ACCIDENT REPORT

Report on the investigation of the contact

and grounding of the ro-ro passenger ferry

Pride of Kent

Calais, France

10 December 2017

MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

SERIOUS MARINE CASUALTY REPORT NO 3/2019 FEBRUARY 2019

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.

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

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

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

Press enquiries during office hours: 01932 440015
Press enquiries out of hours: 020 7944 4292

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

º/min	-	Degrees per minute
CoC	-	Certificate of Competency
ECDIS	-	Electronic chart display and information system
kts	-	knots
kW	-	kilowatts
MARPOL	-	International Convention for the Prevention of Pollution from Ships 1978
MGO	-	Marine gas oil
Navtex	-	Navigational and meteorological warning broadcast service
OOW	-	Officer of the watch
P&O Ferries	-	P&O Ferries Limited
Ro-ro	-	Roll-on roll-off
rpm	-	Revolutions per minute
SECA	-	Sulphur emission control area
STCW	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended
ULSFO	-	Ultra-low sulphur fuel oil
UTC	-	Co-ordinated universal time
VDR	-	Voyage data recorder
VHF	-	Very high frequency radio
VTS	-	Vessel traffic service

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

Photograph courtesy of Pieter Inpijn

Pride of Kent

SYNOPSIS

On 10 December 2017, the UK registered ro-ro passenger ferry *Pride of Kent* struck a jetty and then grounded while departing Calais, France. The ferry's starboard propeller and tail-shaft were damaged and required repair in dry dock. The jetty was also damaged but there were no injuries and no pollution.

Control of *Pride of Kent*'s movement was lost after the ferry had turned off its berth to head for the harbour entrance. Factors directly contributing to the loss of control included:

- The ferry's fast rate of turn as it passed through its intended heading.
- The loss of one of the ferry's two bow thrusters during the turn.
- Lateral movement resulting from leeway induced by winds exceeding 50 knots and the thrust effect of using full port rudder with maximum propeller pitch ahead.

Other factors that also had a bearing on decision-making, the bridge team's performance, and machinery reliability included:

- The master's concern that the wind speed might increase to over 40 knots, the threshhold for having a tug available, influenced the timing of the ferry's departure.
- The omission of a departure brief contributed to the master not being fully supported, and the inexperienced helmsman not being closely supervised.
- Fuel pump problems following a change to ultra-low sulphur fuel oil had occasionally resulted in bow thrusters tripping and reduced engine speed and shaft speeds when manoeuvring.

In view of the actions already taken by P&O Ferries Limited, *Pride of Kent*'s owner/operator, to improve the performance of its bridge teams and maintain machinery reliability, no recommendations have been made.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *PRIDE OF KENT* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Pride of Kent*
Flag	UK
Classification society	Lloyd's Register
IMO number	92441166
Type	Class II passenger ro-ro ship
Registered owner	P&O Ferries Limited
Manager(s)	P&O Ferries Limited
Construction	Steel
Year of build	1991
Length overall	179.7m
Beam	28.3m
Gross tonnage	30635
Authorised cargo	Passengers with cars, freight
VOYAGE PARTICULARS	
Port of departure	Calais, France
Port of arrival	Dover, UK
Type of voyage	Short international
Cargo information	208 passengers, 1752 tonnes cars and freight trucks
Manning	102
Maximum draught	6.40m aft
MARINE CASUALTY INFORMATION	
Date and time	10 December 2017: 1147
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Calais, France. 50º 58.3N 001º 51.0E
Place on board	Propeller/rudder/thruster, keel, engine room
Injuries/fatalities	None
Damage/environmental impact	Starboard propeller and tail-shaft
Ship operation	Manoeuvring
Voyage segment	Departure
External environment	Wind west-south-west force 9, gusting force 12 Calais low water 1133, height 1.57m
Persons on board	310

1.2 NARRATIVE

1.2.1 Aborted berthing on arrival in Calais

At 1005 on 10 December 2017, the ro-ro passenger ferry *Pride of Kent* was approaching Calais, France. On the bridge was the master, an officer of the watch (OOW), an assisting officer, and a helmsman. When the ferry was 1½ miles from the port entrance, the master took the conn from the OOW and briefed the bridge team that he would be keeping the vessel upwind during the approach to berth No.6 **(Figure 1)**. The wind was from the south-south-west at 25 knots (kts).

As *Pride of Kent* passed between the breakwaters, the master noticed that the wind speed had increased, and instructed the bridge team to inform him if there were any exceptional gusts. By 1018, the vessel was approaching berth No.6 and the master was controlling the vessel's movement from the starboard bridge wing control console **(Figure 2)**. The wind was then between 40 and 50kts on the starboard quarter. As the vessel's bow came close to the linkspan landing pads, the master assessed that he would be unable to keep the stern alongside the berth.

Pride of Kent's master immediately advised the bridge team that he was aborting the berthing and that tug assistance was required. He used the engines and bow thrusters[1] to manoeuvre the vessel astern and swing the bow to starboard. The OOW advised Calais Port vessel traffic service (Calais VTS) on very high frequency radio (VHF) channel 17 that the vessel would clear the berth and re-attempt the manoeuvre with a tug. Accordingly, Calais VTS arranged for a tug to attend.

At 1020, *Pride of Kent* was nearly perpendicular to berth No.6 when the assisting officer, who was at the centre console, announced that No.1 bow thruster had stopped. The master continued to turn the ferry to starboard with the assistance of the remaining bow thruster until it was head to wind. He then waited for the tug to arrive. The master assumed that the loss of No.1 bow thruster had been due to its intensive use.

By 1024, the engineers had advised the bridge that No.1 thruster was again available for use. Nine minutes later, *Pride of Kent*'s master manoeuvred the ferry to its berth with the tug *Chambon Suroît*[2] in attendance. The off-going passengers and freight were then disembarked. The ferry's main engines and bow thrusters were kept running as loading commenced for the return passage.

1.2.2 Departure, contact and grounding

Loading operations were completed on *Pride of Kent* by 1116 and the ferry's crew prepared for departure, which had been scheduled for 1035. As they did so, the ferry *Spirit of France* entered Calais with the two harbour tugs in attendance. The tugs had been requested as a precaution as only three of the inbound ferry's four main engines were in use. The wind was 30 to 40kts from the south-west and it was almost predicted low water.

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[1] *Pride of Kent* was equipped with two bow thrusters operated in parallel, each rated at 2000 kW. The forward bow thruster is referred to as No.1 and the aftermost bow thruster as No.2 (see paragraph 1.1.4).

[2] *Chambon Suroît* was one of two tugs available in Calais (see paragraph 1.6).

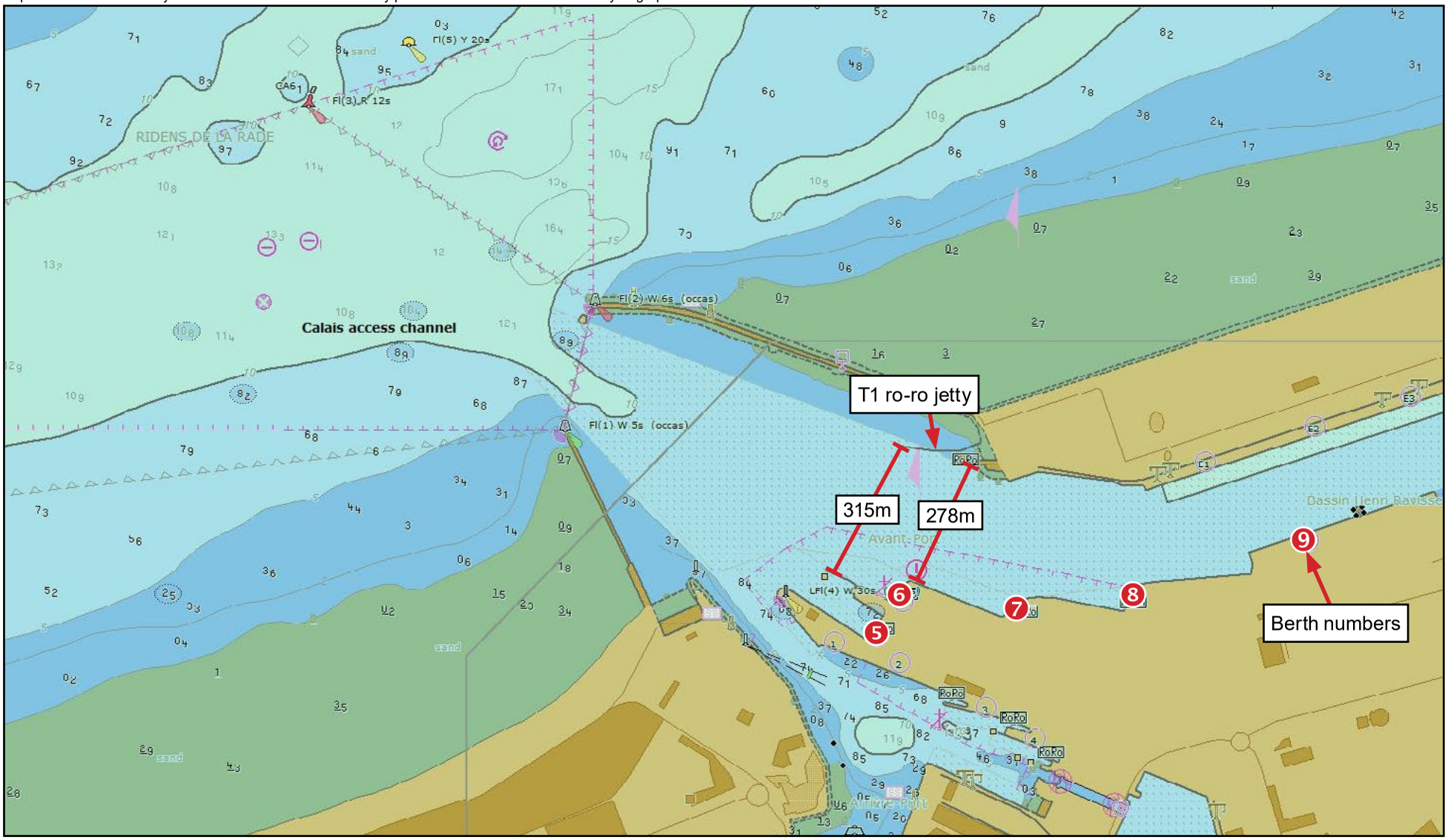

Figure 1: Port of Calais electronic chart extract from cells FR572580 and FR67258A

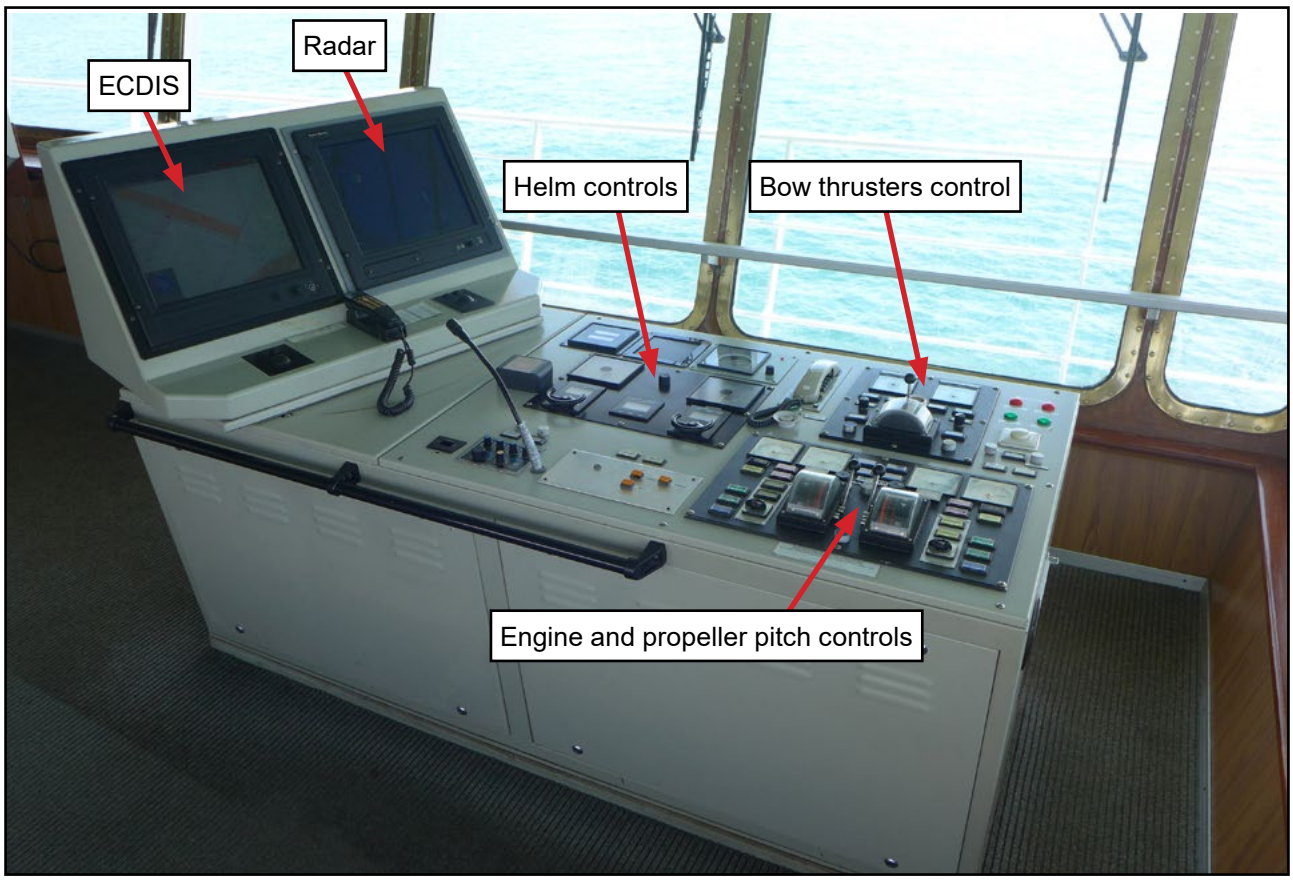

Figure 2: Starboard bridge wing control console

As *Spirit of France* passed down *Pride of Kent*'s port side, the following exchange took place between *Pride of Kent*'s bridge team:

1136:12	Master	*Right we done all this checklist?*
1136:18	OOW	*Just the brief and the topline*[3].
1136:21	Assisting officer	*So what's the situation then?*
1136:22	Master	*Situation we better go topline…we're hovering around 30 to 40 occasionally gusting.*
1136:28	Assisting officer	*You wanting a tug or not?*
1136:30	Master	*He's* [*Spirit of France*] *got both tugs.*
1136:31	Assisting officer	*I know he's got them are you gonna want one?*
1136:35	Master	*I don't think we're worried we came round relatively easily.*

Table 1: Bridge team exchange at 1136

Seconds later, the master announced '*topline*' to the bridge team and the OOW informed Calais VTS that *Pride of Kent* was ready to depart. Calais VTS requested confirmation that a tug was not required. In response, the OOW was prompted by

[3] 'Topline' is used in the ferry industry to confirm that a vessel is ready in all respects for departure.

the master to ask whether a third tug was available. Calais VTS advised that no other tugs were available, and again asked if a tug was required. On instruction from the master, the OOW informed Calais VTS that it was not.

Pride of Kent's master transferred control of the engines, thrusters and steering from the centre console to the starboard bridge wing console. He then switched the rudder controls to 'independent' mode to allow each rudder to be controlled by a separate lever. The helmsman and assisting officer went to the port bridge wing.

At 1138, *Pride of Kent*'s master ordered the mooring lines to be let go. The OOW joined the master at the starboard console and passed the order to the forward and aft mooring teams using his hand-held radio. The south-westerly wind remained at between 30 and 40kts.

By 1140, the mooring lines were clear and the stern had started to lift from the berth as intended. At 1141, the master manoeuvred the ferry astern, and then started to swing its bow to starboard **(Figure 3)**. Seconds later, the wind speed increased to a steady 45kts, gusting to 55kts.

At 1142:04, an engine overload proximity lamp illuminated on *Pride of Kent'*s bridge main engine control panel. The duty engineer in the engine room immediately contacted the bridge via a talkback system and, at the same time, the port shaft briefly reduced to 83rpm. Seconds later, audible and visual alarms on the centre console indicated that No.1 bow thruster had stopped. The helmsman went to the centre console and acknowledged the duty engineer and the alarms.

By now, the ferry was nearly perpendicular to the berth and swinging to starboard at a rate of 40º per minute (º/min). The assisting officer announced "*just the one thruster now*", which was acknowledged by the master. The duty engineer then advised via the talkback system that he would reset the thruster. The master heard the duty engineer but could not determine what he was saying due to the background noise.

Pride of Kent's master continued to turn the ferry using the No.2 bow thruster and main engines, and at 1144:28 it was heading into the wind **(Figure 4)**. At this point, the master changed the thrust direction of the bow thruster from starboard to port in order to slow the rate of turn, which had reached 58º/min.

At 1144:55, *Pride of Kent*'s master put both rudders to amidships as the ferry's heading approached 289º **(Figure 5)**. He then requested the helmsman to take steering control at the centre console and steer for the green light on the southern breakwater. The helmsman pressed the take-over button and moved the port (master) control lever[4] **(Figure 6)** to port 40º. The starboard helm control lever remained at amidships.

About 16 seconds later, the master noticed the difference in the rudder positions and told the helmsman to synchronise the rudders. Accordingly, the helmsman pushed the 'synchronised' button on the centre console and the starboard rudder moved to 40º (to port) to match the port rudder. The master was now becoming concerned by the ferry's continuing turn to starboard, so he set the propeller pitch controls at 'full ahead' and instructed the helmsman to steer further to the south.

[4] In 'syncronised' mode, the port lever controlled both rudders.

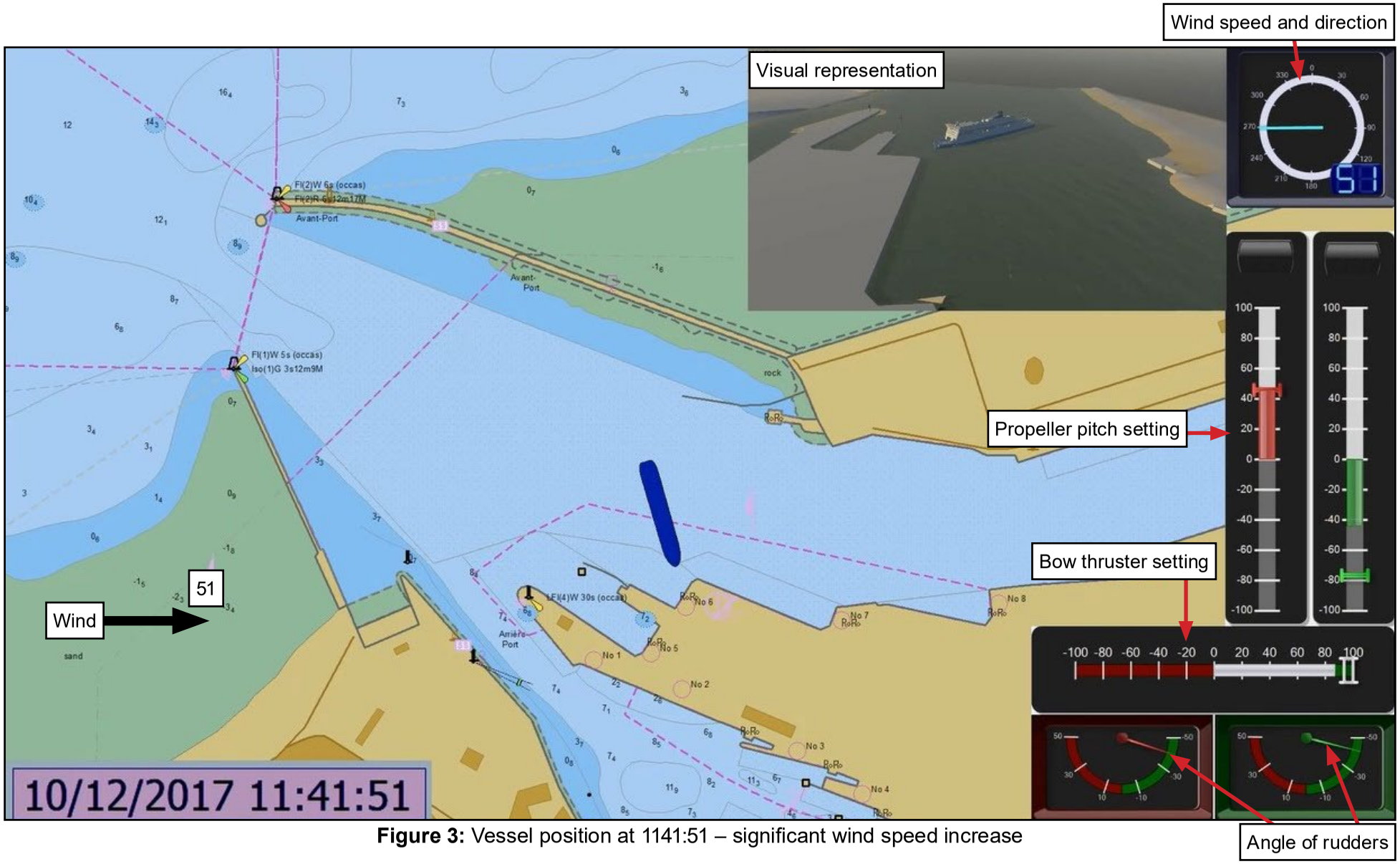

Figure 3: Vessel position at 1141:51 – significant wind speed increase

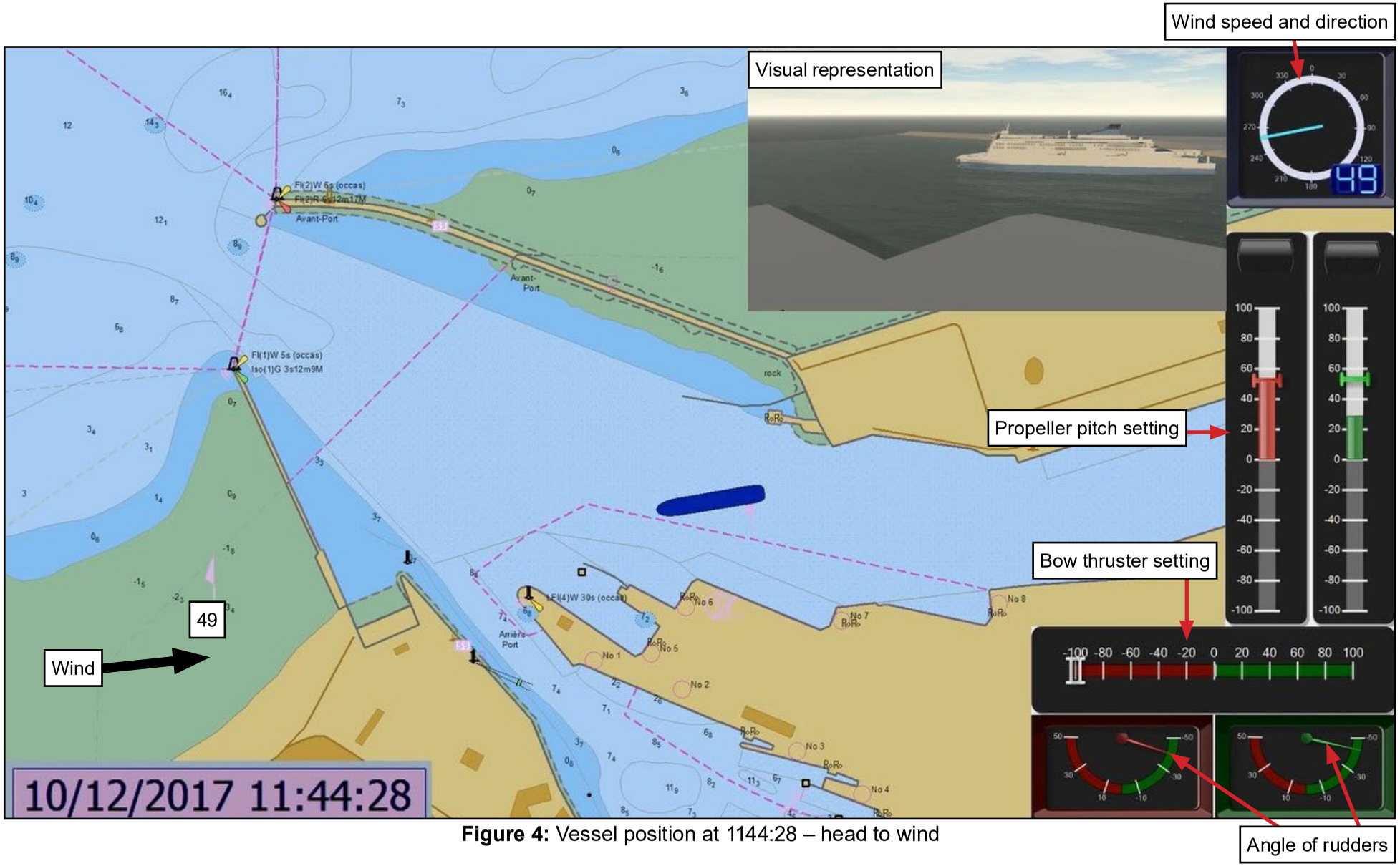

Figure 4: Vessel position at 1144:28 – head to wind

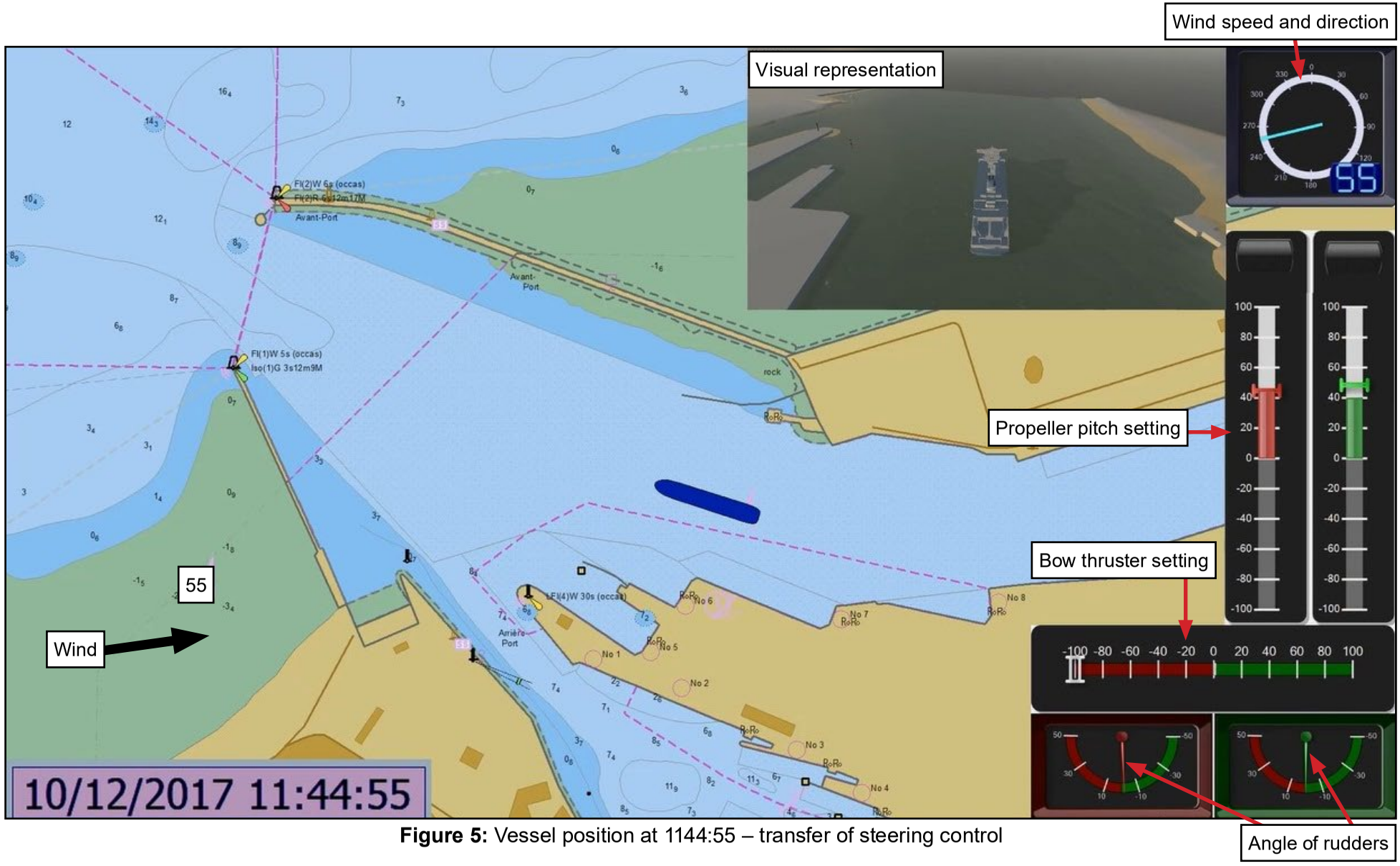

Figure 5: Vessel position at 1144:55 – transfer of steering control

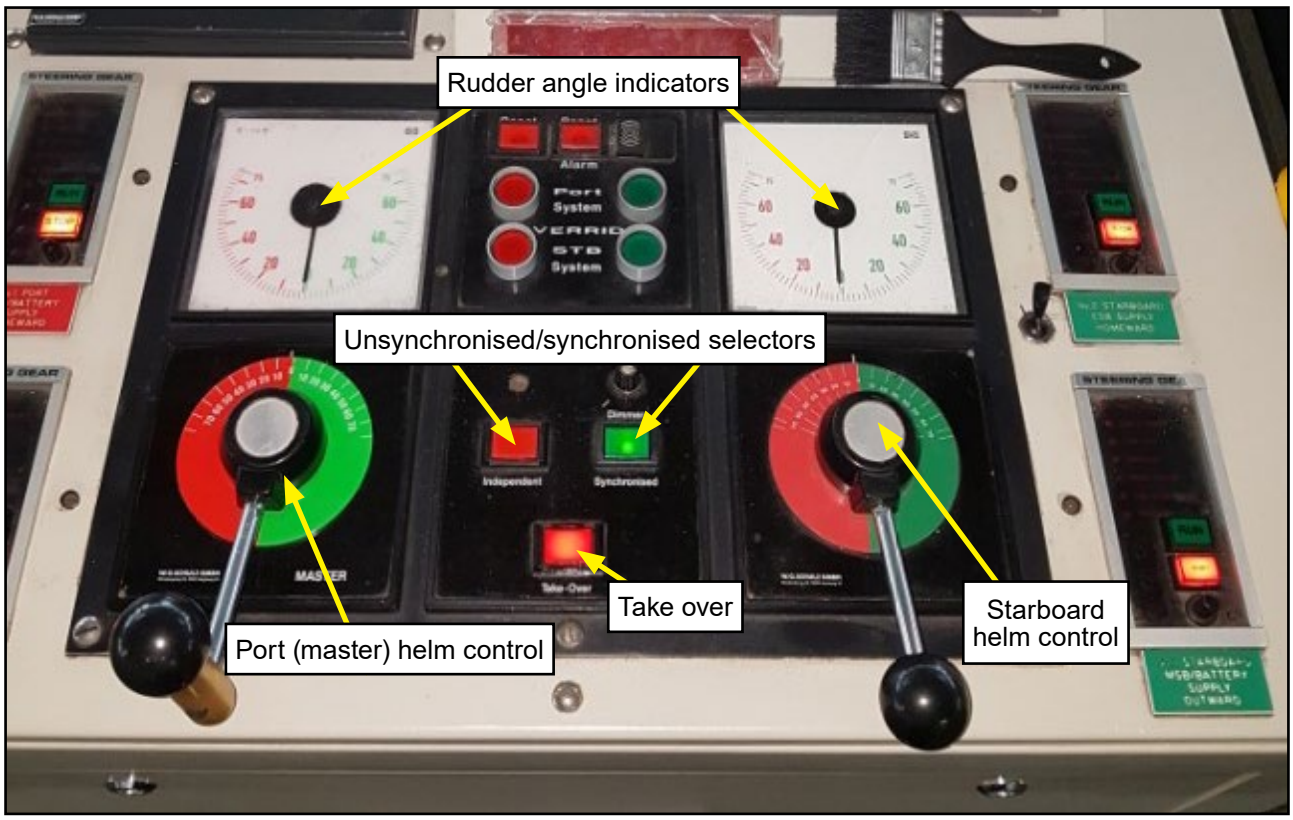

Figure 6: Main console steering control panel (centre console)

By 1145:30 *Pride of Kent*'s heading had reached 309º and, although the ferry was no longer turning to starboard, the helmsman informed the master that it was not responding to his attempts to turn back to port:

1145:34	Helmsman	*It's not coming round.*
1145:36	OOW [on the starboard bridge wing]	*It's getting a bit close to…*
1145:37	Assisting officer	*You got controls in the middle yet?*
1145:41	Master	*We've got the controls in the middle the rudder is over.*
1145:43	Helmsman	*Still isn't coming over.*

Table 2: Bridge team exchange at 1145

Pride of Kent was now close to the T1 ro-ro jetty and the OOW started to provide a commentary of the distance to the piles and walkway.

Pride of Kent continued to close T1 and, at 1146:14, the ferry's starboard side struck the jetty piles. The ferry moved ahead with the propellers still turning and the rudders full to port. About 20 seconds later, the starboard propeller shaft stopped on overload and the ferry then grounded in the shallow water to the west of the jetty **(Figure 7)**. The wind was now gusting up to 70kts.

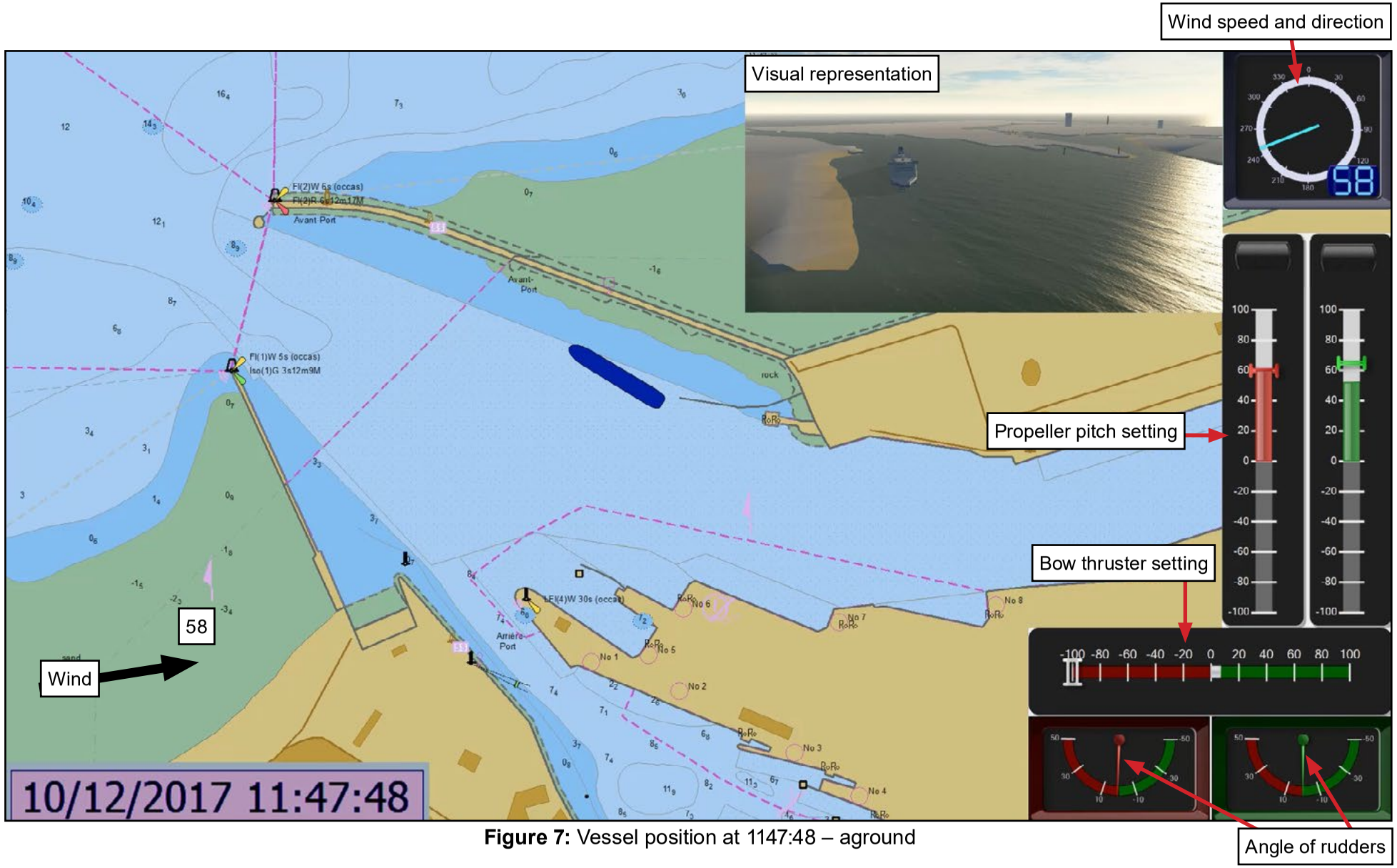

Figure 7: Vessel position at 1147:48 – aground

1.2.3 Post-grounding

Soon after *Pride of Kent* grounded, the master ordered the duty engineer to shut down the main engines. At the same time, the OOW informed Calais VTS that the ferry was aground, and requested tug assistance. In addition, the assisting officer started the grounding checklist.

Pride of Kent's master informed the crew of the situation, who then checked for damage and water ingress. He also informed the passengers and P&O Ferries Ltd (P&O Ferries), and saved the voyage data recorder (VDR) information. By 1206, lines from *Chambon Suroît*, and *Chambon Noroît* were secured to *Pride of Kent* and the tugs were used to keep the ferry clear of the T1 ro-ro jetty.

Meanwhile, the Calais harbourmaster closed the port to traffic and activated the port's emergency plan. With the agreement of P&O Ferries' locally based fleet operations manager, the harbourmaster also arranged for additional tugs to be sent from Dunkirk, France. At the same time P&O Ferries established a crisis cell at its main office in Dover.

By 1430, *Pride of Kent* had re-floated on the rising tide and was secured alongside the T1 ro-ro jetty. At about 1615, Calais port was re-opened, and by 1715 the wind speed had abated to less than 40kts. Two tugs from Dunkirk had also been made fast. These were used to tow *Pride of Kent* to berth No.9 **(Figure 1)**, where its passengers and freight were disembarked.

Pride of Kent was inspected by its crew and a Lloyd's Register surveyor. Damage to the starboard tail-shaft and propeller resulted in the ferry being taken out of service and dry docked in Dunkirk for repair. The walkway and piles on the T1 ro-ro berth were also damaged.

1.3 RECORDED DATA

Pride of Kent's VDR data included heading, speed over the ground, propeller pitch, rudder angle, bow thruster direction and power percentage, rate of turn, and wind speed and direction. This data has been included in a number of the previous figures and is tabulated alongside the key events leading up to the ferry's grounding at **Annex A**.

Due to channel limitations, *Pride of Kent*'s VDR was configured to record the bow thrusters only when running in parallel. Consequently, when No.1 thruster was not running, the running signal for No.2 bow thruster was not recorded. However, the thruster control demand settings for both No.1 and No.2 thrusters were recorded throughout. The clarity of the bridge audio recorded on the VDR was frequently reduced by ambient noise, particularly due to the wind, which frequently made the conversations difficult to hear and comprehend.

Wind information based on data from *Pride of* Kent's anemometer is shown graphically at **Annex B**. **Figure 8** is a screen shot of the ferry's electronic chart display and information system (ECDIS) playback, which shows the intended route, position and heading shortly before grounding. It also shows the ferry's predicted position and heading.

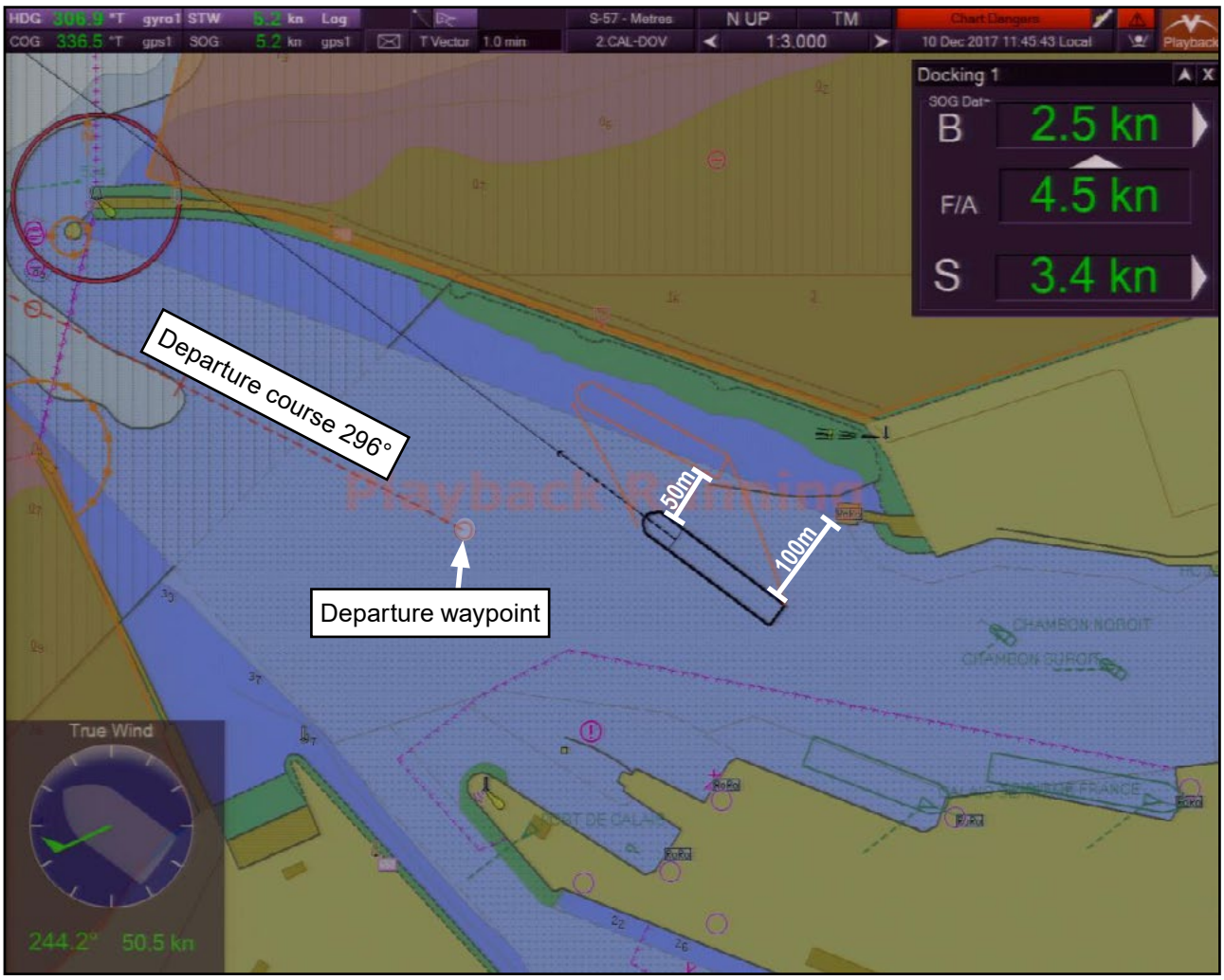

Figure 8: ECDIS playback screenshot at 1145:43 showing lateral speed and bow/stern clearances

1.4 VESSEL

1.4.1 General

Pride of Kent was built in 1991 for freight cargo and traded as *European Highway* until 2003 when it was converted to a ro-ro passenger ship and re-named. The conversion included the fitting of high lift rudders and more powerful bow thrusters.

Pride of Kent was one of six roll-on roll-off passenger ferries operated by P&O Ferries on the Dover to Calais route. It was scheduled to complete four or five round trips daily, with each crossing lasting about 1½ hours. The ferry carried a day crew and a night crew, each working a 12-hour shift. In common with other P&O ferries, the crews followed a duty cycle of 1 week on, 1 week off.

1.4.2 Bridge team

Pride of Kent's master joined P&O Ferries in 1993 as a navigating officer. He held an STCW II/2 Master Unlimited certificate of competency (CoC) and had been a master on board *Pride of Kent* since March 2014. The master was considered by P&O Ferries to be cautious and to follow procedures. He was also regarded as a confident shiphandler, and review of VDR data from previous voyages indicates that

he routinely gave arrival and departure briefs to the bridge team. *Pride of Kent*'s arrival in Calais during the morning of 10 December 2017 was the first occasion that he had aborted a berthing in Calais.

The OOW was a second officer and had been at sea since 2010. He had worked for P&O Ferries since 2014 and had served on all the company operated ferries on the Dover to Calais route. The OOW held an STCW II/1 Officer in Charge of a Navigational Watch Unlimited CoC.

The assisting officer was also a second officer and had been at sea since 1970. He joined P&O Ferries in 1995 and had served on three ferries on the Dover to Calais route. He also held an STCW II/1 Officer in Charge of a Navigational Watch Unlimited CoC.

The helmsman joined P&O Ferries in September 2016 as a deck apprentice and was promoted to able seaman in March 2017. He was awarded his steering certificate during his apprenticeship, but had only worked as a helmsman during the 4 days before the accident to cover a gap in crew rotation. In preparation, he had received additional steering training from an experienced helmsman, which had been focused on steering when the ship had significant headway. The training did not cover the dynamics of high lift rudders and large rudder angles.

1.4.3 Bridge layout, equipment and controls

Pride of Kent's enclosed bridge was fitted with three control consoles; one on the centreline and one on each bridge wing **(Figure 9)**. Each of the consoles was equipped with a radar display, an ECDIS, VHF radio and control panels for the main engines, propeller pitch, bow thrusters and steering. Only the centre console was fitted with a talkback system for communicating with the engine control room, and a rate of turn indicator.

1.4.4 Propulsion and steering

Pride of Kent was equipped with two shafts with controllable pitch propellers, each driven by two main engines (outer and inner). Each propeller shaft powered a shaft alternator, which provided power to two 2000kW bow thrusters. No.1 thruster (nearest the bow) was powered by the port shaft generator and No.2 by the starboard shaft generator. The power output from the shaft generators reduced automatically if the shaft speed reduced to below 145rpm.

The four main engines were protected by an alarm and automatic power reduction system. The alarm activated on the bridge console when the engine load reached 100%. If the load on the engines then exceeded 100% the engine protection system reduced the propeller pitch in order to return the engine load to within acceptable limits. When this occurred, the performance of the bow thrusters was not affected.

Steering was via two high lift rudders on which flaps enabled the effective rudder angle to be doubled. For example, with the rudder set at an angle of 40º, its effective angle was 80º.

Figure 9: Fully enclosed bridge arrangement

1.4.5 Fuel system

In June 2017, the fuel used on board *Pride of Kent* was changed from marine gas oil (MGO) to ultra-low sulphur fuel oil (ULSFO) to reduce vessel running costs. Both fuel types complied with emissions requirements for ships within the North Sea Sulphur Emission Control Area (SECA).

Since the introduction of ULSFO, the main engines' fuel pumps had suffered from increased wear, which resulted in, among other things, difficulty in starting and clutching in, the engines alarming on overload more frequently, high exhaust gas temperatures, and reduced power output that resulted in speed reductions of between 1 and 2kts when on passage. Additionally, the main engine fuel pumps' serviceable life was reduced by as much as 5 years to as little as 2 months. This resulted in all the main engine fuel pumps fitted on board *Pride of Kent* being replaced between August and November 2017. Following the introduction of ULSFO, although the bow thrusters had occasionally tripped, the cause of their failure had not been associated with the degradation of the fuel pumps.

The problems encountered following the introduction of ULSFO on board *Pride of Kent* were reported to P&O Ferries' technical superintendent and were reflected in the chief engineers' end of month reports. However, the status of the main propulsion was recorded as '*satisfactory'* in the ferry's weekly status reports.

Investigation by the propulsion control system's manufacturer in July 2017 indicated that the engine problems being experienced were probably linked to the performance of the fuel pumps. The performance of the fuel pumps was referred to Lloyd's Register technical investigation department in October 2017, but resulting remedial work did not improve the situation and the associated engine problems continued.

1.5 SAFETY MANAGEMENT

1.5.1 Masters' responsibilities

P&O Ferries issued procedures to its ships in the form of fleet regulations, which included:

> *Before leaving the berth and proceeding to sea, the Master must make a full assessment of the ship's readiness to sail. He must ensure that all statutory and Company requirements have been complied with. It is the master's specific responsibility to assess any deficiencies and then either satisfy himself that they are acceptable or require them to be rectified before sailing. Provided that the ship is in all respects ready for sea, the Master may then order the ship to sail.*

and:

> *Before every departure and arrival the Master must ensure that all members of the bridge team and mooring deck personnel, as appropriate, are aware of his intentions and that they are encouraged to challenge him at any time they feel set safety limits are not being met or are uncertain as to his intentions.*
>
> *Briefing should be short (approx. 6 points only) and should cover the risks existing until the next intended briefing. They should be frequently delivered so that the bridge team members clearly understand the intended plan and their role in monitoring it at each stage of the pilotage (eg before departure, after swinging, before clearing harbour entrance/lock, in approach channel river & hand over to OOW).*
>
> *He is to thoroughly brief them of the intended voyage plan, manoeuvre and risks to safe navigation prevailing at the time. To ensure that the plan is fully understood by all team members he shall not commence until certain that all are focussed on the briefing and are giving it their full attention.*
>
> *He is to instruct on the deployment of resources to ensure proper monitoring of the ship's track and port transit. He is to ensure that responsibilities and team roles are clearly understood by all of the bridge team and is to augment his team if additional resources are required at any time.*

1.5.2 Senior master's advice

P&O Ferries' fleet regulations required its senior masters to provide ship-specific advice to other masters. With respect to ship-handling, *Pride of Kent*'s '*Senior Master's Advice to Masters*' included general guidance on the use of tugs, the use of the anchors, the avoidance of vibration and manoeuvring in severe weather. It also recommended manoeuvres for specific arrival and departure scenarios. In particular, the advice included:

- *In all winds of 40 kts or more tug assistance should be considered. In all winds of 50 kts or more a second tug should be considered. [sic]*

- *If only one thrust is available consider ordering a tug in winds over 25 knots.*

- *The ship is subject to a significant increase in leeway when the wind is more than 2 points off the bow or stern.*

- The power of our thrust is about 52 tonnes.

  30 knots of wind on the beam produces 43 tonnes of thrust.

  35 knots of wind on the beam produces 59 tonnes of thrust.

  40 knots of wind on the beam produces 77 tonnes of thrust.

  These figures will vary immensely as the ship pitches and rolls but are mentioned as a guide.

  It must be borne in mind that the duty master will not commence a manoeuvre until taking into consideration his own dynamic risk assessment from his own personal experience. [sic]

- *Commercial considerations should never be a factor in your decision making process. If, after considering all prevailing factors, a duty master is in any doubt as to whether he can complete a manoeuvre safely, then such a manoeuvre should not be attempted. If you deem it necessary, abort a manoeuvre or stand off a port and wait for more favourable conditions.*

In relation to departure from Calais in south-westerly winds, the advice stated:

-40 kts *The stern will lift off very quickly with the offshore wind, but should be able to depart unaided.*

40-45 kts *Consider a tug to stand by to push bow up into the wind as you turn*

+45 kts *Order a tug to push under the port shoulder as the vessel swings round.* [sic]

The advice also stated:

> *In heavy weather conditions always have an abort contingency plan (i.e. head into wind),* and
>
> *If there is an element of doubt on whether you feel a tug is need then my advice is to order one. Gusts of wind can pick up very quickly in this area, and it is a comforting to know that a tug is standing by waiting to assist if required.*[sic]

1.6 PORT OF CALAIS

Calais is France's busiest port for passenger traffic, with ships departing every 20 to 30 minutes. The port handles predominantly cross-channel passenger and freight traffic. Movements inside the port are controlled by Calais VTS, which is manned continuously and also co-ordinates tug requirements and provides tidal and weather information. The port was last surveyed in June 2017 and the charted depths in the main channel off berth No.6 were at least 9m.

The tugs *Chambon Suroît* and its sister *Chambon Noroît*, each with a bollard pull of 65 tonnes, were available 24 hours each day.

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 LOSS OF CONTROL

After sailing, *Pride of Kent* initially turned off berth No.6 as intended. However, the ferry's heading was not steadied until it was more than 10º beyond the planned exit track between the breakwaters of 296º. The ferry was still making little headway and was quickly closing T1 ro-ro jetty **(Figure 8)**. Despite the use of maximum pitch ahead on both shafts, No.2 bow thruster at maximum thrust to port and full helm to port, *Pride of Kent*'s lateral movement towards the ro-ro jetty could not be arrested. Control of the ferry's movement was almost lost completely as soon as the starboard propeller shaft stopped on hitting the jetty.

Control of the ferry's movement was lost due to:

- The fast rate of turn.
- The timing and reduced effectiveness of the actions taken to check the swing.
- The loss of No.1 bow thruster.
- Winds exceeding 50kts acting on the ferry's port side.
- The use of full port rudder with maximum propeller pitch ahead.

Factors influencing the master's decisions included the wind speeds. However, the initial berthing attempt in Calais having to be aborted, and the resulting delay to the ferry's departure, potentially also had a bearing.

2.3 CONSIDERATIONS FOR DEPARTURE

Before sailing from Calais, *Pride of Kent*'s master had much to consider. He had aborted a berthing for the first time in this port during his 3 years in command, which potentially dented his confidence to some degree. It also resulted in a delay of over 40 minutes to the ferry's scheduled departure time. The master's actions, conversations and decisions prior to departure indicate that the delay, together with the wind conditions, might have induced the master to subconsciously impose pressure on himself to sail as soon as possible.

From the master's perspective, there was no reason for *Pride of Kent* not to sail as soon as the passengers and freight had been loaded and the ferry was '*topline*'. The difficulty he anticipated was turning the vessel into the wind, but he had recently turned the ferry off the berth with one bow thruster and, although a tug had been available, it had not been used. Conducting the same manoeuvre on departure in similar wind conditions without a tug would have appeared to be challenging but achievable.

However, it is implicit from *Pride of Kent*'s master's mention of the wind speed and the ferry being '*topline*' **(Table 1)** that he was concerned that the wind speed might increase to over 40kts, the threshold for having a tug available in the senior master's advice (paragraph 1.5.2). This led to the master opting to sail without taking time to brief the bridge team, which was a P&O Ferries requirement and had been identified to him by the OOW as an event still to be conducted. The omission of the brief was at variance with the master's more usual cautious and procedural approach and indicates a preoccupation with expediting *Pride of Kent*'s departure coupled with consideration of the impending manoeuvre.

2.4 TURNING MANOEUVRE

Initially, *Pride of Kent*'s departure went to plan, with the ferry coming off berth No.6 and turning readily to starboard, despite the loss of No.1 thruster. However, although the master reversed the direction of No.2 thruster from starboard to port as the ferry came into wind on a heading of about 260º (Figure 4), this did little to slow the rate of turn, which had reached almost 60º/min. That the master passed control of the steering to the helmsman, and set both propellers to full ahead less than 30 seconds later (Annex A), indicates he was possibly relieved, to some extent, that the anticipated difficult phase of the departure manoeuvre had been completed. He had not appreciated the significance of the continuing fast rate of turn combined with the limitations of the single bow thruster in winds that were now exceeding 50kts.

When control of the steering was passed to the helmsman, *Pride of Kent*'s heading was passing through 289º and the green light on the breakwater, which the helmsman was ordered to steer towards, was already directly ahead (Figure 5). It was only after the rudders were eventually synchronised, full port helm applied and both propellers set to maximum pitch ahead, that the heading was steadied. By then, *Pride of Kent*'s heading had reached 309º and the wind, which had increased to over 50kts, was about 60º on the port bow. Extrapolation of the windage data shown in paragraph 1.5.2 (Table 3) indicates that a wind speed of 50kts would have resulted in approximately 120 tonnes of force acting on *Pride of Kent*. This was more than five times the force generated by the single bow thruster.

Wind speed kts	30	35	40	45	50	55	60	65	70
Force in tonnes	43	59	77	98	121	146	174	204	263

Table 3: *Pride of Kent* windage (wind more than 20º off the bow)

Although use of full port rudder and maximum propeller pitch ahead helped arrest *Pride of Kent*'s turn to starboard, it also exacerbated the ferry's movement towards the ro-ro jetty. The ferry was making minimal headway through the water, and the forces generated by the water flow from the propellers at maximum pitch passing by the fully angled high lift rudders would have pushed the stern to starboard. Along with the wind-induced leeway, this thrust effect at the stern resulted in a lateral speed of about 3kts towards T1 ro-ro jetty, leaving the master less than 1 minute to decide on any avoiding action to be taken. The helmsman's use of full rudder angle to try and steer the ferry towards the end of the breakwater was well intended, but it reflected his relative inexperience in steering at minimal speed and his lack of training on high-lift rudders.

2.5 RESOURCE MANAGEMENT

The omission of a departure brief prior to *Pride of Kent* sailing from Calais was significant, despite the master, OOW and assisting officer all being familiar with the departure manoeuvre from berth No.6. Although the master commented on the wind and the intended turn before sailing **(Table 1)**, neither the specifics of the manoeuvre nor his concerns were verbalised. In addition, the importance of monitoring the rate of turn in the wind conditions experienced was not identified and the opportunity to acknowledge the relative inexperience of the helmsman was missed. Consequently, other than the assistant officer probing the master regarding the use of a tug and advising on the loss of the bow thruster, and the OOW monitoring the distance to T1 ro-ro jetty after control had been lost, the master was not fully supported. The actions of the helmsman were also not closely monitored.

The repetitive nature of short-sea ferry operations is prone to devalue some of the tools used in bridge resource management. Bridge teams are invariably familiar with the characteristics of their vessel, the ports, berths, the manoeuvres usually undertaken, and the procedures followed. As, commonly, little changes from one arrival and departure to the next, briefings can appear to have little benefit. However, as shown by the circumstances of this case, in which the external environment and internal pressures made the situation more complex than usual, briefings are vital in ensuring that bridge teams are aware of the plan and their roles, particularly in connection with monitoring, reporting, interventions and challenges.

2.6 CONTINGENCY PLANNING

The senior master's advice (paragraph 1.5.2) recommended tugs be used in wind speeds of 40kts or higher. However, it also stated that a tug should be ordered to assist if required where there was an element of doubt. In this case, although *Pride of Kent*'s master's decision, not to wait for a tug, was justified to the extent that the ferry turned head to wind without difficulty, his enquiry regarding the possibility of an additional tug being made available indicates a degree of uncertainty existed. Even so, despite the variability of the wind speed and the use of No.1 bow thruster having been lost temporarily during the ferry's arrival into Calais, the possibility of something going wrong during the intended manoeuvre was overlooked.

Consequently, when control of *Pride of Kent* was lost, the bridge team were taken by surprise and were uncertain of the action to take. Although it is evident that the master continued to hope that he could drive the ferry clear, keeping the shafts turning increased the likelihood of the starboard propeller and shaft being damaged. In hindsight, stopping engines and drifting on to the jetty with the shafts stopped, might have resulted in less damage. It might also have prevented the ferry from grounding. Given the prevailing wind strength and the earlier failure of No.1 bow thruster during the ferry's arrival, it would have been appropriate for contingency options to have been included in the pre-departure brief. The lack of a brief prior to departure resulted in this opportunity being missed.

2.7 MACHINERY RELIABILITY

Pride of Kent's No.1 bow thruster tripped during the ferry's arrival and departure from Calais on 10 December due to the reduced performance of the port main engines' fuel pumps. The resultant inability of the pumps to supply fuel to the port main engines at the rate required to keep the engines operating close to overload

resulted in a reduction of the engines' speed before the automatic pitch reduction system cut in. As a result, the shaft speed reduced below 145rpm, the shaft generator tripped, and the No.1 bow thruster stopped.

The occasional tripping of a bow thruster was one of several problems experienced following the change of fuel type from ULSFO from MGO 6 months earlier, although the master was not aware of this connection. Other problems associated with the introduction of ULSFO, which also impacted on *Pride of Kent*'s manoeuvrability, included the port engines alarming on overload more frequently, and reduced engine and shaft speeds. At a technical level, these problems were reported by the ferry's engineers, and P&O Ferries acted quickly to try and resolve them. The fuel pumps were replaced, and technical investigations were undertaken.

However, at the operational level, the continuing issues associated with the fuel pumps' performance on board *Pride of Kent* did not unduly impact on the ferry's schedule, which resulted in the status of the ferry's main propulsion being assessed on board as 'satisfactory' throughout. This assessment did not reflect the increased likelihood of a bow thruster tripping, and reduced main engine and shaft speeds when manoeuvring. In view of the potential impact of these deficiencies on the ferry's manoeuvrability, a more critical approach was warranted.

SECTION 3 - CONCLUSIONS

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

1. Control of *Pride of Kent*'s movement was lost due to a combination of factors, including the timing and effectiveness of the actions taken to check the ferry's fast rate of turn, winds in excess of 50kts acting on the port side, and the use of full port rudder with maximum propeller pitch ahead. [2.2]

2. The aborted berthing manoeuvre on arrival, the resulting delay to the ferry's schedule, and the wind conditions, might have induced the master to subconsciously impose pressure on himself to sail as soon as possible, and probably led him to opt to sail without briefing the bridge team on the departure manoeuvre. [2.3]

3. After the ferry's heading had passed through the wind, the master had not appreciated the significance of the continuing fast rate of turn combined with the limitations of the single bow thruster in winds that were now exceeding 50kts. [2.4]

4. By the time *Pride of Kent*'s heading was steadied, it had reached 309º and the wind, which had increased to over 50kts, was about 60º on the port bow. The resulting windage was more than five times the force generated by No.2 bow thruster. [2.4]

5. The ferry's movement towards T1 ro-ro jetty was exacerbated by the lateral forces generated by the water flow from the propellers at maximum pitch passing by the fully angled high lift rudders. [2.4]

6. The helmsman's use of full rudder angle was well-intended but reflected his relative inexperience and a lack of training on high-lift rudders. [2.4]

7. The omission of a departure brief prior to *Pride of Kent* sailing from Calais contributed to the master not being fully supported, and the actions of the inexperienced helmsman not being closely monitored. [2.5]

8. Despite the variability of the wind speed and the use of No.1 bow thruster having been lost temporarily during the ferry's arrival into Calais, the possibility of something going wrong during the departure manoeuvre was not considered. [2.6]

9. The actions taken immediately prior to *Pride of Kent* colliding with T1 ro-ro jetty indicate that the master continued to hope that he could drive the ferry clear. However, by keeping the shafts turning, the likelihood of damage to the starboard propeller and shaft was increased. [2.6]

10. *Pride of Kent*'s No.1 bow thruster tripped during the ferry's arrival and departure from Calais on 10 December due to the reduced performance of the port main engines' fuel pumps. Problems with the fuel pumps had been experienced since the introduction to ULSFO 6 months earlier. [2.7]

11. The increased likelihood of a bow thruster tripping and reduced main engine and shaft speeds when manoeuvring, warranted a more critical assessment of the status of the ferry's propulsion. [2.7]

SECTION 4 - ACTION TAKEN

4.1 ACTIONS TAKEN BY OTHER ORGANISATIONS

P&O Ferries Limited has:

- Developed a simulator-based programme of training for masters to include, among other things, machinery failures and emergencies.
- Highlighted to its fleet the requirement for effective bridge team briefings, contingency plans, and allowances for deficiencies in vessel performance.
- Amended its fleet regulations with regard to bridge resource management and tug requirements.
- Reverted to the use of MGO on board *Pride of Kent* pending assessment of the problems associated with ULSFO.
- Introduced a procedure to monitor the performance of its bridge teams with a focus on bridge resource management, including the effectiveness of helmsman training, taking into account the value of onboard assessments.
- Developed and implemented a plan for monitoring and assessing the impact of ultra-low sulphur fuel on the reliability and performance of *Pride of Kent*'s propulsion should it be re-introduced in the future.

SECTION 5 - RECOMMENDATIONS

In view of the actions already taken, no recommendations have been made.

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