MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

SERIOUS MARINE CASUALTY | REPORT NO 24/2015 | NOVEMBER 2015

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Dover Seaways' contact with the South Breakwater, Dover

9 November 2014

SUMMARY

On 9 November 2014, the cross-channel ferry *Dover Seaways* struck the end of a breakwater while departing from Dover, United Kingdom for passage to Dunkirk, France. The ferry's bow was damaged but the vessel returned to its berth without assistance. The impact resulted in several minor injuries to passengers and crew. There was no pollution.

The contact with the breakwater resulted from a loss of directional control as *Dover Seaways* turned towards the harbour's eastern entrance. The ferry's engines were set to 'full astern' and the starboard anchor was let go, but these actions did not prevent the ferry from running into the breakwater at 3.5kts. No announcement was made to warn the passengers and crew.

Dover Seaways

The loss of directional control was due to a change in the mode the steering control system was operating. The change in steering mode was not intentionally initiated and remains unexplained. The response of the bridge team was positive but the action to stop the ferry was taken too late.

This accident occurred 17 months after the ferry *Sirena Seaways* made heavy contact with the quay in Harwich, United Kingdom, after which DFDS A/S was recommended to consider ways in which passengers and crew could be warned of an impending accident.

A recommendation has been made to the ferry's owner intended to improve the response of its bridge teams in emergency situations and to reduce the likelihood of passenger and crew injuries.

FACTUAL INFORMATION

Narrative

During the morning of 9 November 2014, *Dover Seaways* was alongside Dover Ferry Terminal Berth 3 **(Figure 1)**. By 0745, the ferry was being made ready for its next crossing to Dunkirk, France, and the on-duty master and the chief officer had joined the on-watch quartermaster[1] on the bridge. The stern ramp was housed and at 0754 the engines were placed on standby[2].

Dover Seaways sailed at 0756. The master manoeuvred the vessel from the port wing control console **(Figure 2** and **3)** where he controlled the propulsion, steering and thrusters. The chief officer accompanied the master while the quartermaster was by the starboard wing control console checking that the starboard side was clear. The wind was south-westerly at between 7 and 10kts. It was daylight and the visibility was good.

As *Dover Seaways*' stern cleared the piers, the master increased speed by setting the engine control to between 'slow ahead' and 'half ahead'. He also applied 10º of port helm to turn the vessel toward the port's eastern entrance between the Eastern Arm and the South Breakwater **(Figure 1)**. Meanwhile, the quartermaster moved to the radar display to port of the centre control console **(Figures 2** and **4)** and started to track radar targets that were likely to be encountered outside the port.

At 0758, the quartermaster heard a 'double-beep' from the centre control console, indicating that the mode of steering control had changed. He asked the master if he still had control of the steering. In response, the master increased port helm.

Almost immediately, *Dover Seaways* started to turn to starboard. The master ordered the quartermaster to put the steering in 'main wheel' control[3] and apply full port helm. Within seconds the master realised that the vessel would not be able to pass through the entrance as planned.

Dover Seaways was about 250 metres from the northern end of the South Breakwater, making a speed of 10.4kts, when the master set the engine controls to 'full astern'. He also set the thrusters to 'full' thrust to port and ordered the anchors to be let go[4]. Accordingly, the chief officer warned the crew on the forecastle and then the quartermaster activated the anchor release switches **(Figure 5)** on the bridge.

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[1] Quartermaster is the term given by DFDS A/S to its navigational watch ratings.

[2] Standby indicates that all machinery is ready for immediate use by the bridge.

[3] 'Main wheel' is the ship's steering wheel sited in the centre of the bridge **(Figure 7)**.

[4] There is conflicting evidence about the orders given. The master either ordered the port anchor to be let go followed by 'let go both' or he ordered 'let go both' soon followed by an order to let go only the port anchor.

Reproduced from Admiralty Chart BA 1698-0 by permission of the Controller of HMSO and the UK Hydrographic Office.

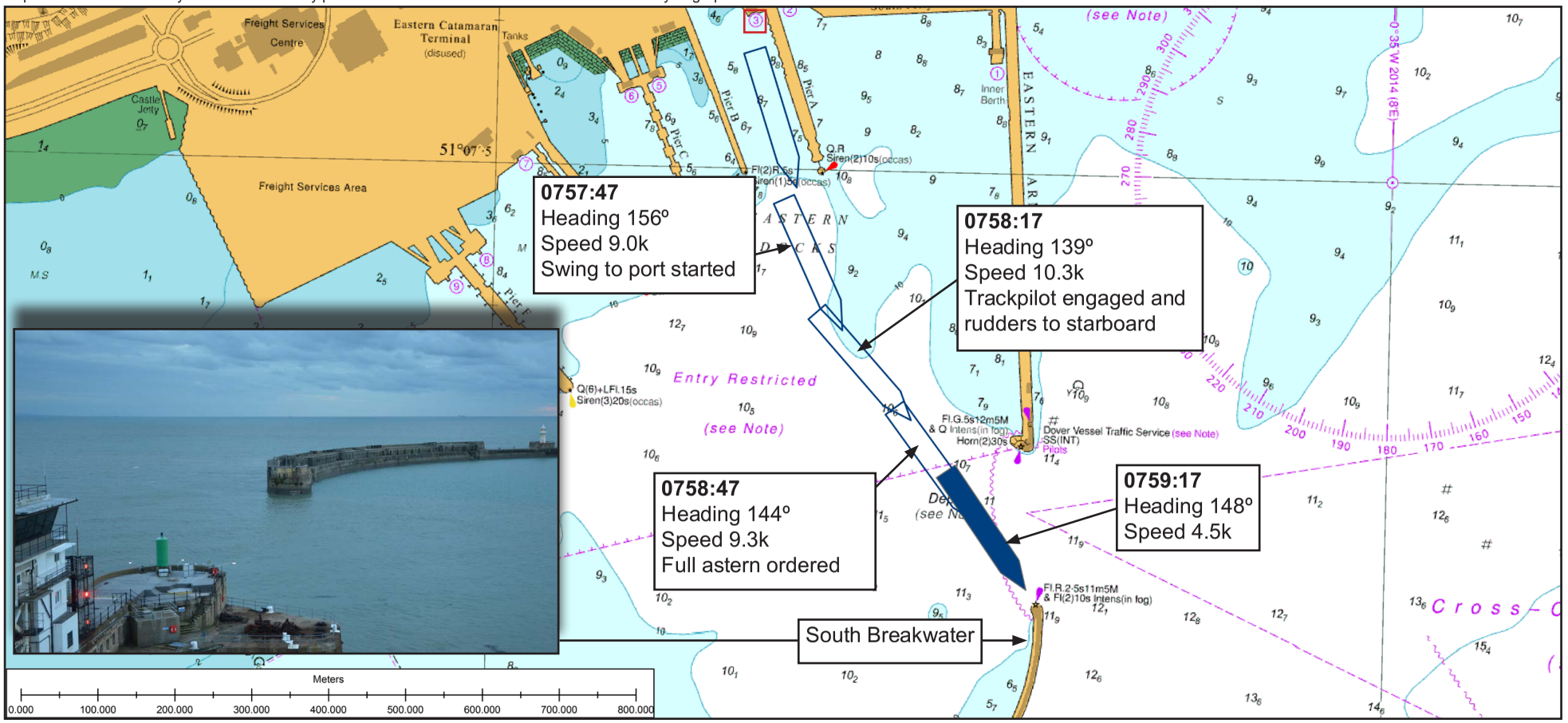

Figure 1: AIS plots of *Dover Seaways* with inset of Eastern Entrance. (Times taken from alarm logs, AIS data and CCTV)

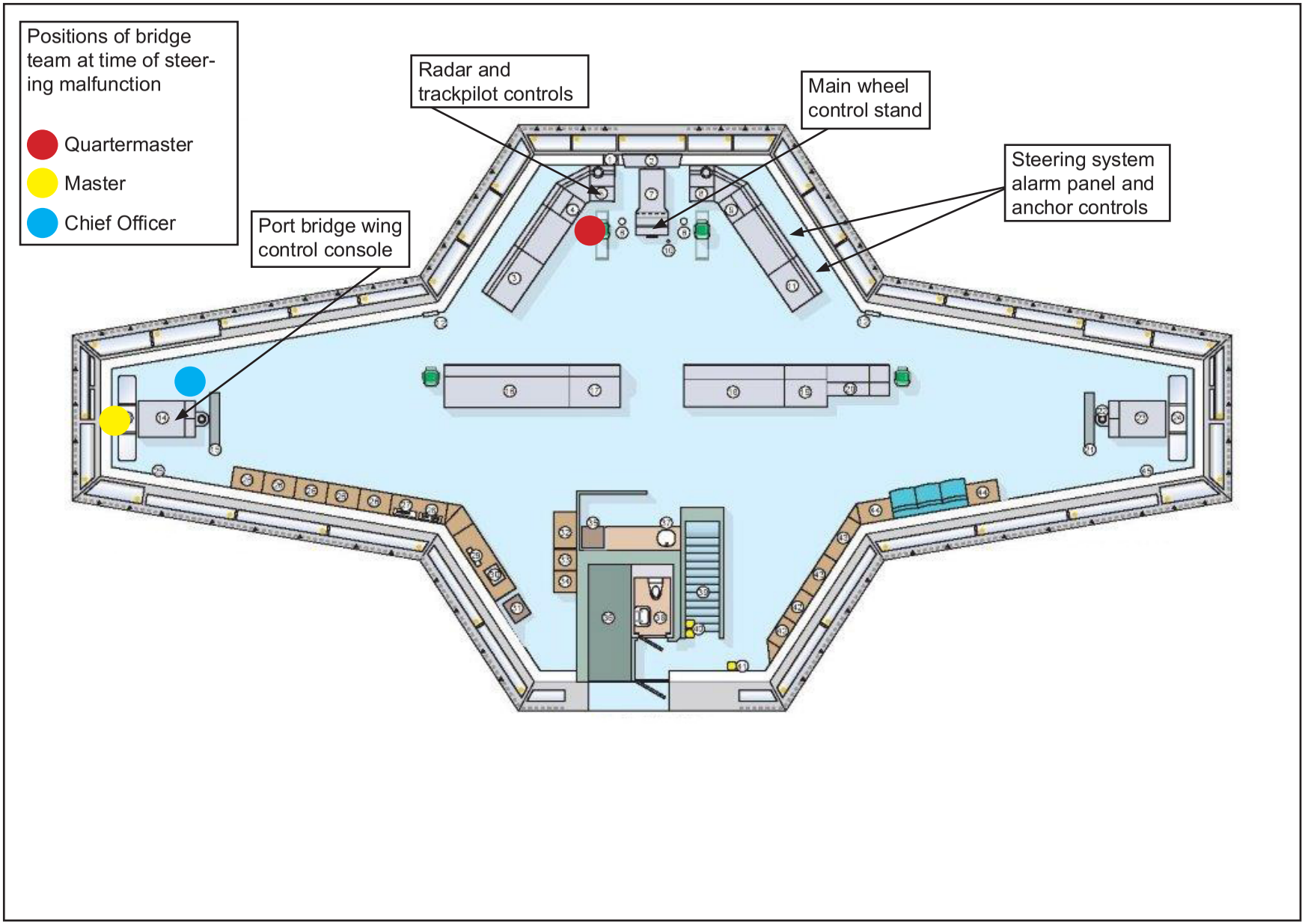

Figure 2: Bridge layout

Figure 3: Port bridge wing console

Dover Seaways' speed reduced as it continued towards the end of the South Breakwater. At 0759:19, the ferry hit the end of the breakwater **(Figure 1)** at a speed of about 3.5kts. The passengers and crew were not warned of the impact and many fell to the deck or were thrown from their seats; three passengers and ten crew sustained minor injuries. Several vehicles were also damaged.

Dover Seaways remained underway; only the starboard anchor had released but insufficient cable had run out and the anchor had not reached the seabed. The anchor was recovered and the ferry returned alongside without assistance. Meanwhile, the ferry's first-aid team treated the injured in the vessel's cafeteria. Details of the injured were passed to the Port of Dover, which informed the emergency services. The emergency services met the ship on arrival and three of the injured persons were taken to a local hospital for further checks.

Figure 4: Centre console

Dover Seaways' bulbous bow and 'cow-catcher'[5] were damaged **(Figure 6)**, which required the ferry to be dry docked in Rotterdam, The Netherlands for repair. There was no pollution, and *Dover Seaways* returned to service on 21 November 2014.

Vessel

Built in 2006, the DFDS A/S owned ferry *Dover Seaways* operated on the cross-channel route between Dover and Dunkirk conducting up to eight crossings a day. The ship was certified to carry up to 1000 persons on board, including crew.

Bridge team

Dover Seaways' officers and crew worked a 12 hours on, 12 hours off rota. On 9 November 2014 the bridge team started their duty at 0630 having had 12 hours off. All of the bridge team were UK nationals and the master and the chief officer held pilotage exemption certificates for Dover.

[5] A metal structure welded to the bow to support the shore ramp.

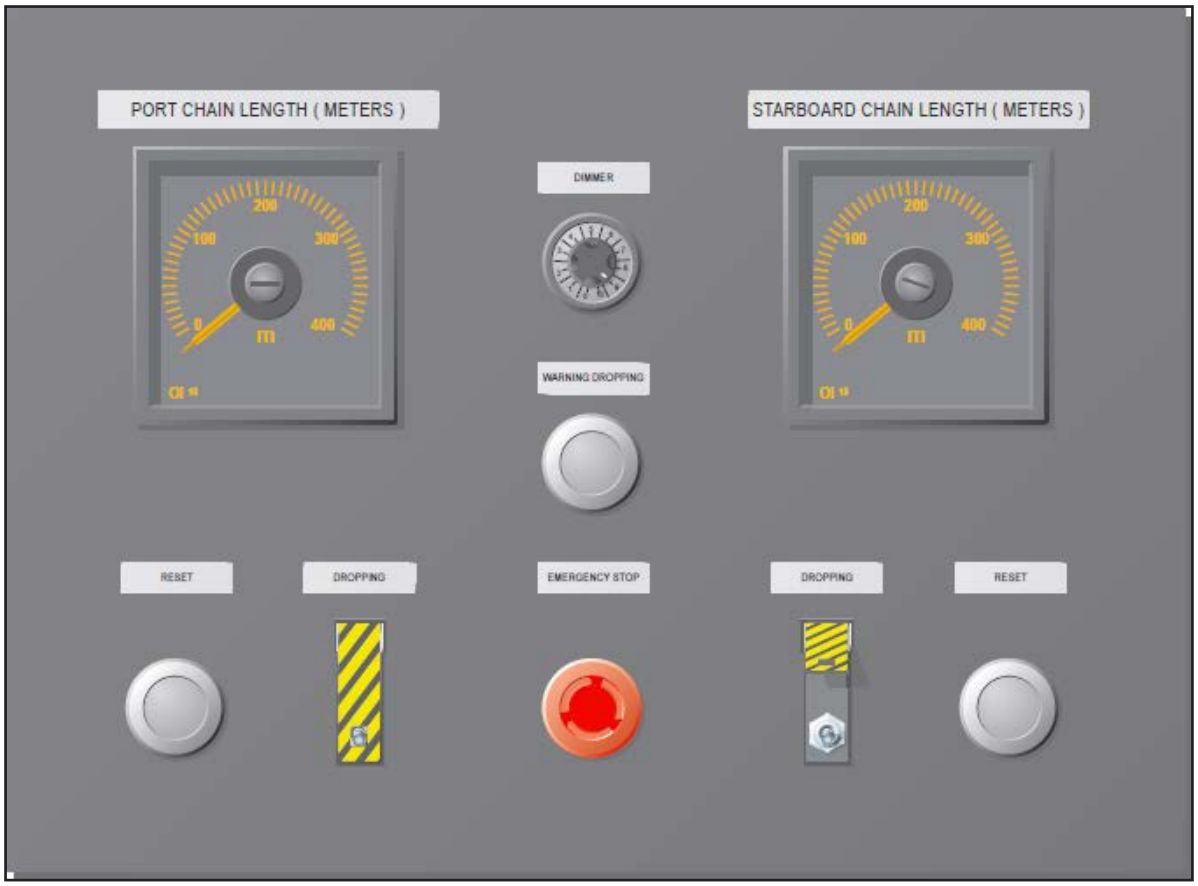

Figure 5: Bridge remote anchor release controls

Figure 6: Damage to bulbous bow and “cow-catcher”

The master was 37 years old and had gained his STCW II/2 (Unlimited)[6] certificate of competency (CoC) in 2002. He started on the cross-channel route as a chief officer in 2010 and he was promoted to master in June 2013.

The chief officer was 41 years old and had worked in the cross-channel ferry industry since 1991, starting as a deckhand. He held an STCW II/2 (chief mate) CoC.

The quartermaster was 35 years old and had served on board *Dover Seaways* since 2006. He held an STCW II/4 navigational watchkeeping CoC.

The bridge team had all received familiarisation training on the bridge layout and equipment in accordance with the DFDS safety management system. Regular (weekly) steering gear tests and emergency steering drills had been conducted as required by SOLAS[7] Chapter V Regulation 26.

Steering system

Dover Seaways was fitted with two high-lift rudders. Each rudder was driven by a rotary vane steering gear system with two hydraulic motors. The steering gear was operated by an electronic control system from the bridge ('follow-up') or directly by solenoids in the steering gear room ('non-follow up'). With two hydraulic motors running, the rudder moved from 35º one side to 35° on the other side in approximately 16 seconds. Rudder angle indication was provided on conning displays on the bridge control consoles and overhead repeaters.

In 'follow-up', the steering gear could be controlled in one of four modes:

- Autopilot
- Main wheel
- Call-up
- Trackpilot

The mode selector switch was on the main steering stand **(Figure 7)**. Selection of the 'call-up' mode enabled the steering control to be selected at one of the following positions:

- Port bridge wing console
- Starboard bridge wing console
- Port trackpilot
- Starboard trackpilot
- Autopilot

Steering control was transferred between these positions by the use of 'take-over buttons' that required positive pressure to engage. There was no indication on the bridge wing control consoles to show the

[6] STCW – The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended. The II/2 certificate with an 'unlimited' or 'chief mate' endorsement allows the holder to serve on any commercial vessel, except tankers, as master or chief mate respectively. The II/4 certificate allows the holder to serve as a watchkeeping rating.

[7] SOLAS – The International Convention for the Safety of Life at Sea 1974, as amended

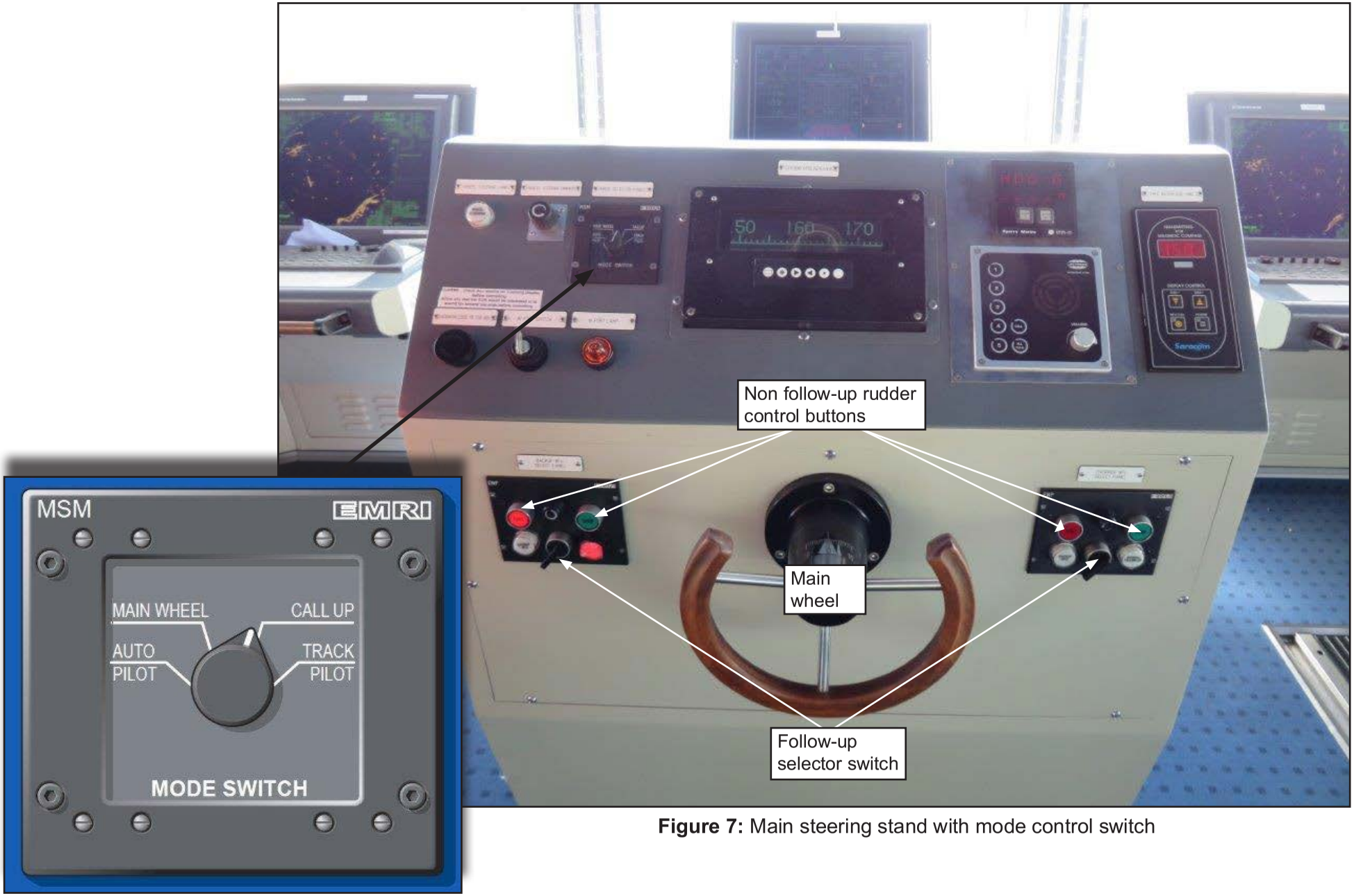

Figure 7: Main steering stand with mode control switch

station in control of the steering. This information was only provided on the centre console. The steering mode selected and therefore the station with steering control was over-ridden when the 'mini wheel' on the centre control console was used.

When *Dover Seaways* sailed on 9 November 2014, all hydraulic steering pumps were operating. The steering mode selected was 'call-up' and the steering was controlled from the port bridge wing control console. The steering failure decision support checklist **(Figure 8)**, the steering system manual, and the steering poster[8] required by SOLAS were available on the bridge.

Automatic steering

Automatic steering was via either the autopilot or one of two trackpilots. The autopilot was located on the centre console and controlled the rudders to follow a pre-set course. The trackpilots were located next to the port and starboard radars, either side of the centre control console. The trackpilots' operation was similar to that of the autopilot but they were able to use global positioning system information to follow a course over the ground rather than steer a pre-set heading. The trackpilots were interfaced with the electronic chart display and information system (ECDIS).

When the autopilot or the trackpilots were selected by using either the mode selector switch or the call-up buttons, the systems adjusted the rudders to follow the ship's heading at the time of selection. Therefore, it was usual practice to select autopilot or trackpilot control after the ferry was steady on its intended heading or track. If the systems were switched on while the ship was turning they applied sufficient rudder, limited by user preference, to counteract the turn and resume the vessel's heading at the time the take-over button was pressed, or the mode selector switch was moved. *Dover Seaways'* rudder limits were set at 30º.

Decision Support System

DFDS

CHECK LIST for:

Decision Support Checklist –17. STEERING FAILURE

Reference: Emergency Response Manaual / SMS Section 7.3.1, 259 / Bridge Procedures Guide – Check List C1

Page:	***CHECK LIST:***
1 OF 1	***17***

	ACTION		CHK
1	REDUCE SPEED AND IF NECESSARY, TAKE ALL WAY OFF THE VESSEL. TEST STEERING SYSTEM	MAIN WHEEL [FOLLOW UP] / BUTTONS [NON- FOLLOW UP] / & WING CONTROLS	
		MINI WHEEL	
		LOCAL CONTROL IN STEERING GEAR ROOM	
2	ESTABLISH THE NATURE OF THE STEERING FAILURE	COMPLETE SYSTEM FAILURE	
		POWER FAILURE	
		CONTROL SYSTEM FAILURE	
3	ENGAGE HAND STEERING WITH 4 STEERING MOTORS IF POSSIBLE		
4	COMPANY / U.K. COASTGUARD / C.R.O.S.S. GRIZ-NEZ / HARBOUR AUTHORITY INFORMED – DUTY GMDSS OFFICER ON BRIDGE		
5	ADVISE SHIPPING IN THE AREA ABOUT CHANGE IN NAVIGATIONAL STATUS – SECURITE MESSAGE		
6	TRANSMIT CHANGED NAVIGATIONAL STATUS VIA A.I.S.		

Figure 8: DFDS Decisions Support Checklist 17. Steering failure

[8] SOLAS Chapter V Regulation 26 requires a simple block diagram of the steering system and its changeover procedures to be displayed on the bridge.

Examinations and tests

Following the accident, examination of the ECDIS and steering system alarm logs identified that on 9 November 2014:

- The trackpilot steering mode activated after *Dover Seaways* left the berth. The system was engaged at 0758:14 and disengaged at 0758:42.
- During the loss of directional control, the 'clog filter' and the 'control power failure' alarms activated on all four steering motors.

The following was also observed during subsequent steering system trials:

- The steering system functioned correctly.
- The 'clog filter' alarms activated. It was determined that the alarms tended to activate when the hydraulic oil in the steering system was cold. The frequency of the alarms also increased when replacement filters were required.
- The 'control system failure' alarms also activated, but the performance of the steering system was unaffected.
- The bridge team were aware that control of steering could be transferred to the bridge wing consoles when the 'call-up' mode was selected. They were unaware that control could also be transferred to the autopilot or trackpilot if their respective 'take-control' buttons were pressed.
- The shaft on the mode selector switch on the bridge main steering stand was loose.

The defect to the mode selector switch had been recorded in the defect log 5 days before the accident but it had not been reported to the company's technical managers. The mode selector switch was removed for examination. The switch shaft retaining nut on the underside of the casing was found to be loose; no other defects were found.

Anchoring system

Dover Seaways was equipped with two high holding power anchors with 302.5m of cable on the starboard side and 330m on the port side. Provided the guillotine preventer was removed, the winch was out of gear and the brake hydraulic pump system was running, the anchors could be 'let go' from the bridge using a 'dropping' switch **(Figure 5)**. The operation of the 'dropping switch' activated the hydraulic power pack. The brake cylinder was then pressurised and the brake was released. The delay between activating a switch on the bridge and anchor release was approximately 6 seconds. The speed the anchor cable ran out was regulated by the automatic application of the brake when the speed reached 180m/minute. As soon as the speed of the anchor cable reduced, the brake released.

After the accident, the anchor release system was found to function correctly when it was operated before *Dover Seaways* entered dry dock in Rotterdam for repair.

Voyage data recorder

Dover Seaways' voyage data recorder (VDR) was not working. It was reported as defective on 4 November 2014 and a replacement had been ordered. The Maritime and Coastguard Agency, as the UK Maritime Administration, had issued a temporary dispensation to allow the vessel to operate without a VDR.

ANALYSIS

Loss of directional control

Evidence from the ECDIS alarm log, the 'double-beep' heard by the quartermaster and the unexpected turn to starboard all indicate that directional control of *Dover Seaways* was lost due to control of the steering transferring from the port bridge wing control console to one of the trackpilots.

Post-accident trials and examinations indicated that the 'clog filter', the 'control power failure' alarms and the defective mode selector switch were not connected to the loss of control. While the 'double beep' heard by the quartermaster alerted the bridge team to the steering problem, had a steering system alarm sounded it is possible the bridge team would not have reacted as they were used to hearing the 'clog filter' and 'control power failure' alarms sound, and ignoring them as spurious. For ship's staff to have confidence in the alarm system, any perceived frequent or spurious sounding of alarms should be challenged and investigated.

No tracks had been input to the trackpilots from the ECDIS. Therefore, the trackpilot in control of the steering would have applied the helm required to steer the gyro heading at the time control was transferred. As the ferry was turning to port, the trackpilot would have applied up to 30° (the rudder limit set) of starboard rudder in order to stop the swing and return the vessel to the initial heading (approximately 139°) **(Figure 1)**.

The cause of the transfer of the steering control from the port wing console to a trackpilot is not known. The transfer was not intended and the steering system functioned correctly in all modes during tests conducted after the accident. As the quartermaster was at the port radar display and close to the port trackpilot, the possibility of the 'take control' button on the port trackpilot being accidentally pressed cannot be discounted. However, it is not known to which trackpilot steering control was transferred. Furthermore, the possibility of the transfer of steering control being due to an intermittent fault cannot be eliminated.

Response

Dover Seaways was less than 400 metres from the port of Dover's eastern entrance when steering control transferred to the trackpilot at 0758:14 **(Figure 1)**. At a speed of approximately 10kts, it was imperative that the bridge team acted quickly. However, although steering control was established at the 'main wheel', the main engines set to 'full astern' and the starboard anchor let go, these actions were taken too late to be effective. Furthermore, the use of the bow thrusters would have been ineffective at speeds above 5kts.

Directional control was lost for 28 seconds. During this period, *Dover Seaways* closed to within 250 metres from the end of the South Breakwater. The master appreciated that there was insufficient time and sea room to resume the turn to port to pass through the eastern entrance. However, by then there was also insufficient sea room ahead for the ferry to stop. Had the vessel's engines been set to 'full astern' in accordance with the onboard checklist for 'steering failure' **(Figure 8)** as soon as the loss of steering control was identified, contact with the breakwater could have been avoided.

Although the starboard anchor was let go, it did not reach the seabed. Therefore, the anchor did not act as a brake as intended. As the anchor release system functioned correctly following the accident, the late release of the starboard anchor and the non-release of the port anchor were probably due to the need to clear the forecastle, the inherent system delay and the interruption to the release sequence following the master's change of order (see footnote 4).

System knowledge and use

Dover Seaways' bridge team were experienced in the use of the ferry's steering system. They had completed bridge familiarisations and participated in regular steering failure drills. However, although the bridge team identified the loss of directional control and managed to regain control within 28 seconds, gaps in their understanding and use of the system, and the failure to complete basic checks prevented a more rapid response.

In particular:

- The 'call-up' indicator panel **(Figure 4)** was not checked when the audible indication of the change in steering mode was first heard. This would immediately have shown that the steering control had transferred to one of the trackpilots.

- The bridge team were not aware that in 'call-up' mode the control of the steering could be transferred to the trackpilots.

- The rudder angle indicators on the conning displays or overhead repeaters were not monitored. Otherwise, the movement of the rudders from port to starboard when control was transferred to the trackpilot would have been appreciated sooner.

Warnings

As *Dover Seaways* approached the South Breakwater, the bridge team were undoubtedly focused on the imminent contact. To some extent, it is also likely that they were in a state of shock. However, the lack of a warning broadcast to the crew and passengers was a significant omission.

The lack of warning of the impact meant that no-one braced, sat or lay down, or moved to a safe position. Consequently, when *Dover Seaways* struck the breakwater at a speed of about 3.5kts, the sudden stop was sufficient for a number of passengers and crew to lose their balance and fall to the deck, causing minor injuries. It also caused vehicles to move. In the circumstances, it was fortunate that more serious injuries did not result.

Following the heavy contact in Harwich, UK, by the DFDS ferry *Sirena Seaways* on 22 June 2013, the MAIB recommended DFDS A/S to:

'*Consider ways in which passengers and crew can be rapidly informed about an impending accident to minimise the potential for injuries'.*

In response, DFDS A/S stated:

'*All ships will be notified to consider to use any means of alerting passengers, e.g. general alarm followed by an announcement, if deemed safe by the captains to do so. This will be communicated by the use of our exchange of experience system*'.

The circumstances of this accident indicate that this action has not been successful.

CONCLUSIONS

- Directional control of *Dover Seaways* was lost due to the steering control transferring from the port bridge wing control console to one of the trackpilots.
- The cause of the transfer of the steering control from the port wing console to a trackpilot has not been identified.
- The re-establishment of steering control, the setting of the main engines to ‘full astern’ and the letting go of the starboard anchor, were too late to be fully effective.
- The bridge team were not fully familiar with some aspects of the steering control system and did not monitor the rudder angle indicators.
- The minor injuries sustained by several passengers and crew could have been avoided if a warning broadcast had been made.

ACTION TAKEN

DFDS A/S has:

- Conducted a risk assessment of ships manoeuvring at ferry terminals.
- Revised its procedures for machinery failures.
- Formalised reporting procedures for defects of critical systems.
- Introduced a comprehensive programme to familiarise the bridge teams with their vessel’s steering and anchoring systems.
- Sent all navigating officers, quartermasters and engineer officers on an MCA approved maritime resource management course tailored to the company’s ferry operations.
- Addressed the problem of the recurring ‘clog filter’ alarm by fitting new pressure differential switches and amending the hydraulic pump operating procedures.

RECOMMENDATION

DFDS A/S is recommended to:

2015/155 Take steps to improve its vessels' crews' responses to emergency situations by, inter alia:

- Including simulated ship systems failures in its bridge resource management training, and
- Ensuring that its standard operating procedures prioritise the need for passengers and crew to be provided with a timely warning, especially when impact is imminent, so that the risk of injuries can be reduced.

Safety recommendations shall in no case create a presumption of blame or liability

SHIP PARTICULARS	
Vessel's name	*Dover Seaways*
Flag	United Kingdom
Classification society	Lloyd's Register
IMO number	9318345
Type	Passenger ro/ro
Registered owner	DFDS Seaways AB
Manager	DFDS A/S
Year of build	2006
Construction	Steel + 100A1
Length overall	186.65m
Gross tonnage	35923
Minimum safe manning	21
Authorised cargo	Passengers, cars and freight
VOYAGE PARTICULARS	
Port of departure	Dover
Port of arrival	Not applicable
Type of voyage	Short international
Cargo information	Passengers, cars and freight
Manning	72
Passengers	320
Draught	6.29m
MARINE CASUALTY INFORMATION	
Date and time	9 November 2014 0759 UTC
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Dover eastern entrance southern breakwater
Place on board	Accommodation / forecastle / bulbous bow
Injuries/fatalities	Minor injuries to 3 passengers and 10 crew
Damage/environmental impact	Yes / none
Ship operation	Manoeuvring
Voyage segment	In transit
External & internal environment	Wind SW 10kts, daylight, good visibility