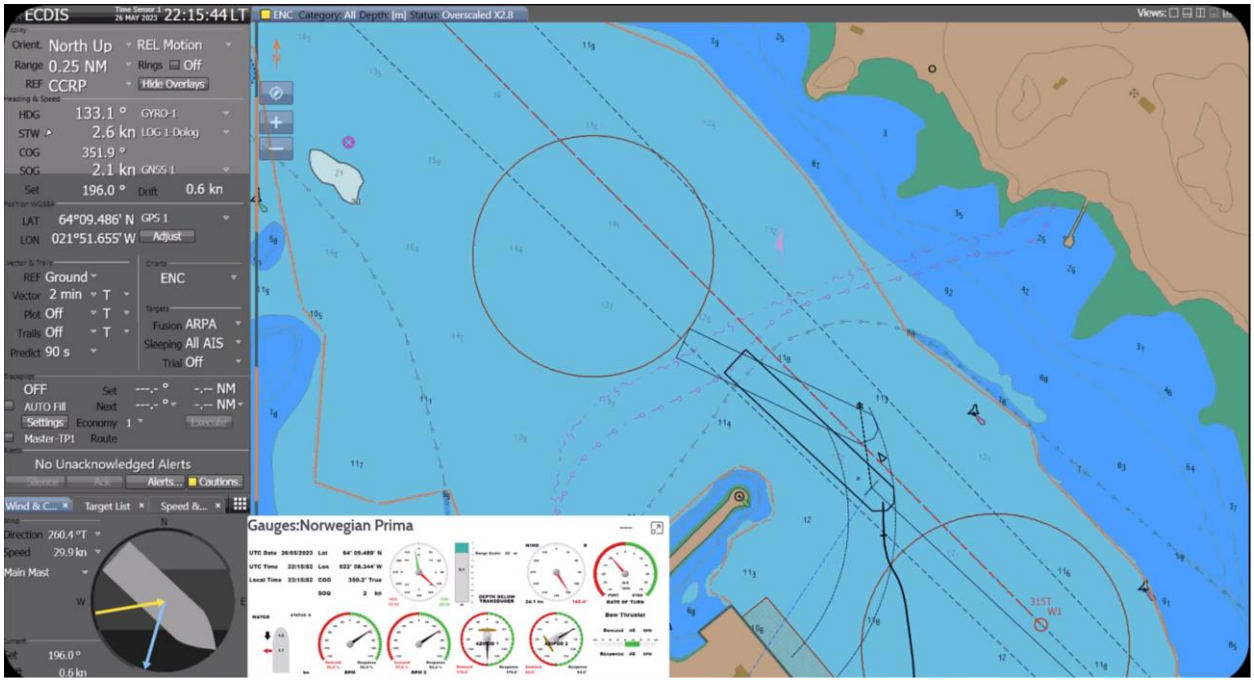


Fig. 1 Norwegian Prima passing breakwater and starting to swing

Approximately halfway through the turn, with the wind speed increasing, Magni re-positioned from the port bow to the starboard bow. Shortly afterwards, when the turn was almost complete, the master increased speed and, at about the same time, the vessel experienced gusts in excess of 35 knots from the west. The pilot requested[1] that Magni push at full power.

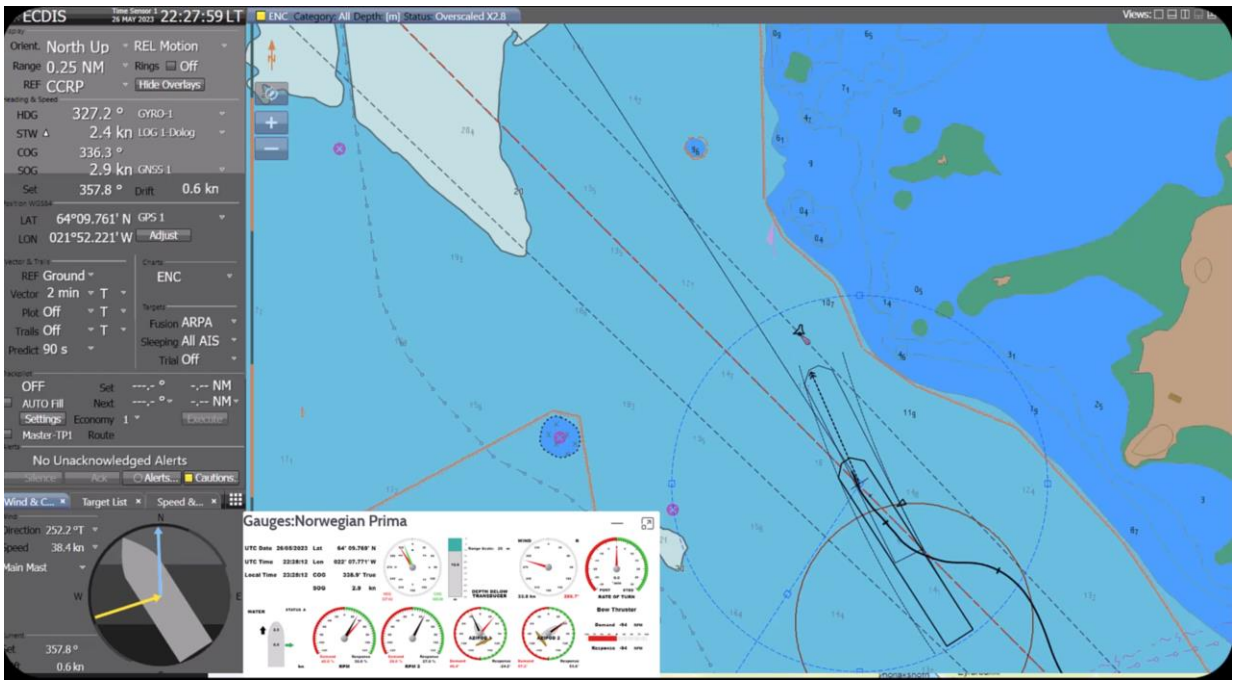


Fig. 2 Norwegian Prima swing almost complete, increased forward momentum

[1] Communications between pilot and Magni were in Icelandic.

The wind speed continued to increase with gusts in excess of 50 knots. With Magni pushing at full power, the vessel could not achieve its planned track, the master increased power to the azipods, attempting to gain the required heading. At 22:31 the vessel allided with Hjallasker buoy, marking the eastern edge of the navigational channel.

Fig. 3 Stills from mobile phone footage (looking forward): Hjallasker buoy, Magni adjusting position

To avoid the risk of entanglement with the buoy, Magni pulled clear and could not reestablish itself to push for two minutes, resulting in Norwegian Prima losing further leeway towards the rocks. The master continued to “walk the ship” – alternating the direction of thrust from the azipods to attempt lift the bow and then to lift the stern.

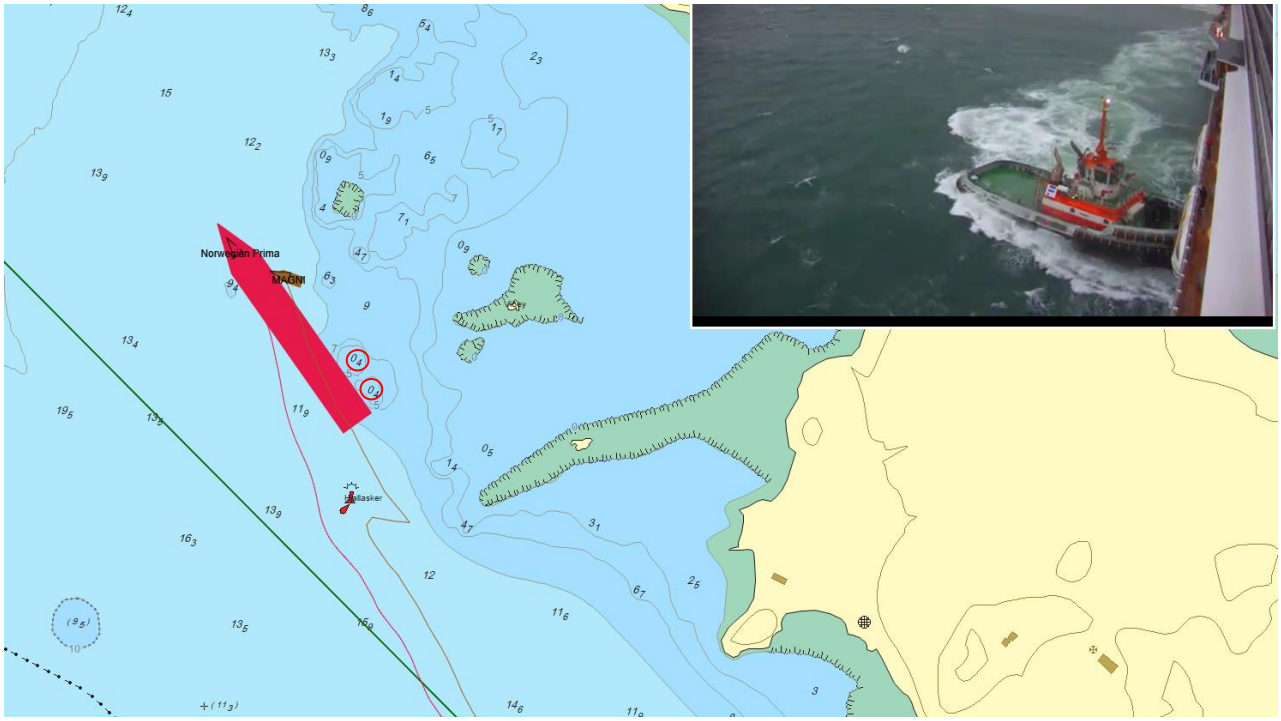


Fig. 4 Norwegian Prima at closest point to shallow rocks as Magni regains position to push (CCTV inlay)

Fig. 5 Stills from breakwater CCTV: Hjallasker buoy (ringed) clears Norwegian Prima's stern

With Norwegian Prima having over-run the buoy and closing on rocks with a charted depth[2] of 0.4 m, Magni informed the pilot that the tug would sustain damage if it continued

[2] There was 3.0 m of tide above chart datum. Norwegian Prima's departure draught (aft) was 8.6 m

to push. The pilot asks that they continue pushing. Norwegian Prima's stern passed approximately 10 m clear of the rocks.

After then passing within 25 m of a shoal with a drying height (above chart datum), the vessel managed to regain the planned track and depart the harbour without further incident.

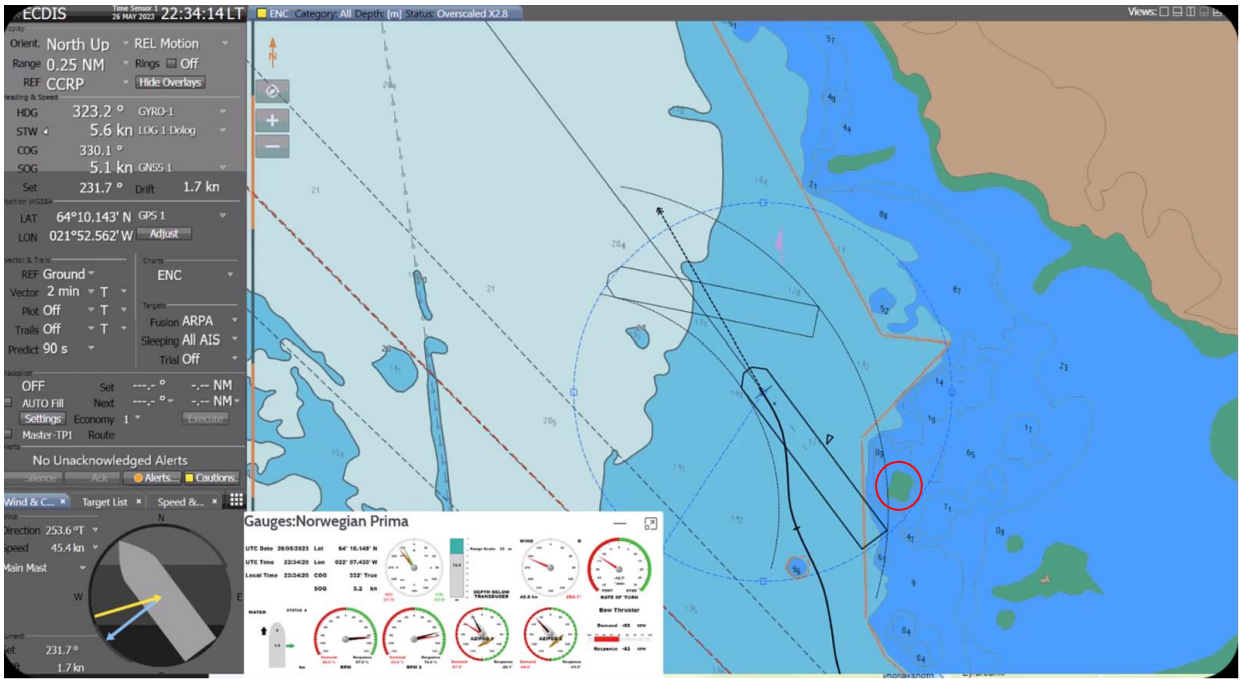


Fig. 6 Norwegian Prima attempting to clear drying height (ringed)

There were no injuries or pollution. Norwegian Prima suffered no damage as a result of overrunning the buoy but the tug suffered minor damage due to prolonged pushing whilst it helped the vessel avoid grounding.

2.1 Details of vessels

Norwegian Prima was a passenger ship, it was registered under the flag of The Commonwealth of The Bahamas on its launch in 2023.

Fig. 7 Norwegian Prima (courtesy of Norwegian Cruise Lines Ltd.)

The vessel had the following principal particulars:

Call sign	C6FB3
IMO number	9823986
Built	Italy, 2022
Length overall	293.4m
Breadth	40.5m
Depth moulded	11.7m
Propulsion power	Twin azipods (16.5MW each), three bow thrusters (2.5MW each)
Gross / net tonnage	143,535 / 112,862
Class Society	Det Norske Veritas

On departure from Reykjavík:

Draught	Forward 8.15m	Aft 8.6m
Onboard	Crew 1482	Passengers 3156

The ship is owned by Leonardo One, Ltd., Bermuda, and technical and safety management is performed by NCL (Bahamas) Ltd. and had been issued a Document of Compliance (DOC) under the International Safety Management Code by The Bahamas Recognised

Organisation Det Norske Veritas. Norwegian Prima's bridge team all held appropriate qualifications for their respective roles on board.

The master was a 37 year old Panamanian and had sailed with Norwegian Cruise Lines for 14 years. He had worked on Norwegian Prima during its construction and was promoted to master for its commissioning in 2022. This was the master's first call at Reykjavík.
The pilot was 55 year old Icelander he had been a captain on commercial vessels for 8 years. He had sailed as a deck officer and chief mate for numerous years before that. He had been a pilot for six and a half years and had never had any mishap as a pilot.

Magni was a tug which also served as a pilot vessel. It was registered under the flag of Iceland in 2020.

Fig. 8 Magni

The vessel had the following principal particulars:

Call sign	TFIS
IMO number	9855903
Built	Damen, Netherlands, 2019
Length overall	31.25m
Breadth	12.2m
Depth moulded	5.35m
Bollard pull	85 tonnes
Gross tonnage	450
Class Society	Lloyd's Register

2.2 Weather

The Icelandic Meteorological Office uses the HARMONIE-AROME numerical weather prediction model[3] for forecasting. The nine hour wind speed forecast (10 m above surface) in force at the time of departure is shown below. For Reykjavik Harbour (ringed) the wind was forecasted to be from the west with speeds of 14-16 meters per second (27-31 knots) with higher wind speed forecasted offshore.

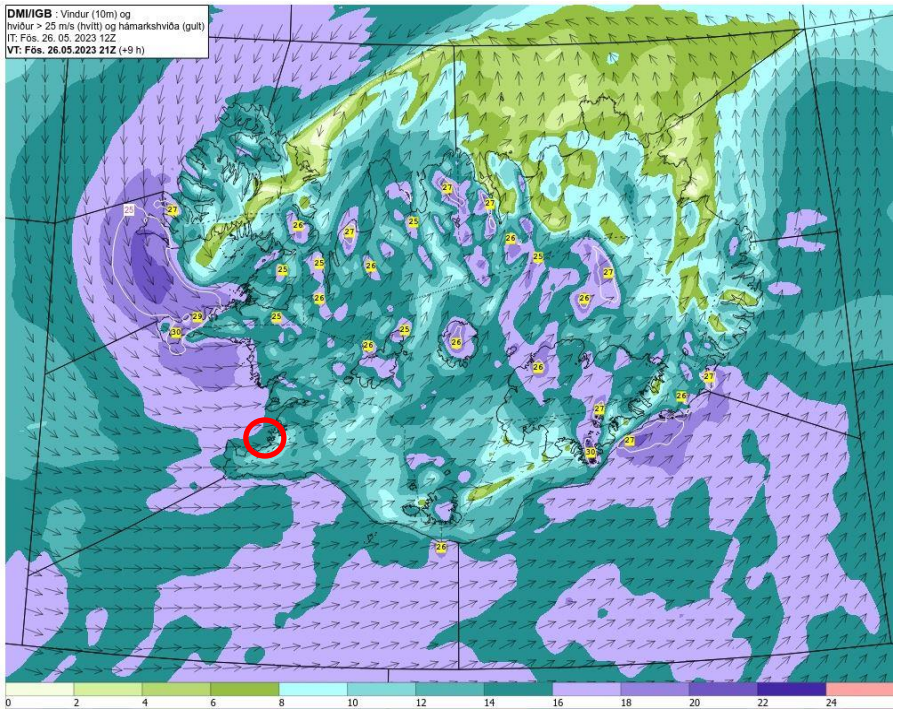


Fig. 9 - Iceland 9 hour forecast valid at 21 UTC, 26 May 2023

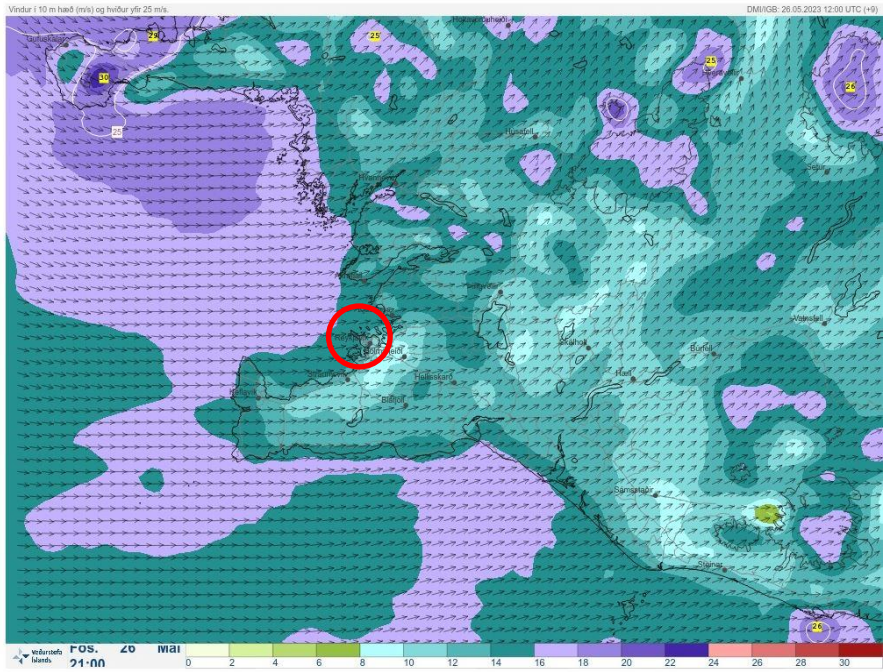


Fig. 10 - Iceland southwest coast 9 hour forecast valid at 21 UTC, 26 May 2023

[3] For full explanation of the model is available here: https://en.vedur.is/weather/articles/nr/3232

3. Analysis

3.1. Scope of investigation

The scope of the investigation was limited to the circumstances of Norwegian Prima's call at, and departure from, Reykjavík harbour - until clear of danger at 22:35. It includes the decision to sail, the roles of the pilot and the harbour authority.

3.2. Reconstruction

While conducting the investigation, investigators used data from Norwegian Prima's voyage data recorder and footage from CCTV cameras to recreate the event using specialist software. A video of this part of the voyage was created and can be seen here:

Information was also taken from The Icelandic Coast Guard, records from the Associated Icelandic Ports. Interviews were conducted with the master of Norwegian Prima, the pilot and other persons that could help put the events into context.

3.3. Decision to depart

When decision was made to depart on schedule, the weather forecast from the Icelandic Meteorological Office predicted wind speeds in the range of 27-31 knots in the bay area.

The forecasted wind speed was below the master's threshold of what he thought the vessel "could take", considering its approximate 14,000m^2 windage area: if winds were forecasted higher than 33-35 knots he would not attempt to sail. This threshold was based on his personal experience – no formalised mathematical or simulated assessment of the handling capabilities had been made during design or construction and there was no guidance offered as part of the vessel's safety management system. There was therefore also no effective impact assessment

available to the bridge team of the loss of power or any component during a manoeuvre at a given wind speed. Whilst the vessel was ready to use an anchor, given the proximity to navigational dangers with all outputs at full power – there was no margin left. A loss of power due to entanglement with the buoy, or touching the seabed, may have proved catastrophic.

The forecasted wind speed was also below the threshold of 35 knots established by the port authorities when the pilot should evaluate circumstances specially in relation to safety: he/she should consider wave height, sea state, the machinery of the vessel and how many tugboats are needed. If pilot is in doubt, he can confer with the harbourmaster whether to delay departure, deny service, or make an exception from the standard working procedure[4]. The pilot had concerns about departure in the forecasted conditions but as it was below the threshold, he did not feel empowered to stop the vessel from sailing.

Regardless of the thresholds, the master investigated the possibility of pumping treated waste water ashore to enable the vessel to remain alongside. There was no option to do this directly at Reykjavik - it was facilitated using trucks with an approximate capacity of $20m^3$ - this was considered to be time consuming and ultimately unnecessary considering the forecast.

In any event, the master took an early decision to request a tug's assistance for departure.

3.4 Swinging the vessel

With Norwegian Prima moored bow-in on arrival, the vessel needed to swing to depart. At the time of the incident there were three areas used by pilots to swing vessels at Reykjavík:

A. inside the harbour

B. outside the breakwater

C. outside the fairway (at buoy Nr.7 approximately 3.5 nautical miles from breakwater)

[4] https://island.is/reglugerdir/nr/0798-2009

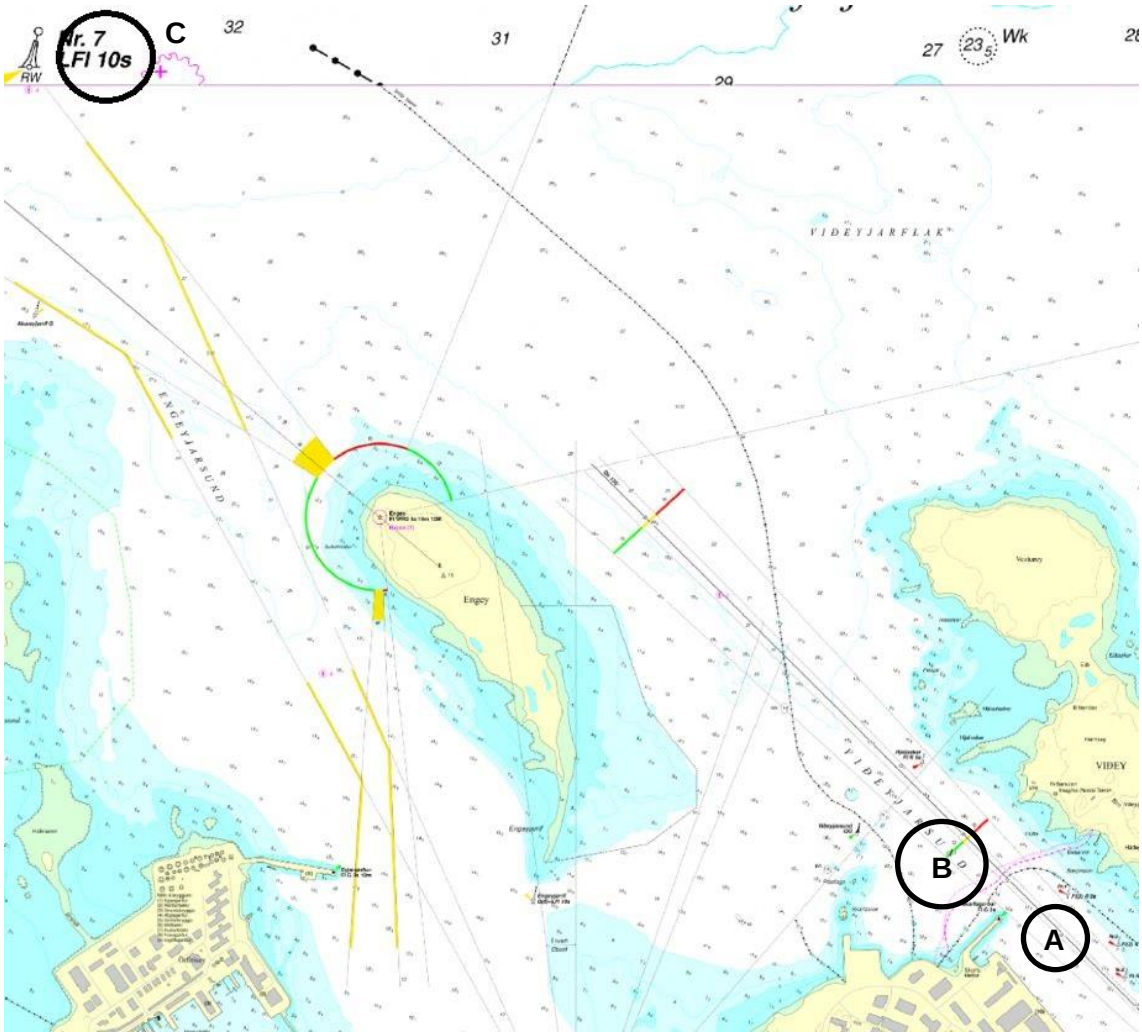


Figure 12 – turning circles at Reykjavík

For departure, Norwegian Prima was considered too large to swing inside the harbour at circle A in the prevailing conditions[5]. The pilot's preference was to depart stern first and swing near circle C but the master and pilot opted to swing outside the breakwater, at circle B. This position is exposed to westerly winds and bounded by the shallows to the east and west.

When the wind speed increased at a critical point of the manoeuvre – with the vessel almost stopped and beam on to the wind – there was limited navigable water available for the vessel to complete the swing and gain its planned track.

3.5 Manoeuvring Norwegian Prima – mental models

The master and pilot had different mental models of how best to use the available resources to manoeuvre Norwegian Prima clear of the shallows east of Hjallasker buoy.

[5] 450m total diameter v 293.4m length overall of Norwegian Prima

The pilot's mental model was that forward momentum needed to be limited to a speed of around 3 knots to maximise the effectiveness of Norwegian Prima's bow thrusters and the ability of the tug to push.

The master's mental model was that Norwegian Prima's azipods were the best option to lift the bow – whilst the effectiveness of the bow thrusters was lost due to the forward speed, there was greater sense of control and reduced leeway.

The different approaches were based on personal experience of each of the people involved. Whilst the master/pilot exchange is a tool to ensure that the entire bridge team have, a shared mental model of the intended passage plan, the vessel manoeuvring characteristics and any operational defects, this deep-seated personal experience is difficult to share and is too late to be addressed as a potential emergency situation develops.

In any event, the effectiveness of the tug can be seen when it had to stop pushing for two minutes to avoid entanglement with the Hjallasker buoy. Norwegian Prima's leeway increased and its course over the ground (see fig. 4)

4. Conclusions

- The master's decision to sail was based on a weather forecast of 25 knots wind speed, this was within his own threshold for sailing and below the winds speed that the harbour authority required further assessment from the pilot.
- The vessel's safety management system did not identify any maximum wind speed limits for manoeuvring and there was no effective impact assessment available to the bridge team of the loss of power or any component during a manoeuvre at a given wind speed.
- The master's decision to sail may have been informed by a lack of available capacity for treated waste water in the vessel's tanks.
- The pilot had concerns about sailing in the prevailing conditions, but he did not feel he had sufficient power to delay the vessel. He insinuated that it would be best to delay but the urgency was not understood by the master.
- The vessel experienced wind speeds significantly in excess of the forecasted wind speed at a critical time during its manoeuvre – with the wind abeam and no forward momentum it could not hold station, even with the assistance of the tug.
- The master and pilot had differing mental models on the effectiveness of manoeuvres – the master felt that more power to the azipods would be the best solution whilst the pilot was concerned that the increased speed reduced the effectiveness of bow thrusters and the ability of the tug to push.
- Norwegian Prima over ran the Hjallasker buoy (but avoided entanglement with its mooring chain) left the safe navigable channel and passed within 10m of rocks at a charted depth of 0.4m.

5. Actions taken

Faxaflóahafnir sf (Associated Icelandic Ports)

- Updated its working procedures and reduced windspeed limits when passenger vessels are leaving or entering the harbour to 27 knots.
- Committed to send its pilots for simulator training to enable manoeuvring exercises using podded vessel for the Old Harbour and Skarfabakki.
- Committed to transmit to all interested parties an updated Port Information Guide. Revisions will include information about sewage disposal and details of the port's weather stations.
- Started a pilot mentoring and evaluation scheme.

6. Recommendations

Norwegian Cruise Lines is recommended to:

Holistically review the information made available to bridge teams to enable an effective assessment of risk for manoeuvring in ports.

Faxaflóahafnir sf. (the Associated Icelandic Ports) is recommended to:

Update its working procedures so that communication between pilots and captains of pilot boats and tugboats are in English when piloting foreign vessels into, out of or in the harbour areas.

The Ministry of Infrastructure is recommended to:

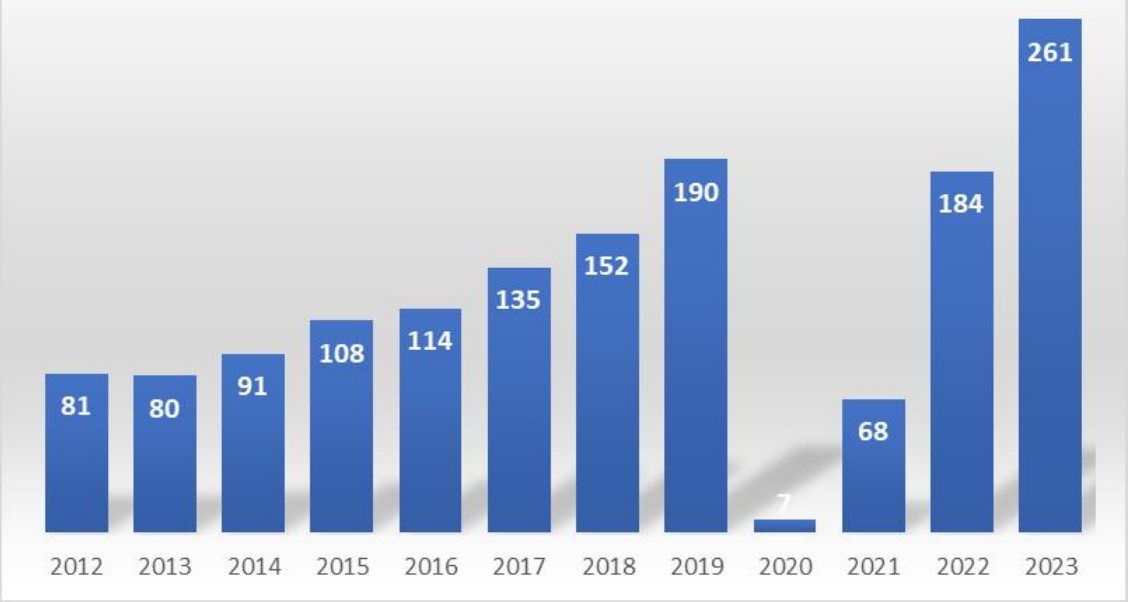
Strengthen port regulations where piloting is required to ensure the pilot's authority to halt entering or departure of a ships to port if weather condition or other circumstances are such that the safety of a ship, its crew, passengers, or environment may be threatened.

The Ministry of Infrastructure is recommended to:

Ensure that a risk assessment is carried out for ports where cruise ships make port of call to ensure safety.

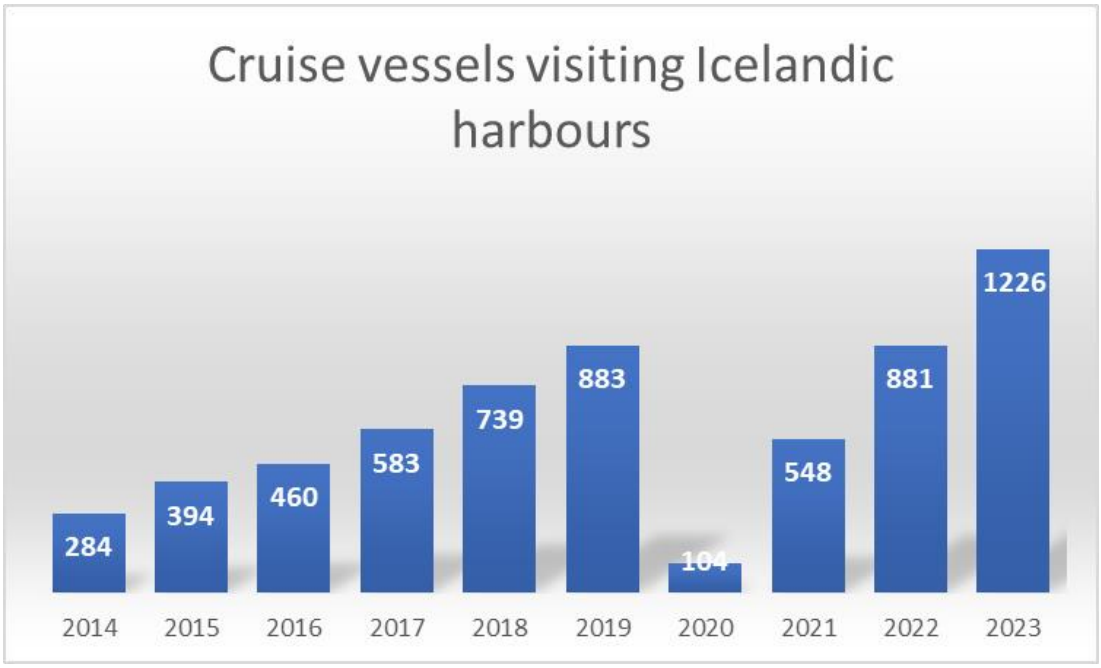
Appendix 1

Increasing traffic of passenger vessels in Reykjavik harbour:



There is a concern of increasing traffic of passenger vessels around Iceland. The traffic in Reykjavík harbour is of concern but also traffic near sensitive areas where big vessels are sailing close to shore and sometimes letting people on shore. Many sensitive areas are of concern. This must be evaluated by appropriate authorities and actions taken.

Figure below shows visits of cruise vessels to Icelandic harbours.



Appendix 2

Timeline

Time UTC	Timeline of events	Windspeed
21:00	Preplanning departure meeting conducted with the pilot involved.	
22:05	Norwegian Prima unmoored. Tug Magni on port side.	15-28 kn
22:06	Norwegian Prima starts moving astern out of port. Discussion on the bridge that the wind is increasing.	19-25 kn
22:08	Norwegian Prima is loose from the pier. Tug is clear of NP.	25-33 kn
22:10	Norwegian Prima sailed astern passing the breakwater.	20-40 kn
22:18	Norwegian Prima starts turning. In 8 minutes mostly 20 kn in gusts up to 32 kn.	20 kn, gusts to 32 kn
22:24	Tug pushes on starboard bow with full power.	25 kn
22:27	Norwegian Prima starts to increase speed forward.	30-45 kn
22:27´30	Pilot informs master that if Norwegian Prima drifts to north the only option is to turn to east to avoid getting the stern going on ground.	37 kn
	Pilot asks the tug for maximum power on bow as long as it can hold.	40-45 kn
22:29´44	Norwegian Prima is drifting and is informed that the tug cannot hold power.	45-52 kn
	Captain of the tug informs that NP is going over the buoy.	50 kn
22.31	Norwegian Prima is touching the buoy.	50 kn
22:31´55	Norwegian Prima sailed over the buoy.	50-54 kn
22:32´50	Norwegian Prima is about 35 metres from underwater rock.	50-54 kn
22:32´49	Norwegian Prima is 10 metres from underwater rock. Captain of the tug informs the pilot that the tug will sustain damages if he continues pushing. The pilot replies: „It doesn't matter continue pushing.“	50 kn
22.34´24	Norwegian Prima has its stern close to shallow water.	35-55 kn
22:34´51	Norwegian Prima is cleared from dangers and can disembark the pilot.	40- 55 kn

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