Marine Safety Investigation Unit

Transport Malta

MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the collision of the

Maltese registered passenger ship

CELESTYAL CRYSTAL

with the Marshall Islands registered tanker

STI PIMLICO

In the Çanakkale Strait's Traffic Separation Scheme

on 27 June 2015

201506/030

MARINE SAFETY INVESTIGATION REPORT NO. 10/2016

FINAL

The MSIU gratefully acknowledges the assistance and cooperation of the Turkish Accident Investigation Board within the Ministry of Transport, Maritime Affairs and Communications, during the safety investigation of this accident.

Investigations into marine casualties are conducted under the provisions of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 and therefore in accordance with Regulation XI-I/6 of the International Convention for the Safety of Life at Sea (SOLAS), and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009, establishing the fundamental principles governing the investigation of accidents in the maritime transport sector and amending Council Directive 1999/35/EC and Directive 2002/59/EC of the European Parliament and of the Council.

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

The objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 27 June 2015. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

The findings of the safety investigation are not binding on any party and the conclusions reached and recommendations made shall in no case create a presumption of liability (criminal and/or civil) or blame. It should be therefore noted that the content of this safety investigation report does not constitute legal advice in any way and should not be construed as such.

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GLOSSARY OF TERMS AND ABBREVIATIONS

AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
BA	British Admiralty
COLREGs	International Regulations for Preventing Collisions at Sea 1972, as amended
CPA	Closest point of approach
DNV GL	Det Norske Veritas Germanischer Lloyd
E	East
ECDIS	Electronic Chart Display and Information System
GPS	Global Positioning System
GMDSS	Global maritime distress safety system
GT	Gross tonnage
ILO	International Labour Organization
IMO	International Maritime Organization
ISM Code	International Safety Management Code for the Safe Operation of Ships and Pollution Prevention
kW	Kilowatt
LOA	Length overall
LT	Local time
m	Metres
mb	Millibar
MSIU	Marine Safety Investigation Unit
Nm	Nautical miles
N	North
OOW	Navigational officer of the watch
Ro-ro	Roll-on/roll-off

RPM	Revolutions per minute
SOG	Speed over ground
SMS	Safety Management System
SOLAS Convention	International Convention for the Safety of Life At Sea, 1974, as amended
STCW Convention	International Convention on Standards of training, Certification and Watchkeeping for Seafarers, 1978, as amended
TCPA	Time of closest point of approach
TSS	Traffic Separation Scheme
TSVTS	Turkish Strait Vessel Traffic Service
UTC	Universal Time Coordinated
VDR	Voyage data recorder
VHF	Very high frequency
VTS	Vessel Traffic Services

SUMMARY

At about 0126 (UTC +3) on 27 June 2015, the passenger ship *Celestyal Crystal* collided with the product tanker *STI Pimlico* about 0.7 nautical miles off Gelibolu Lighthouse in the Çanakkale Traffic Separation Scheme.

Celestyal Crystal sustained major damage to her bow above the waterline and forward of the collision bulkhead. There were only four minor injuries. The vessel proceeded to anchor where she disembarked her passengers and temporary repairs were made to allow her to sail on a single voyage for permanent repairs.

STI Pimlico sustained damage to her main deck port side, electrical systems and piping, and her shell plating was pierced below and above the waterline.

The safety investigation concluded that the immediate cause of the accident was an inaccurate awareness of the dynamic situation.

The Marine Safety Investigation Unit (MSIU) has made a number of recommendations to Optimum Shipmanagement Service, the managers of *Celestyal Crystal* aimed at improving the safety of navigation and emergency response on board vessels under its management and to the Turkish Straits Maritime Pilots with respect to pilotage service in the Strait of Çanakkale.

1 FACTUAL INFORMATION

1.1 Vessel, Voyage and Marine CasualtyParticulars

Name	*Celestyal Crystal*	*STI Pimlico*
Flag	Malta	Marshall Islands
Classification Society	DNV GL	DNV GL
IMO Number	7827213	9686871
Type	Passenger	Chemical / Product Carrier
Registered Owner	Cristal Trading Opco LLC	STI Pimlico Shipping Company Limited
Managers	Optimum Shipmanagement Service S.A.	Claus-Peter Offen Tankschiffreederei GMBH & Co. KG
Construction	Steel	Steel (Double Hull)
Length overall	158.88 m	184.0 m
Registered Length	134.66 m	176.06 m
Gross Tonnage	25611	24162
Minimum Safe Manning	20	*Not available*
Authorised Cargo	Not Applicable	Bulk liquid
Port of Departure	Lavrio, Greece	*Not available*
Port of Arrival	Istanbul, Turkey	*Not available*
Type of Voyage	Short International	*Not available*
Cargo Information	Not applicable	*Not available*
Manning	382	*Not available*
Date and Time	27 June 2015 at 0126 (LT)	
Type of Marine Casualty or Incident	Serious Marine Casualty	
	Serious Marine Casualty	Serious Marine Casualty
Location of Occurrence	Dardanelles Traffic Separation Scheme 40°24’N 026°41’E	
Place on Board	Ship – Forecastle deck / Bulbous bow / over side	Over side / cargo tank / freeboard deck
Injuries/Fatalities	Four minor injuries	None
Damage/Environmental Impact	None	Cargo spill overboard
Ship Operation	On passage	On passage
Voyage Segment	Transit	Transit
External & Internal Environment	Good visibility. Northerly moderate breeze with slight seas	
Persons on Board	1235	*Not available*

1.2 Description ofVessels

1.2.1 *Celestyal Crystal*

The Maltese registered *Celestyal Crystal* (Figure 1) is a passenger/cruise vessel built in 1980 at Wartsila Ab, Turku, as an Ice Class 1A Ro-Ro[1] ferry. She was converted to a cruise ship in 1992. The vessel has a gross tonnage (GT) of 25,611 and is classed by DNV GL.

Celestyal Crystal is owned by Cristal Trading OPCO LLC, and the technical management is carried out by Optimum Shipmanagement Service S. A. The safety management system of Optimum Shipmanagement Service meets the requirements of International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) for passenger ships. A Document of Compliance valid until 26 February 2019 was issued by DNV GL on behalf of the flag State. The safety management system (SMS) of *Celestyal Crystal* was audited by DNV GL and issued with a Safety Management Certificate valid until 06 May 2019. The Company owns and operates five vessels under the Maltese flag.

Figure 1: MV *Celestyal Crystal*

The vessel has a length overall of 158.88 m and a beam of 25.20 m. Her depth is 15.56 m and the maximum deadweight is 1,703 tonnes at a summer draught of 5.91 m. *Celestyal Crystal*'s propulsive power is provided by four 12-cylinder Wärtsilä medium speed, four-stroke diesel engines, producing 4,781 kW at 500 rpm.

[1] Ro-ro is an acronym for Roll-on/roll-off. Roll-on/roll-off ships carry wheeled cargo.

The engines drive two, controllable pitch propellers at 170 rpm through reduction gearboxes. *Celestyal Crystal* is also fitted with two 590 kW bow thrusters. The vessel's service speed is about 21.0 knots[2].

The vessel is traded by her operators on cruises in the Mediterranean and South America.

1.2.1.1 Bridge layout and equipment on *Celestyal Crystal*

Celestyal Crystal's navigation bridge layout is a fully enclosed integrated design and would be considered standard for a ship originally built as a Swedish ferry in 1980 (Figures 2 and 3). The main conning console includes the radars, ECDIS, VHF radio communications, engine and thruster controls, and autopilot.

Figure 2: Port side view of the bridge and main console

The chart table is located on the starboard side of the main console and the main GMDSS station is situated within the bridge area, but on the port aft side. The Electronic Chart Display and Information System (ECDIS) and two radar displays are housed in the forward part of the console and a further radar display has been retro-

[2] One knot is equal to 1.852 $kmhr^{-1}$.

fitted at the aft end of the centre of the console (Figure 3). The starboard forward radar display is for the bow radar, but was not operational at the time[3].

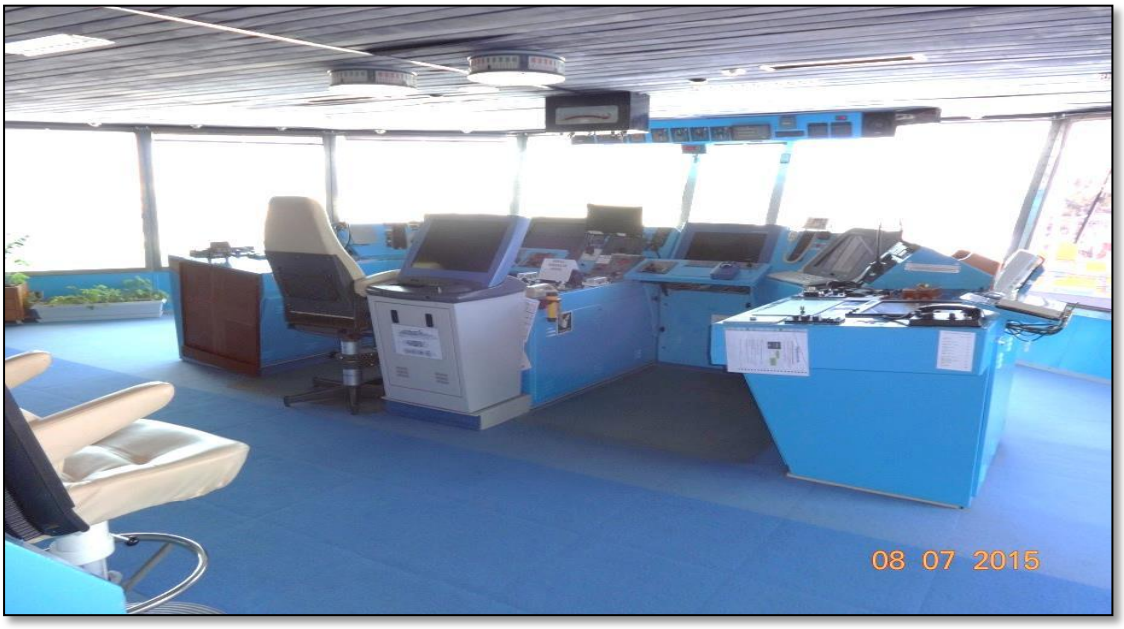


Figure 3: Main bridge console

The hand steering position is located forward of the main console under the bridge windows (Figure 4). The helmsman has to look down to the gyro repeater and rate of turn indicator, which are situated almost at floor level. From this position, the forward view is limited.

Figure 4: Helmsman at the designated steering position

[3] The MSIU had conflicting information on this matter. Documentary evidence made available to the MSIU indicated that one of the X-band radars was out of order on repairs. During the consultation process, however, the managers informed that the starboard forward radar has two scanners – one on the bow and the other on the mast. Managers submitted that although the bow scanner was not operational, however, this did not make the third radar inoperative because it could operate using the mast scanner.

The vessel had a dual SAM ECDIS that was being used as the primary means of navigation. The ECDIS was fitted about a year before it became mandatory on *Celestyal Crystal.* The vessel also maintained a folio of paper nautical charts. The reason for maintaining paper nautical charts in addition to ECDIS was the reliability issues of ECDIS hardware/software that were experienced fleet wide by the management, and the incomplete ENC coverage of trading areas.

Celestyal Crystal was also equipped with the following navigation equipment:

- Two Global Positioning Systems (GPS);
- Gyro and Magnetic Compasses;
- Three radars –S-Band SAM Electronics, X-Band SAM Electonics, and X-Band Kelvin Hughes radars with automatic radar plotting aid (ARPA);
- Automatic Identification System (AIS);
- Doppler Log;
- Bridge Navigation Watch Alarm System;
- Automatic Pilot;
- Echo Sounder; and
- Voyage Data Recorder.

Additionally, the vessel carried radio equipment in accordance with the Global Maritime Distress Safety System (GMDSS) requirements. At the time of the collision, all the navigational equipment was reported to be operating satisfactorily except the bow radar[4], but this was in excess of the SOLAS requirements.

1.2.2 STI Pimlico

STI Pimlico (Figure 5) is a double hull, chemical/ products carrier, owned by Scorpio Ship Management SAM and managed by Scorpio Commercial Management of Monaco. The vessel was built by Hyundai Mipo Dockyard Co. Ltd., Korea in 2014 and is registered in Marshall Islands and classed by DNV GL.

[4] *Vide* footnote # 3.

STI Pimlico has a length over all of 184.00 m, a moulded breadth of 27.40 m and a moulded depth of 17.60 m. It has a summer draught of 11.916 m and a summer deadweight of 38734 tonnes. The vessel has six pairs of cargo tanks (and two slop tanks), fitted to port and starboard and separated by a continuous longitudinal bulkhead.

Propulsive power is provided by a 6-cylinder B&W 6S50ME-B9, slow speed direct drive diesel engine, producing 10,680 kW at 117 rpm. This drives a single, fixed pitch propeller at a service speed of 14.0 knots.

Figure 5: MT *STI Pimlico*

1.3 Manning and Crew on Board *Celestyal Crystal*

Celestyal Crystal was manned with a compliment of three navigation watchkeeping officers and six bridge watchkeeping ratings (quartermasters). In addition, the vessel had a master, a staff captain, and a safety officer who all worked day work hours and all of whom possessed a Master's Certificate of Competency. There was also an apprentice officer onboard. The master, staff captain, safety officer and other watchkeeping officers were all Greek nationals. The bridge watchkeeping ratings were Filipino and Indonesian nationals.

The working language on board was English.

Celestyal Crystal was manned in excess of the Minimum Safe Manning Document issued by the flag State Administration. As the vessel was manned with three navigating officers, the watchkeeping hours were divided among the three officers on a '4-on, 8-off' basis as follows:

Chief mate	0000 to 0400	1200 to 1600
Chief mate	0400 to 0800	1600 to 2000
Second mate	0800 to 1200	2000 to 2400

The navigating officers also had to attend mooring stations when calling at and departing ports.

1.3.1 Master

The master was 55 years old and first went to sea as a cadet in 1982. He obtained his Certificate of Competency in 1998 and had revalidated his license in February 2012 for another five years. The master had an 'Endorsement Attesting the Recognition of a Certificate' from Transport Malta's Merchant Shipping Directorate dated 08 May 2012. The master has been sailing in this rank since 1998 and his experience has mainly been on cruise ships. He joined the Company[5] in April 2007 as a Master. He had previously sailed on *Celestyal Crystal* in 2013 and earlier in 2014 and re-joined *Celestyal Crystal* on 11 July 2014.

1.3.2 Chief mate (12-4)

The chief mate was 54 years old and had 33 years of seagoing experience. He obtained his Master's Certificate of Competency in April 2007. He had an 'Endorsement Attesting the Recognition of a Certificate' from Transport Malta's Merchant Shipping Directorate dated 08 August 2014. The chief mate joined the Company in 2007 and this was his second contract on board *Celestyal Crystal*. His initial contract on board was from 06 June 2014 to 10 November 2014. He then re-joined on 26 November 2014 and has since remained on board.

[5] At the time, the Company was Louis Ship Management, but was renamed Optimum Shipmanagement Service S.A. in 2015.

1.3.3 Quartermaster (12-4)

The Quartermaster was 51 years old and had 22 years of seagoing experience. He had certificates as an able seaman and rating forming part of a navigational watch issued in April 2015 by the Republic of the Philippines. He joined the Company in 2003 as an ordinary seaman and was promoted to quartermaster in 2007.

1.4 Conduct of Navigational Watch

The SMS procedures on navigation and bridge organisation, classify navigation watch in pilotage waters as 'type B'. Watch 'type B' requires either the master or, in his absence, the staff captain in command on the bridge. In addition to the officer of the watch (OOW), an AB is called on the bridge for lookout duties if the helmsman is hand steering the vessel. The SMS Manual stipulates that vessel must at all times be navigated in compliance with the Collision Regulations, and where early and positive action is taken, the OOW must make sure that the action is having the desired effect. While ARPA provides reliable CPA and TCPA, the navigational procedures recommend the OOW to double check the ARPA information by taking frequent compass or radar bearings of the approaching vessel.

1.5 Environmental Conditions

On 27 June 2015 at 0100 local time (approximately 26 minutes before the collision), the Navarea MET Forecast provided the following information:

Wind speed	Beaufort 4 or 5
Wind direction	North Northeast
Wave height	Slight

Weather conditions recorded in the deck logbook at midnight indicated good visibility with the following conditions:

Wind speed	Beaufort 2
Wind direction	Northeast
Barometric pressure	1012 mb
Sea	Smooth
Visibility	Clear

1.6 Narrative

1.6.1 Events dynamics on *Celestyal Crystal*[6]

Celestyal Crystal was engaged on a series of cruises from Greece that consisted of three, four or seven days duration.

At 1200 on 26 June 2015, the vessel departed Lavrio, Greece at the start of a seven day cruise with 853 passengers and 382 crew on board. The vessel had completed the same cruise on a number of occasions, and the first port of call was Istanbul with an ETA of 0900 on 27 June 2015.

The draughts on departure were 6.24 m forward and 5.82 m aft. Prior to leaving port, an emergency drill was held for all newly embarked passengers as required by SOLAS and the watertight doors were closed. The average speed required to reach Istanbul was 16.8 knots, which was below the ships full service speed of 19.5 knots. *Celestyal Crystal* cleared port at 1230 and the vessel was set to 'full away', on passage.

1.6.1.1 Events leading up to the collision

Celestyal Crystal transited the Aegean Sea and at 2100, the officer of the watch (OOW) gave two hours' notice of standby to the engine control room. Standby was set when the vessel would slow down to embark the pilot and transit the Strait of Çanakkale.

Standby was rung at 2254 and the vessel entered the Çanakkale Traffic Separation Scheme. The master took the con and was assisted by the officer of the watch, two quartermasters (one steering) and an apprentice officer. The vessel was on hand steering and speed was reduced to embark the Çanakkale Strait pilot. At 2300, the pilot boarded and the vessel entered the Strait. The second quarter master was sent to stand-by the anchor. The Master remained on the bridge with the pilot advising the courses to be set. The ship remained on hand steering throughout the transit, which was uneventful.

At 2400, the watch changed and the 0000-0400 OOW(chief mate) and quartermasters relieved the 2000-2400 watch.

[6] The clocks on board were maintained at UTC +3. All logbook entries are UTC +3.

At 0108, the vessel approached the exit of the Strait and the pilot ordered a course of 035°, which the helmsman acknowledged. Speed at this time was 14.7 knots. At 0111, the master started to reduce speed and at 0112, he gave the order to open the port side shell door in preparation for the pilot to disembark.

The vessel's heading and speed was 035º and seven knots respectively. There were two vessels in the same Northbound traffic lane ahead of *Celestyal Crystal*. One vessel (*STI Pimlico*) was heading South in the Southbound traffic lane (Figure 6).

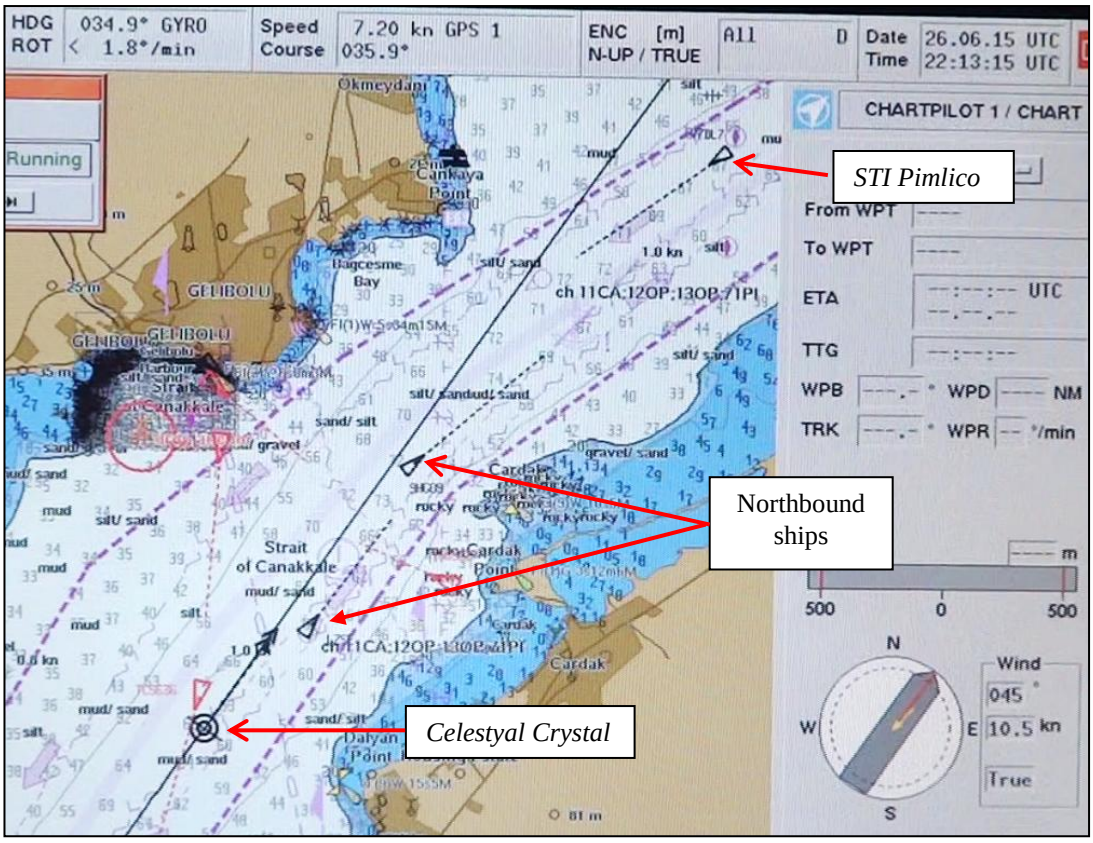


Figure 6: Screenshot of the ECDIS at 0113 as the pilot left the bridge

At 0113, the pilot left the bridge and eventually disembarked at 0116. Soon after, the master ordered the speed to be increased. Thereafter, the master and chief mate discussed *Emona*, the first vessel on the starboard bow, which *Celestyal Crystal* would soon overtake[7]. The master and chief mate visually sighted bright lights ahead and ascribed it to the accommodation lights of *Emona*. At 0118, the master instructed the chief mate to call VTS and *Emona*, before overtaking her from the starboard side and asked him if he was happy to take over the con. After receiving a positive

[7] *Emona* was identified by her call sign LZSE.

confirmation, he left the bridge. In addition to the chief mate, the bridge was manned by the apprentice officer and the quartermaster, who was sitting in the seat forward of the console, steering the vessel. The second quartermaster was securing the anchors on the forecastle deck.

Soon after the master left the bridge, the OOW instructed the quartermaster to steer 033°. At 0122, he instructed to steer 030° and a minute later 028°, in anticipation of overtaking *Emona* on her port side. The OOW stated that he was monitoring the traffic, using the centre radar and the vessel's position on ECDIS.

At 0123 (Figure 7), the apprentice officer left the bridge. The OOW stated that he noticed[8] from the radar that *STI Pimlico* was bearing 034° at a distance of 1.06 nm and *Emona* was bearing 060° at a distance of 0.59 nm. However, at this stage, he was becoming concerned about the vessel being overtaken and left the radar position. He also ordered the quartermaster to steer 026°.

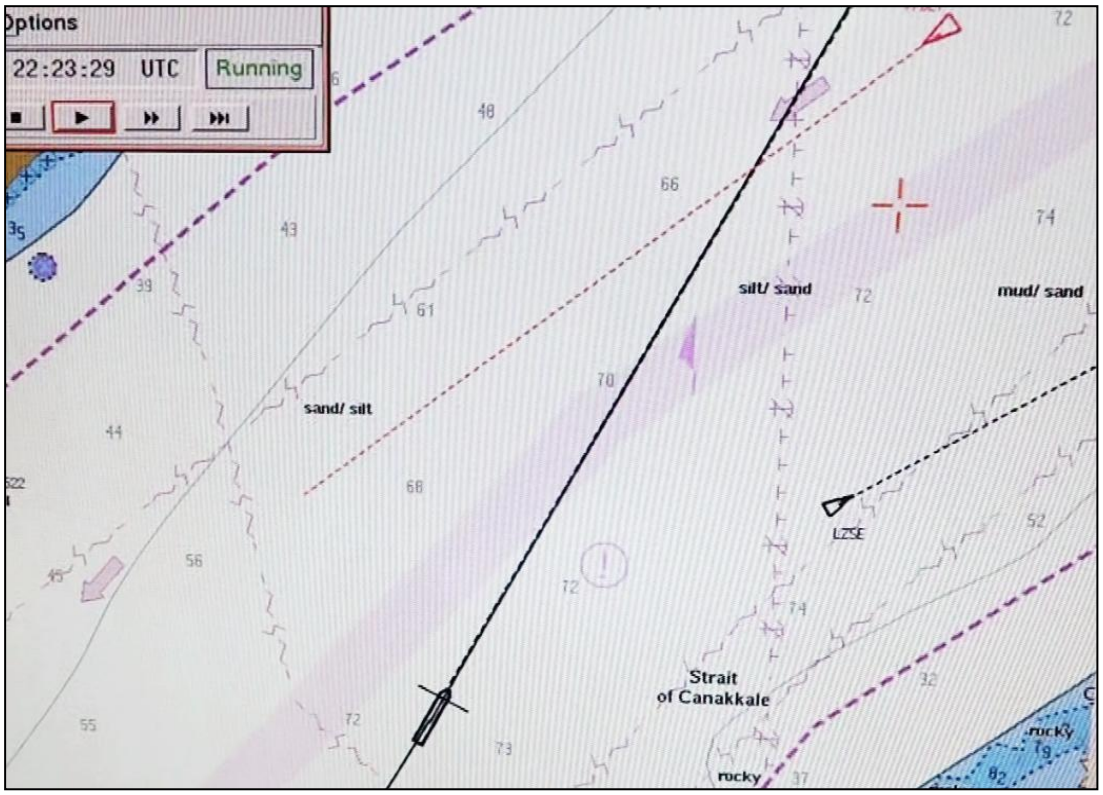


Figure 7: Positions of vessels at 0123:29

[8] The chief mate's last recollection of the vessel position.

Just as *STI Pimlico* (call sign V7DL7), laden with 30,000 tons of naphtha fuel from the Russian port of Tuapse[9], appeared on the radar screen, the OOW left the radar / ECDIS position and went to the bridge front windows to observe *Emona*.

Between 0123:23 and 0123:58, the chief mate ordered an alteration of course from 026° to 020° in two degree intervals. At 0123:58, *STI Pimlico* was bearing 033° at a distance of 0.87 nm and *Emona* was bearing 066º at a distance of 0.57 nm (Figure 8).

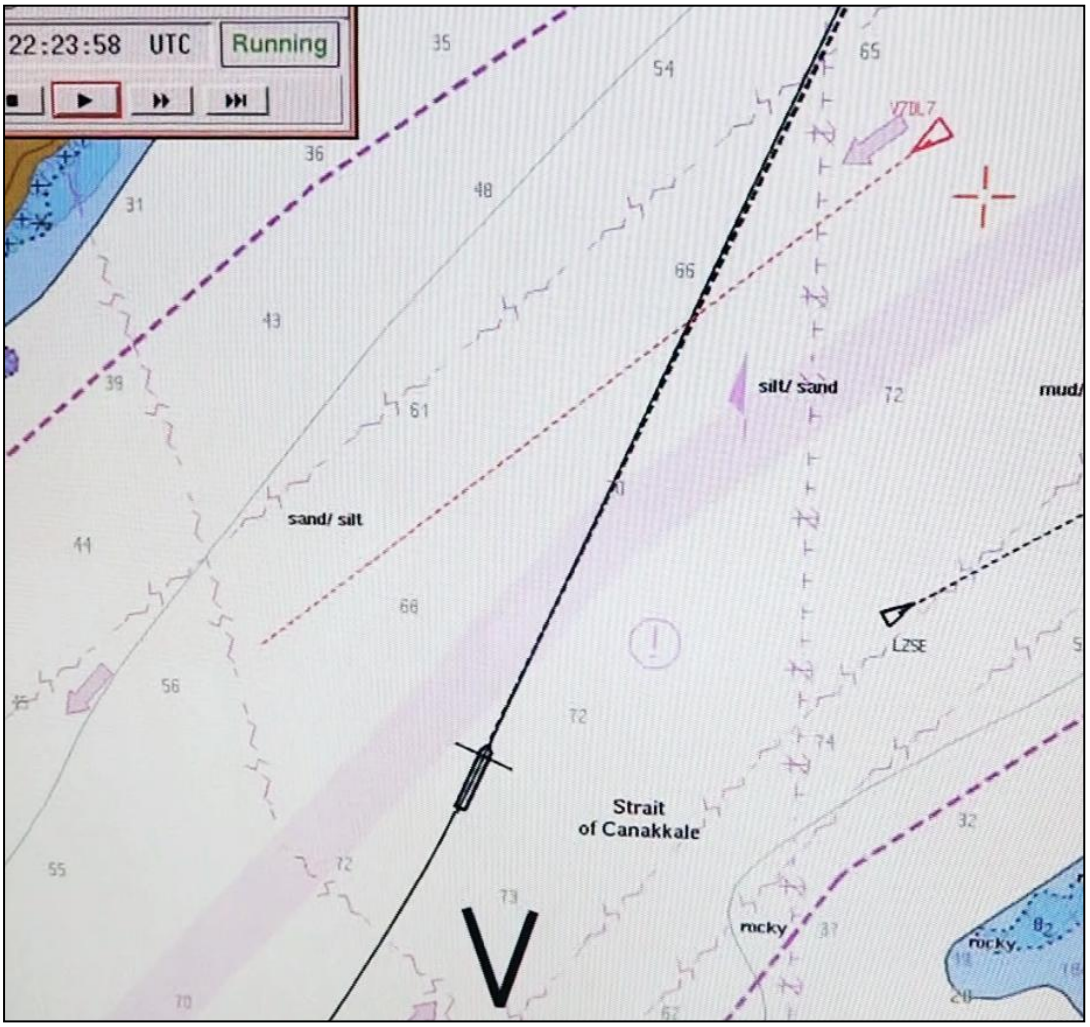


Figure 8: Positions of vessels at 0123:58

At about 0124, VTS called *Celestyal Crystal* on VHF and warned the chief mate of an inbound tanker on her port side and to keep clear, to which he responded, "*yes, captain OK*". At 0124:33, VTS called *Celestyal Crystal* again and advised the chief mate "*please come to your starboard side immediately and pass with inbound vessel port to port, red to red clearly.*" The chief mate replied "*it's not possible now to go to*

[9] Source: http://www.seanews.com.tr/cruise-ship-celestyal-crystal-collides-with-tanker-sti-pimlico-at-dardanelles/150623/.

starboard, negative sir." The VTS replied with a series of successive questions, "*what is your intention?*", "*where are you proceeding?*", followed by an immediate advice to "*come to your starboard side immediately*" and "*pass with the inbound tanker port to port.*"

Soon after, the VTS asked twice again, "*where are you proceeding, Celestyal Crystal?*" Following these questions, VTS called *STI Pimlico* to "*take all necessary precautions, in order to avoid a collision.*" Immediately, VTS insisted again with *Celestyal Crystal*, "*where are you proceeding?*" Following a confirmation from *STI Pimlico*'s OOW that he had already taken precautions, VTS asked *Celestyal Crystal* again to "*...be clear from the inbound tanker.*"

At 0125:17, *STI Pimlico*'s bearing remained almost stationary at 034° but the distance to *Celestyal Crystal* had decreased to 0.38 nm, whereas the bearing and range to *Emona* were 087° and 0.57 nm respectively (Figure 9). The chief mate then put the propeller pitch to full astern and ordered the helmsman initially to come to hard-a-port. He then realised that this was a mistake, and countermanded the order to hard-a-starboard. *Celestyal Crystal*'s speed of was 14.5 knots.

Figure 9: Positions of vessels at 0125:17 (48 seconds to collision)

At 0126:05, *Celestyal Crystal*'s bow came in to contact with the port side of *STI Pimlico* almost at right angles, at a speed of 11.5 knots (Figure 10).

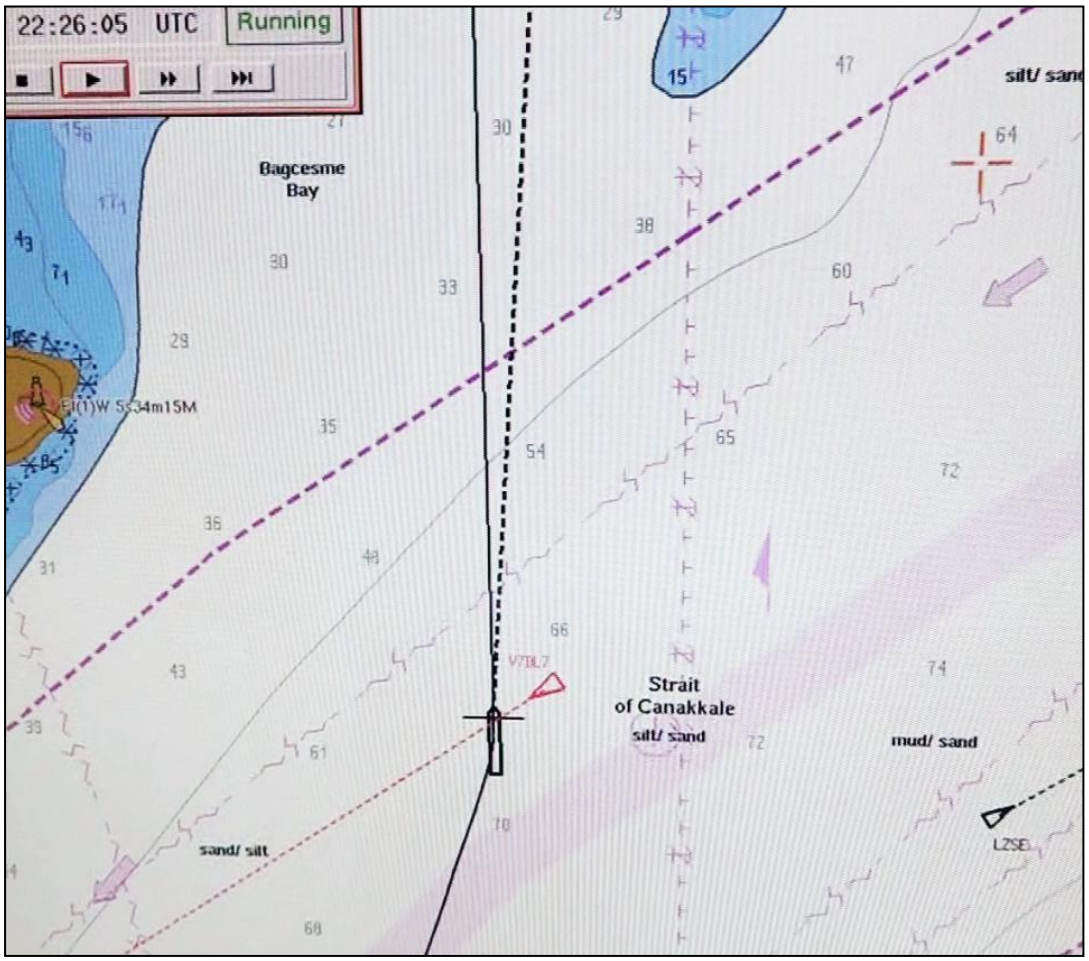


Figure 10: Positions of vessels at 0126:05 (time of impact)

A transcript of the important events taken from the VDR, ECDIS and VHF, leading up to the collision is attached as **Annex A**.

1.6.1.2 Post collision events

The master returned to the bridge less than a minute after the collision, having felt the impact from his cabin. As he entered the bridge, he noticed that the two ships were still together, but within seconds the tanker started to swing to starboard and the two ships separated. The master reported the collision to VTS and stated that he was checking his vessel for damage.

The ship was stopped in the water and the staff captain and safety officer proceeded forward to assess the damage. The staff captain checked the collision bulkhead and reported to the master that it was intact with no water ingress. They then checked the

bow thruster compartment on deck no. 2 and found it dry. Inspection of the impact area, however, showed considerable damage to the starboard bow, starting two metres above the waterline. The damage assessment party could find no evidence of water entering the ship. In the meantime, the carpenter was instructed to sound all tanks.

The master looked from the starboard bridge wing and could see damage to the starboard bow and the decks forward (Figure 11). The forward deck on deck no. 5 had been badly damaged in the collision. This area was one of the designated assembly stations[10] for the passengers in the event of an emergency but now was no longer safe. Since there were no reports of water ingress and one of the main assembly stations was unsafe, the master made the decision not to sound the General Emergency Signal[11].

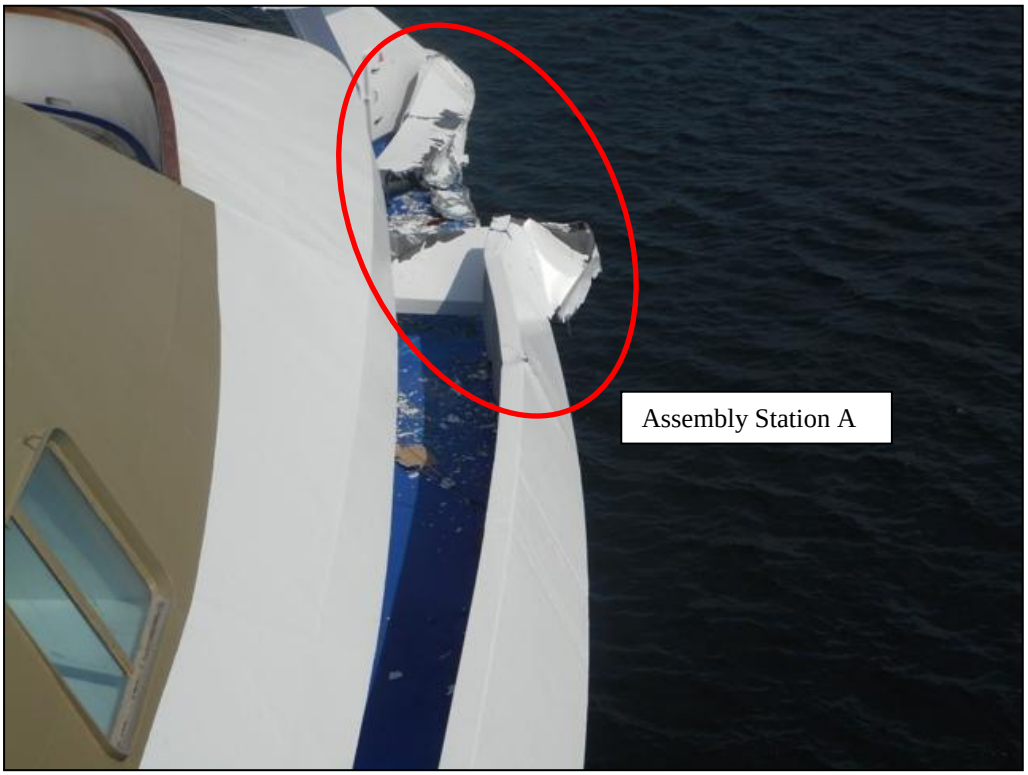


Figure 11: View of the damage from starboard bridge wing

At 0134, having received confirmation that the damage to the ship was above the waterline, the master made an announcement to the passengers advising them that the ship had been involved in a collision, the damage had been checked and that there was

[10] A designated area where passengers muster in the event of an emergency on board.

[11] The General Emergency Signal calls all passengers and crew to their emergency stations.

no danger to the vessel. The announcement was subsequently repeated in five different languages, *i.e.*, Greek, Spanish, French, Turkish and German to take into account the multiple passengers' nationalities.

The hotel manager summoned his team and they patrolled all decks and reassured the passengers. Other than a few passengers in the night club, most passengers were in their beds at the time of the collision. While there was some concern voiced by several passengers, there was no sign of panic. A further announcement was made at 0200, including an instruction that smoking was prohibited due to the strong smell of petrol.

Further announcements were made to passengers, but there was a delay before a muster was called to safely account for all passengers and crew and ensure there were no injuries.

The master completed the 'Collision Checklist' contained in the SMS and contacted his office. He also requested for a pilot to take the ship to a safe anchorage. The pilot boarded at 0147 and at 0213 the vessel dropped anchor in 40° 23.8′ N 26° 39.6′ E.

Figure 12: *Celestyal Crystal* at anchor

At 0220, a Turkish patrol boat arrived on scene to inspect the damage. The master boarded the patrol boat and when he returned, he made a further announcement at 0247 confirming that the vessel was safe and at anchor.

On 02 June 2015, *Celestyal Crystal* completed her temporary repairs and proceeded to Perama, Greece for permanent repairs.

1.7 Injuries

Despite the force of the collision being sufficient to wake everyone and cause most drawers to open and items to fall off shelves, only four injuries were reported. Two crew members and two passengers were initially seen by the ship's doctor and subsequently sent ashore to hospital for further examination. The hospital confirmed that all four injuries were strain related (minor) injuries.

1.8 Damages to Both Vessels

Celestyal Crystal sustained damage to her starboard bow (Figures 13a-d and 14) that included:

- Deck 2 damage to steelwork from frame 172 to fore end;
- Deck 3 damage to steelwork from frame 173 to fore end;
- Deck 4 damage to steelwork from frame 181 to fore end;
- Deck 5 damage to steelwork from frame 179 to fore end; and
- Internal damage to bulbous bow but no leaks or cracks.

STI Pimlico had an explosion in one of her cargo tanks and listed 15° on her port side. There were no injuries but she was reportedly leaking naphtha into the sea[12].

The damages sustained by *STI Pimlico* were on her main deck port side, electrical systems and piping. The side shell plating was pierced below and above the waterline.

[12] Source: http://www.seanews.com.tr/cruise-ship-celestyal-crystal-collides-with-tanker-sti-pimlico-at-dardanelles/150623/

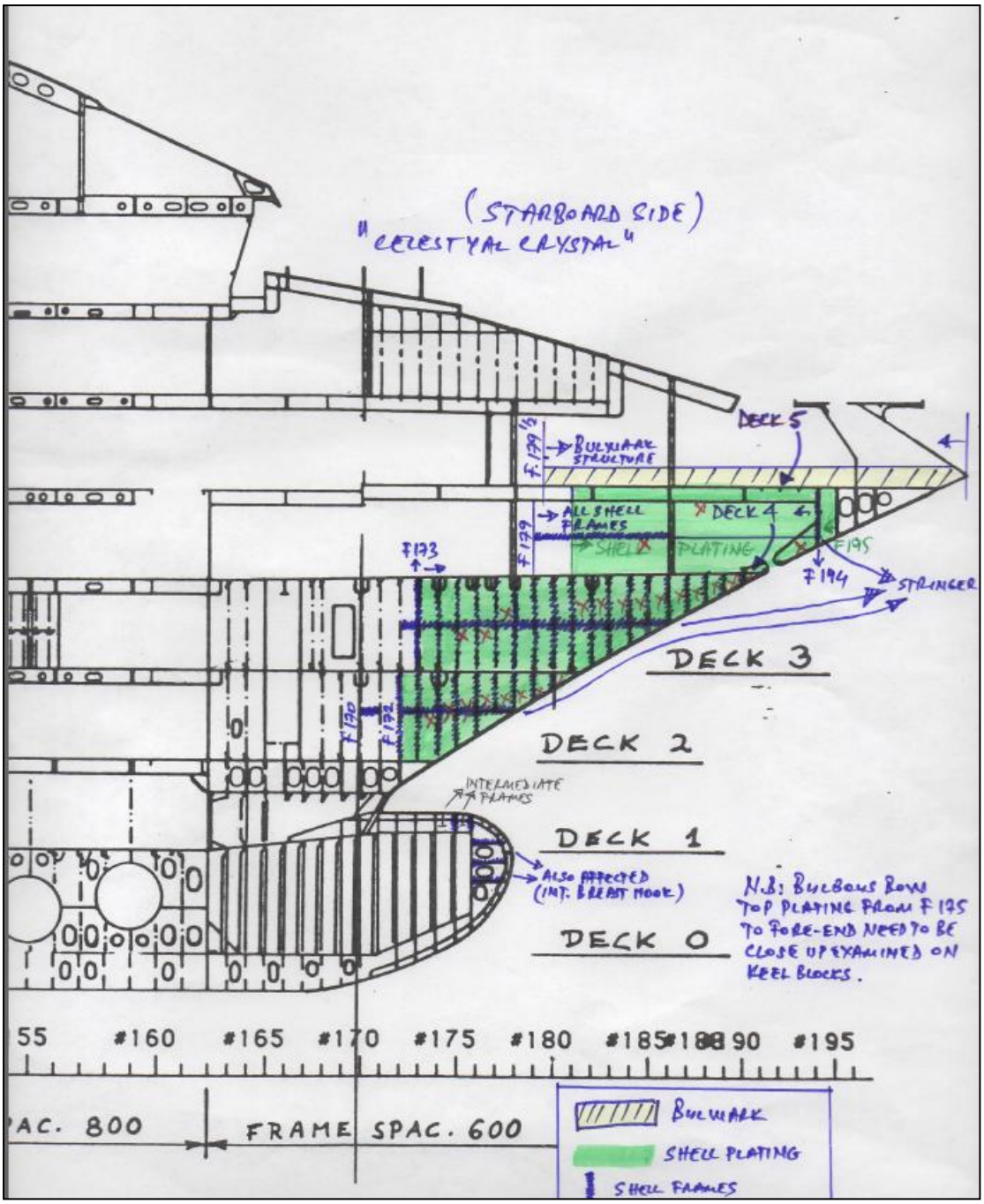
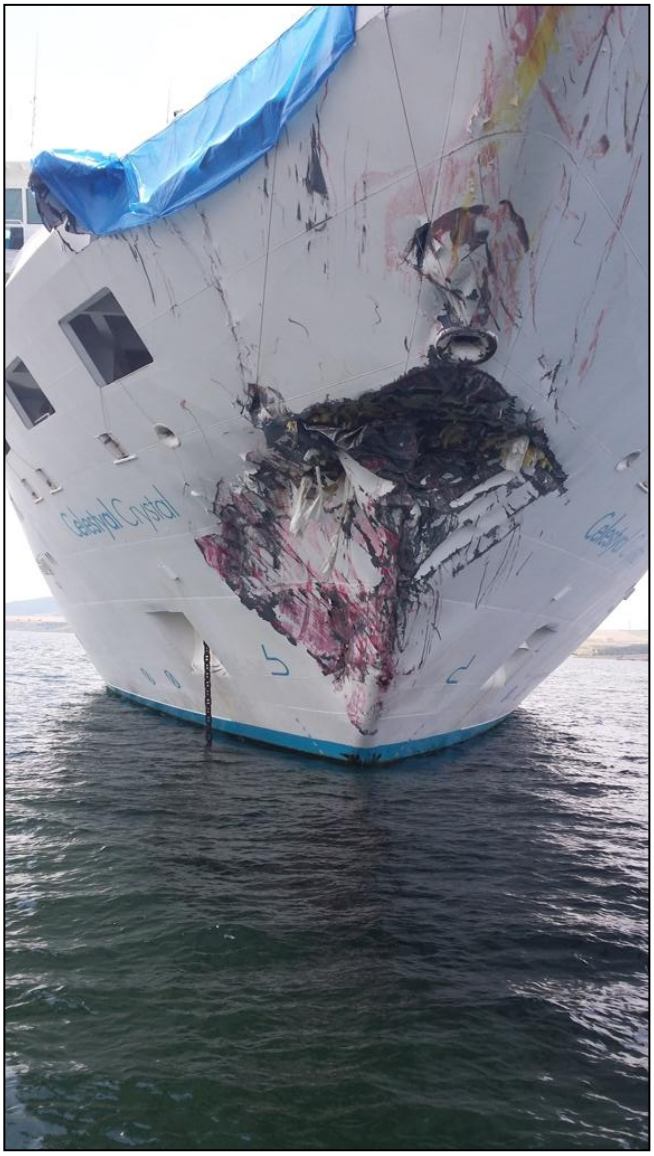


Figure 13a: Damages to the bow



Figures 13b-d: Damages to the bow and forecastle area

Figure 14: Repairs to the bow

1.9 Marine Traffic Regulations

The Turkish Strait Marine Traffic Regulations, which are in force since 1998, is the legislation which regulates the traffic in the Turkish Strait. The Turkish Straits comprise the Strait of Istanbul, the Strait of Çanakkale (Çanakkale Bogazi) and the Sea of Marmara.

Vessels transiting with dangerous cargo and vessels of 500 GT and over, are required to report to the nearest Traffic Control Center before their arrival at Istanbul or Çanakkale Strait. According to this legislation, there are specific requirements for tankers of over 150 m and all ships which are longer than 200 m.

All ships longer than 200 m and tankers whose overall length is between 150 m and 200 m, are subject to planning for their passage through the Çanakkale Strait, which must be communicated to the VTS, 24 hours before the entry into the Strait. Entry and exit for the Strait have to be also communicated to the VTS. *Celestyal Crystal* had complied with these requirements. Tankers of over 200 m, all vessels whose length exceeds 300 m, and towing vessels shall pass only during daytime. Tankers of over 150 m in length (but less than 200 m) may pass through the Çanakkale Strait during daytime and at night, on condition that during this passage, there should not be another tanker, which is longer than 150 m, and that is sailing in the opposite direction.

The speed limit in the Turkish Strait is 10 knots. However, if the vessel steerage at this stage is compromised, it can be increased following consultations with the VTS.

Ships navigating the Turkish Strait are required to keep a safe distance of eight cables from the ships sailing ahead. VTS can ask ships to increase this distance, depending on the type of ship. Slow ships are required to keep as much to the starboard side of the traffic lane as possible, so as to allow faster ships to overtake them. However, vessels shall not overtake other vessels unless there is a necessity; should there be the necessity to overtake a slow ship, the overtaking ship is required to notify the VTS. VTS provides information on the traffic conditions and if the circumstances are safe enough, the ship ahead is informed accordingly. Ideally, overtaking manoeuvres

should be carried out while ships are on a straight line course. Overtaking is forbidden between Nara and Kilitbahir Points[13].

STI Pimlico had to wait at anchorage due to a Northbound tanker traffic in the Strait. During this time, there were three tankers waiting at anchorage.

1.10 Çanakkale Bogazi

The Sea of Marmara links the Mediterranean to the Black Sea. At the Southwest end is the Çanakkale Bogazi (Figure 15) and at the Northeast end of the Strait is the Bosporus.

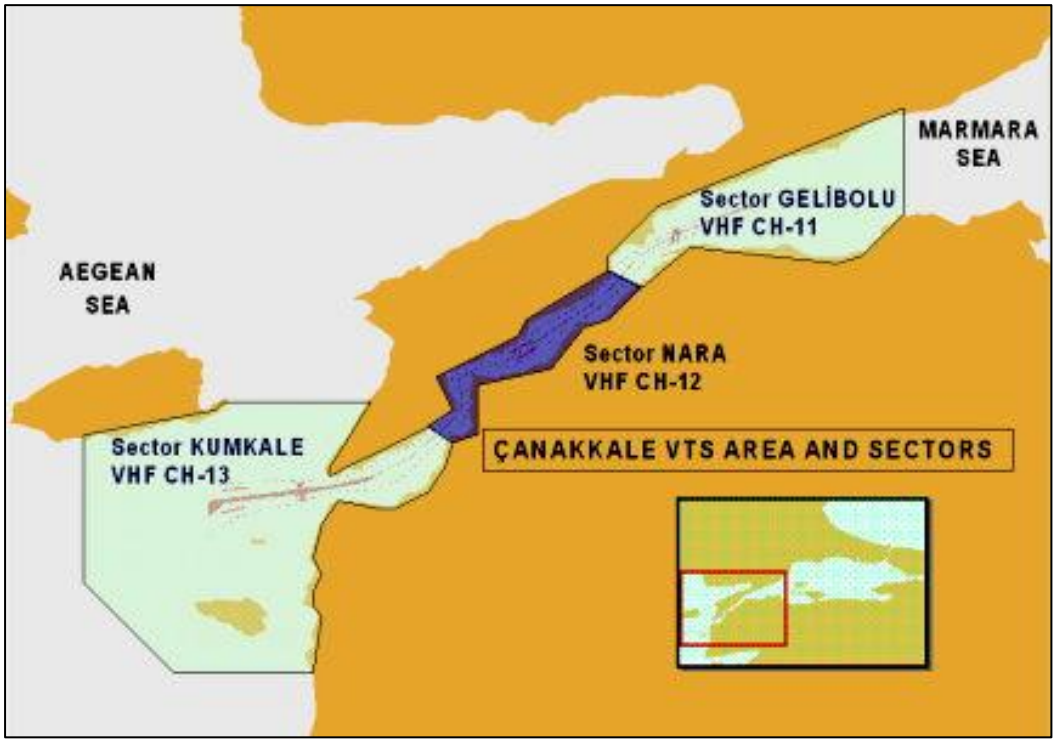


Figure 15: Çanakkale Bogazi

The Strait can be entered at any time and there are no draft restrictions, although vessels over 200 m in length or over 15 m draught are advised to pass through the Strait during daylight hours. Pilotage is not compulsory for vessels transiting the entire Strait, however, it is strongly advised in view of the strong currents and high density of traffic. A Traffic Separation Scheme (TSS) operates in the Strait and is supported by a Vessel Traffic Service (VTS).

[13]The collision occurred outside these limits.

1.11 Çanakkale Vessel Traffic Service

Marine traffic in Çanakkale Bogazi is monitored by Çanakkale VTS. Çanakkale VTS is part of the Turkish Strait Vessel Traffic Service (TSVTS). It is operated in accordance with the Turkish Maritime Traffic Regulations and IMO Resolutions A.857 (20) and A.827 (19). The TSVTS provides information, navigational assistance and traffic organization services. The area covered by Çanakkale VTS includes Gelibolu, Nazra and Kumkale (Figure 15). Vessels in Gelibolu report to Sector Gelibolu on VHF channel 11 (Figure 16).

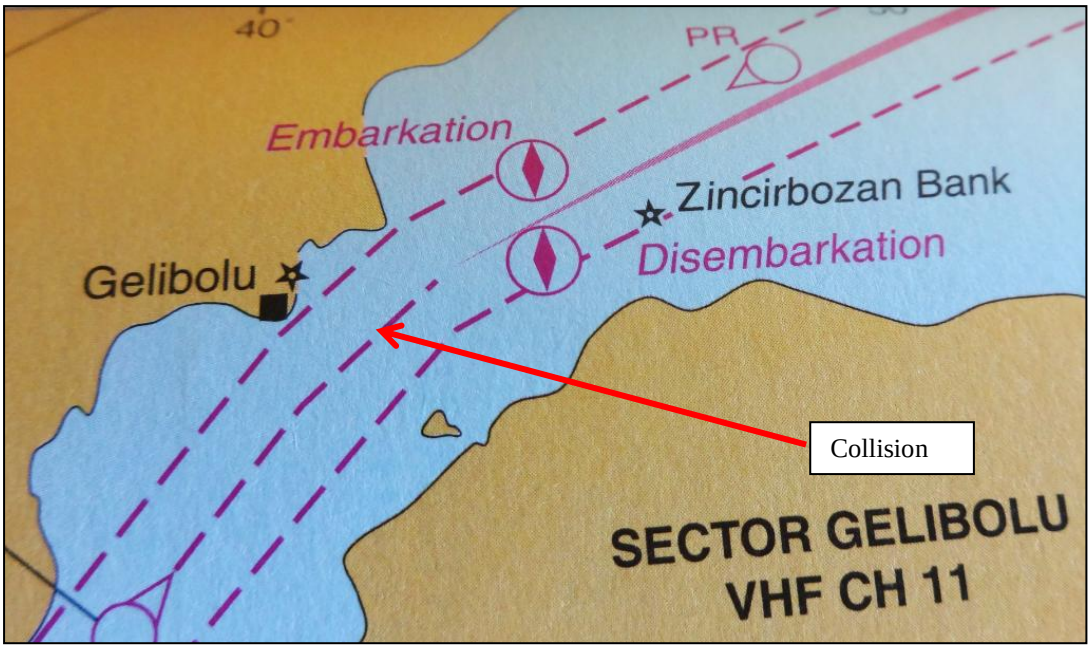


Figure 16: Area covered by Sector Gelibolu (where the collision occurred)

1.12 Traffic Separation Scheme

A Traffic Separation Scheme (TSS) adopted by the IMO was introduced throughout the Turkish Strait in 1995. The TSS provides traffic lanes[14] separated by a traffic line or zone to prevent vessels meeting head on. They are drawn on navigational charts and monitored by TSVTS. Unless suspended by the Authorities, all vessels navigating in the TSS must comply with Rule 10 of the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs).

[14] Vessel movement in traffic lane proceeds in opposite or nearly opposite directions separated by a traffic line or zone.

1.13 Pilotage Service

Maritime pilots are skilful ship handlers and possess extensive knowledge of local waters. These include tidal / sea currents, maritime activities, commercial traffic and local vessel movements, navigational hazards, *etc.*, which independently or collectively have considerable influence on safe navigation. He is also knowledgeable of the regulatory requirements and other special conditions in the pilotage area that the master may not be fully conversant. On board, the pilot can interact with the navigational bridge team, assess manoeuvring capabilities, assist the master and provide essential communications link with the maritime authorities, VTS and other ships.

Though pilotage is not compulsory in a non-stopover passage through the Turkish Strait, Turkish Maritime Authorities and IMO Resolution A.827 (19) recommend pilotage for safe navigation and protection of the environment. The pilotage waters lie between the pilot boarding and disembarkation positions located at each end of the Turkish Straits. These positions are defined in the Maritime Traffic Regulations.

Article 45 of the Regulations specifies that in the case of vessels passing through Çanakkale Strait, the pilot boarding and disembarking area on the Aegean Sea side is in 40° 00. 45′ N 026° 08. 154′ E and 40° 01. 55′ N 026° 08. 20′ E respectively. On the Marmara Sea side, the pilot boarding is 40° 25. 70′ N 026° 44. 15′ E and disembarking in position 40° 25. 05′ N 026° 44. 10′ E. These positions are marked on BA Chart 4249. In the event of high traffic density or navigational safety, the pilot boarding and disembarking areas may be temporally changed by the Authorities.

1.14 The Collision Regulations

The following rules taken from the International Regulations for Preventing Collisions at Sea 1972 (as amended) (COLREGs), are relevant to this accident:

Rule 5 Lookout;

Rule 7 Risk of collision;

Rule 8 Action to avoid collision;

Rule 10 Traffic Separation Schemes;

Rule 13 Overtaking vessels;

Rule 16 Action by the give-way vessel; and

Rule 17 Action by the stand-on vessel.

2 ANALYSIS

2.1 Purpose

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future. However, during the course of the safety investigation, the MSIU received no information on the events and actions on board *STI Pimlico*. Therefore, neither the factual nor the analysis part of this safety investigation report is being considered comprehensive to provide a detailed understanding of the accident dynamics.

2.2 Fatigue and Alcohol

The master, chief mate and the quartermaster all reported as being well rested at the time of the incident. The records of the hours of rest were in order and showed that rest hours were in excess of those required by STCW. No indication of signs of fatigue were captured on the Voyage Data Recorder (VDR) playback. Alcohol tests were carried out shortly after the accident on the master, staff captain, safety officer and chief engineer and all crew members that were on duty at the time. All tests results were negative and therefore fatigue and alcohol were not considered to be a contributing factor to this accident. With respect to *STI Pimlico*, the MSIU had access to neither the 'Hours of Work' document of the bridge team nor the results of alcohol and drug, carried out on board, if any.

2.3 ECDIS and Voyage Planning Record

Celestyal Crystal was fitted with an ECDIS and fully complied with the chart carriage requirements of SOLAS Regulation V/19. Although, Company management had experienced fleet wide issues with ECDIS software (licenses, updates, *etc.*) and occasionally with hardware, a voyage plan which involved planning, execution and monitoring of vessel's route, nonetheless, was uploaded in ECDIS. Additionally, details of the planned voyage and a list of nautical paper charts were written down on SMS Form F-MOP-009-02. The fact that the form was approved by the master and endorsed by watch keepers on sailing from Lavrio has cast doubt as to the

navigational reliability of ECDIS. The MSIU was unable to determine whether this was the reason behind the chief mate's minimal reference to the ECDIS data during the crucial minutes of the vessel's deviation into the opposite traffic lane.

2.4 Pilot / master Exchange of Information

Annex 2 of the IMO Assembly Resolution A.960 (23) recommends exchange of information. Section 5.2 states:

> Each pilotage assignment should begin with an information exchange between the pilot and the master. The amount and subject matter of the information to be exchanged should be determined by the specific navigation demands of the pilotage operation. Additional information can be exchanged as the operation proceeds.

The Resolution further recommends that pilotage authorities should develop a standard exchange of information taking into account regulatory requirements and best practices in the pilotage area.

On boarding *Celestyal Crystal*, the Çanakkale Strait pilot acknowledged receipt of pilot card F-MOP-006-02 and the master/pilot information exchange form F-MOP-007-02. However, there was no documented evidence of shore-to-ship pilot / master information exchange, which essentially include details of pilot passage, local regulations, anticipated ship movements and pilot disembarkation position. Although it was not excluded that information had been verbally communicated by the pilot to the master before the pilot's disembarkation, these key issues had not been logged in the deck logbook[15].

2.5 Disembarkation of Pilot

After the pilot had embarked *Celestyal Crystal*, navigation in the Strait of Çanakkale was uneventful. On arriving Gelibolu, the pilot disembarked roughly four nm short of the disembarkation position. The vessel's exit from the Strait was carried out without pilot assistance. The weather recorded in the ship's logbook indicated that the

[15]The only record of this exchange in the deck logbook was '[p]ilot disembarked, captain has the con.'

weather was no encumbrance to the pilot disembarking at the appropriate pilot station. Moreover, the safety investigation found no evidence of pilot's intention or reason for early departure from the vessel or of any navigational advice or guidance given to the master[16].

2.6 Overview of the Traffic

At 0118, when the master left the bridge, *Celestyal Crystal* was following the Northeast traffic lane and had planned to overtake *Emona*. She was therefore obliged to follow Rule 10 (Traffic Separation Schemes) and Rule 13 (Overtaking) of the COLREGs and was required to keep out of the way of *Emona* as per Rule 16 (Action by give-way vessel).

Emona was also following the Northeast traffic lane and was being overtaken. She was obliged to follow Rule 10 and Rule 17 (Action by stand-on vessel).

STI Pimlico was following the Southwest traffic lane and was obliged to follow Rule 10.

2.7 Actions of the OOW and Situation Awareness

Shortly after the pilot boat cleared the vessel, the master instructed the chief mate to keep *Emona* on the starboard and left the bridge. The OOW set a course of 033° to allow more room for the vessel (*Emona*) he was intending to overtake. C*elestyal Crystal* did not inform the VTS of the intention to overtake the vessel. This was considered to be a missing safety barrier system because the VTS would have been in a position to provide foresight to the crew members on the bridge. It was very probable that the OOW was so fixated with overtaking *Emona* that he neither called the vessel nor reported to VTS.

[16] During the Consultation Period, the Accident Investigation Board of Turkey advised that upon the vessel's arrival at Gelibolu, the master started to reduce speed and gave the order to prepare the pilot ladder for pilot disembarkation. This was interpreted to mean that the master did not feel the need for the experience, knowledge and skill of the pilot. The Accident Investigation Board submitted that when the master was asked by the Çanakkale Harbour Master (during the course of the initial investigation into the accident) as to why the pilot was disembarked at an early stage, the master replied that he thought that it was a suitable position to drop the pilot. Moreover, the Accident Investigation Board stated that according to the pilot, the master was verbally provided with navigational advice and guidance before he disembarked.

During the course of overtaking *Emona*, a ferry on the port bow altered her course in the direction of *Celestyal Crystal* and passed close astern (Figure 18). This manoeuvre distracted the chief mate and consequently, he did not observe *Emona*'s alteration of course to starboard within the traffic lane. The OOW then entered into a discussion with the apprentice officer regarding the glare of the lights that the nearby vessels were displaying.

At about 0122, shortly before the apprentice officer left the bridge, the OOW ordered a course of 030° and then 028° to increase the closest point of approach with the vessel to what he thought was *Emona* (Figure 17). In response to his subsequent alterations of course to port, the OOW expected the bearing of the vessel to open. Instead, the bearing closed. He then shifted his position from the radar to the bridge window to visually observe the vessel.

Although the OOW was looking ahead, he was aware neither of own vessel's position in the TSS nor the danger of his vessel heading into the Southbound traffic lane.

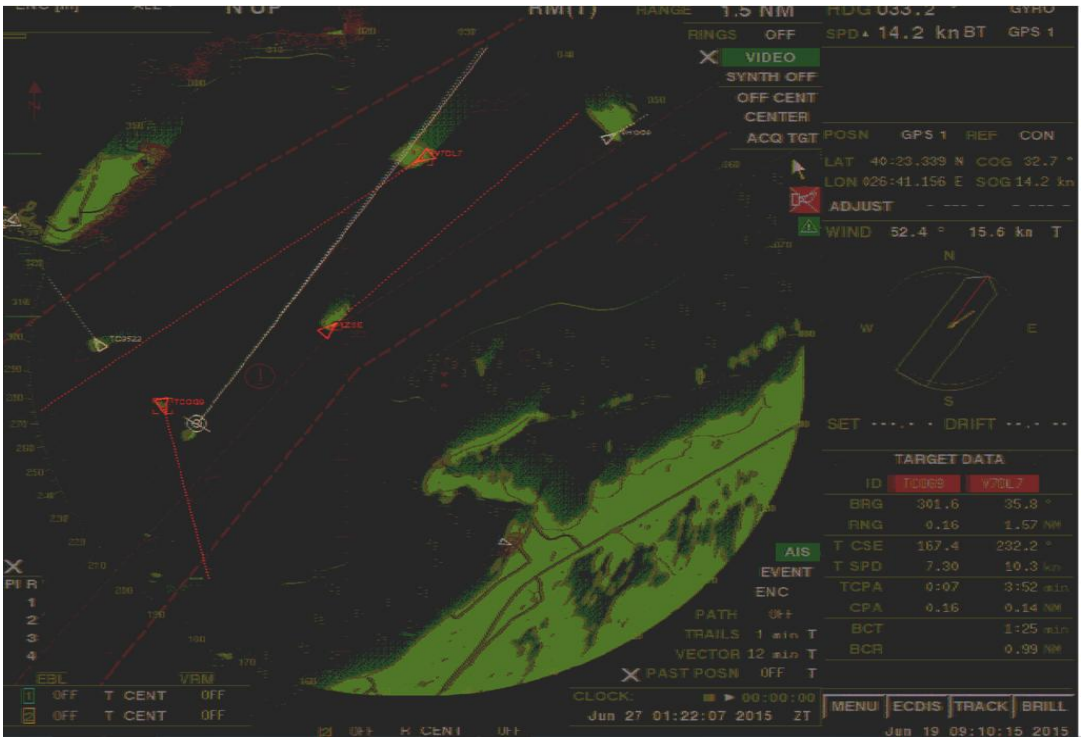


Figure 17: Radar screen showing vessels at 0122:07

During the course of the safety investigation, the OOW had limited recollection of the events prior to the collision and was not aware that *Celestyal Crystal* had entered the

traffic separation zone. He had become solely concerned with the bright lights of the other vessel (*Emona*) to starboard[17].

Two minutes before the collision, VTS first called *Celestyal Crystal* on the VHF to warn of a ship on her port side. The OOW acknowledged the call and stated "negative, not possible to come to starboard"[18]. It seemed evident to the safety investigation that even at this stage, the OOW remained convinced that if he were to alter course to starboard, he would run in the danger of colliding with *Emona* which was on his starboard side. It was only after VTS called him a third time at 0125 that he realised that the vessel he was overtaking was not *Emona* and that he was on a collision course with *STI Pimlico* which, until that moment had remained undetected by the chief mate (Figure 18).

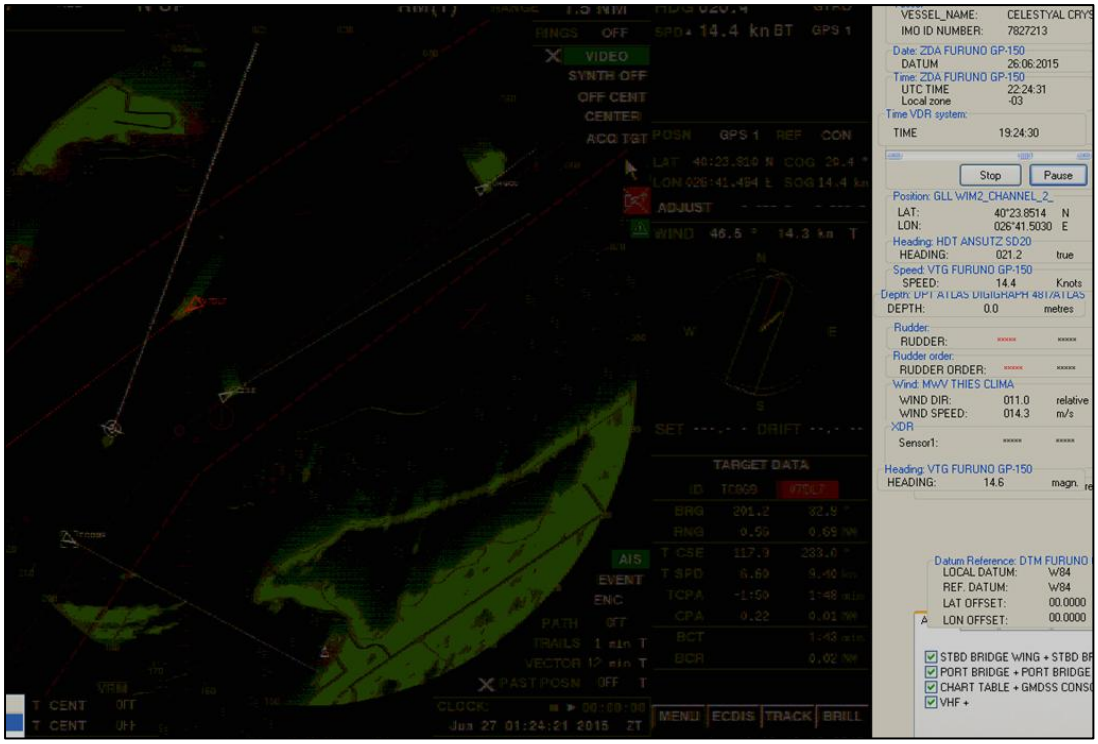


Figure 18: Radar screen showing vessels at 0124:31

[17] The OOW informed the Turkish Accident Investigation Board that there were bright lights at the aft of the vessel he was overtaking. However, the pilot on board *Celestyal Crystal* did not recall any lights at the aft of *Emona*.

[18] Radar images show *STI Pimlico* fine on the starboard bow *of Celestyal Crystal*.

The lights that the OOW thought were on the aft of *Emona* were actually the deck lights of *STI Pimlico*, which was preparing to embark the pilot and hence switched on the deck lights for the safe embarkation of the pilot[19].

When the deck lights of *STI Pimlico* first appeared, the two ships, *i.e. Emona* and *STI Pimlico*, were seen in a straight line by the OOW. It is likely that the distant bright lights obscured the navigation lights of *STI Pimlico* and may have given the appearance of coming from *Emona*'s accommodation. Around this time, *Emona* was starting to alter her course to starboard. After this point, the OOW believed that he was overtaking *Emona*.

Since *STI Pimlico* was proceeding in the Çanakkale Strait, the OOW perceived that the ship he thought he was overtaking was moving towards his port side and giving less space to his ship to overtake. Thus, to mitigate the situation, he tried to keep the vessel on his starboard side and kept altering his course to port.

Both the master and apprentice officer had commented on the bright accommodation lights of *Emona* and the OOW was also certain he did not mistake the lights of *STI Pimlico* for the lights of *Emona*. However, as stated above, his recollection of events was limited and the only fact he stated for certain was that everything had happened so fast. The MSIU is also aware that he had stopped using the navigational equipment, the navigational alarms were muted and he was exclusively relying on visual sighting of lights. His assessment of the situation, therefore, was limited.

The last time the OOW had seen *Emona* on radar was at about 0123. However, it would seem that he had not checked the radar (Figure 18) and ECDIS when he decided to alter course to port; otherwise, he would have noticed that he was heading towards *STI Pimlico* and that there was no risk of collision with *Emona*. Moreover, consulting the radar and ECDIS after his first contact with VTS, would have quickly established that he had entered the traffic separation zone and was on a collision course with *STI Pimlico*.

[19] *STI Pimlico* surpassed the designated pilot boarding point without pilot and continued her passage in the Strait with her deck lights on.

The OOW had an animated conversation with the apprentice officer about lights that distracted him from effectively monitoring the situation. When the apprentice officer left the bridge at 0123, the chief mate's decisions appeared to be based on a visual sighting of lights ahead rather than any of the navigational information which was available to him.

The fact that the OOW missed important cues during the course of his navigational watch, led the safety investigation to analyse the inaccuracy in his awareness of a situation which was dynamic and hence constantly changing. It is crucial for an OOW to keep a constant track of the developing events as they unfold. This will ensure an adequate and updated knowledge of the status of the situation.

His focus on a particular part of the environment could be considered as a disturbance which led to a detachment of the OOW's understanding of the situation and the actual content outside of the bridge window. The external environment was typical of a busy TSS, *i.e.*:

- multiple goals to be pursued by the OOW during his watch; and
- a particular factor competing for the attention of the OOW.

These two factors led the OOW to:

1. miss critical cues on the actual state of the system; and
2. erroneously interpret information which he was receiving on the bridge.

The evidence suggested potential issues with the receipt of information from the navigational instruments and outside of the ship. Therefore, even at a stage where interpretation of data would have not yet started, the OOW was already experiencing problems which would eventually compromise his assessment of the situation and any subsequent (navigational) decisions, which he was to take prior to the collision.

2.8 Look-out

The COLREGs (Rule 5) require that a proper lookout is maintained at all times. This is a fundamental requirement. Indeed, on board navigational procedures consider it

dangerous for the OOW to act as sole look-out and stress observance with the bridge manning levels defined in the vessel's SMS.

Although the chief mate had visually sighted the two vessels closest to *Celestyal Crystal*, it appears that even in view of the factors discussed above, he was unable to make a full appraisal of the situation and/or of the risk of collision (Rule 7), by taking visual bearings or using the radar effectively.

Moreover, when the master left the bridge at 0118, there was no look-out. The chief mate was effectively carrying out the duties of a look-out and OOW. The apprentice officer was not part of the bridge team and was not required to remain on the bridge after the master had departed[20]. The second quartermaster was on the forecastle deck to help secure the anchors.

The assigning of second quartermaster on anchors during transit seems to indicate habitual non-attendance of a dedicated look-out which over time and with no untoward incident reinforced a belief that it was safe to navigate in that way and very likely influenced the master's decision not to send for another person or hold apprentice officer on the bridge for lookout duties. The safety investigation feels that the lack of a dedicated look-out person removed an important control measure which would have helped the OOW, preoccupied with overtaking another vessel, establish true aspect and direction of *STI Pimlico.*

2.9 Risk of Collision and Action to Avoid Collision

Prior to altering the vessel's course, the chief mate did not establish the position of the vessel or determine whether there was any risk of collision with the two vessels in the immediate vicinity.

Evidence indicated that the two radars were set on 'auto acquire', in AIS mode. This meant that only targets transmitting AIS data were tracked automatically. The targets displayed on radar were neither plotted by ARPA, nor were they manually acquired. Compared to a manual acquisition of targets to provide the OOW with an ARPA plot to determine if there was a risk of collision, reliance on AIS data may be problematic,

[20] The primary task of the apprentice officer was to provide general assistance to the master during pilotage.

given that the equipment is not fitted on all vessels and therefore cannot be relied upon for collision avoidance.

The radar and ECDIS showed that risk of collision did not exist with *STI Pimlico* and that the initial alteration of course from 35º to 33º was adequate to overtake *Emona* safely in accordance with Rule 13. As explained in the previous sub-section, these cues were missed.

Moreover, *STI Pimlico* (or any other vessel in the vicinity) would not have been aware of any actions taken by *Celestyal Crystal* since the alterations of course were small to be readily apparent.

2.10 Ergonomics of the Navigational Equipment

The SAM Electronics ECDIS was located on the starboard forward part of the console and the Kelvin Hughes Radar had been retro-fitted to the end of the T shaped console (Figure 19). This meant that the OOW had to stand on the starboard side of the console, which allowed him to see the ECDIS and then by stepping back slightly, to view the radar display.

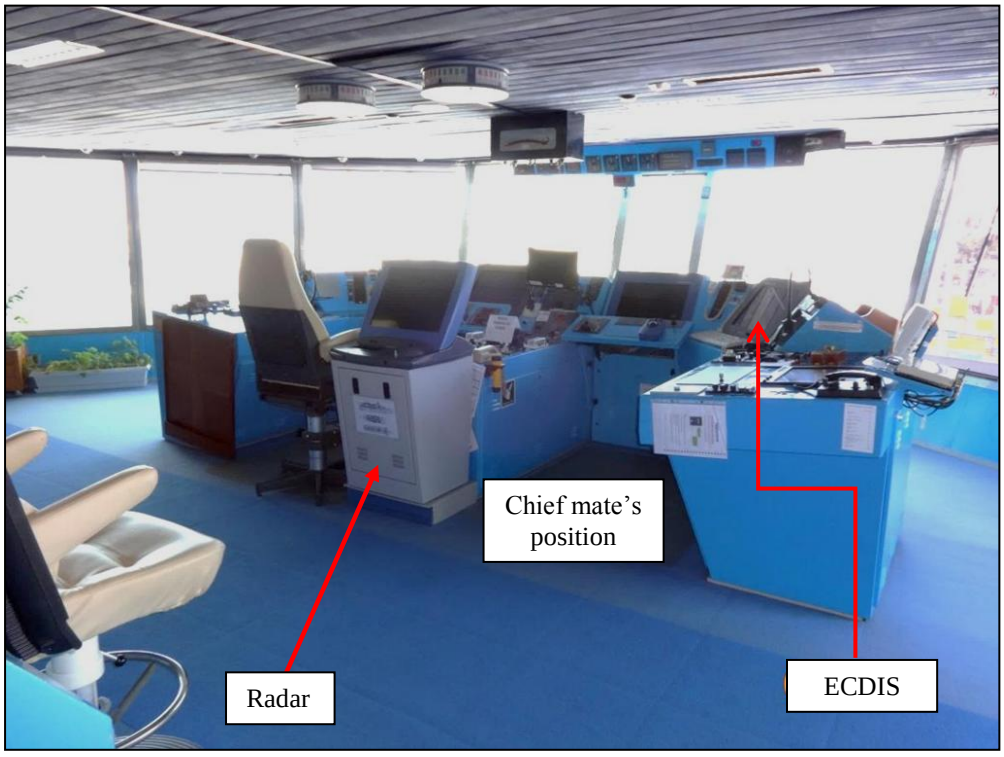


Figure 19: Navigation Conning Console

The position of the new radar at the end of the 'T' was not ideal, as the layout of the console was originally designed so that the operator sat in a chair and had visibility of all the instrumentation grouped in front of him.

It was not excluded that the position of the radar and ECDIS may have contributed to the chief mate's inaccurate situational awareness.

The steering position was unusual in that the helmsman sat on a chair in front of the console when manual steering was engaged. This meant that he would have had to look down for most of the time (Figure 4) and therefore be ineffective as a look-out with no assistance to the OOW, apart from steering the vessel. This clearly reinforces the requirement of having a dedicated look-out at all times.

2.11 Bridge Team Management

An effective bridge team will work to eliminate the risk of an error by one person developing into a dangerous situation. At this stage, the presence of a third person, properly integrated in the bridge team, may have provided crucial input to enhance the OOW situation awareness and avoid *Celestyal Crystal*'s progressive alteration of course to port.

The master handed over the watch to the chief mate and left the bridge about two minutes after the pilot disembarked. His departure from the bridge prevented:

- a proper lookout until the quartermaster returned;
- the OOW from settling in his watch for a few more minutes longer;
- an observation of the vessel to settle on her next course, which was coming up soon; and
- his overall visual of a situation with crossing ferries (even if not on a collision course), which had not yet cleared the vessel.

The OOW's situational awareness was inaccurate to an extent that during a critical time of his watch, he became convinced that he was about to collide with the ship he was overtaking. The situation on the bridge did not allow different bridge team members from constructing and sharing a situational model of the context and from

which, potential future states of the system may have been anticipated (distribution situation awareness).

It is evident that the actions of the OOW were instigated by incomplete and inaccurate external representations, related to temporal and spatial elements of the situation outside the bridge and which were the result of the interpretation of data received from diverse sources.

2.12 Actions to Inform Passengers After the Collision

Following the collision, the master was aware that he was required to sound the emergency signal and call the crew to their emergency stations and passengers to their assembly stations. However, he did not raise the alarm because he could see from the starboard bridge windows that the main assembly station 'A' had been badly damaged and could no longer be used.

The loss of a major assembly station made the decision of sounding emergency stations a more complicated one because the alternative assembly station was located on 'Deck 8'. This would have required the crew members getting to their emergency station before starting to move passengers from their cabins to the alternative assembly station, which would require the passengers to be redirected by the crew members. The master was rightly concerned that by sounding the emergency signal, the passengers with no crew members to direct them, would automatically go to the main assembly area, which was not safe.

The master assessed the situation and knew that *Celestyal Crystal* had hit *STI Pimlico* bow on and since the bow was ice strengthened, he was confident that the damage would not be severe as *Celestyal Crystal* had not developed any list. He therefore decided to wait until he had received reports from the damage assessment party before deciding whether to sound the emergency signal.

2.13 Post Collision Support to the Master

The master was left on the bridge with the OOW who had just been involved in a collision and who was probably traumatised. This left the master making all the

decisions with little support, as the next most senior deck officer, the staff captain was investigating the damage. This has prevented the master from fully concentrating on the management of the overall emergency, such as, for instance, the conduct of an early head count, which only happened after the Company prompted it.

2.14 Actions by *STI Pimlico*

By about 0124, the OOW on board *STI Pimlico* should have become aware of *Celestyal Crystal*'s position within the traffic separation zone, and that it was heading towards his vessel. However, it is highly probable that this cue was not captured because there was no evidence to suggest that the risk of collision had been determined.

Although *STI Pimlico* was the stand-on vessel in this situation, the OOW was obliged to take action to avoid a collision as soon as it became apparent that *Celestyal Crystal* was not taking action in accordance with Rule 17 (a)(ii). It did not transpire that the OOW was aware of this danger – even when VTS contacted *Celestyal Crystal* over VHF.

THE FOLLOWING CONCLUSIONS AND RECOMMENDATIONS SHALL IN NO CASE CREATE A PRESUMPTION OF BLAME OR LIABILITY. NEITHER ARE THEY BINDING NOR LISTED IN ANY ORDER OF PRIORITY.

3 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

3.1 Immediate Safety Factor – *Celestyal Crystal*

.1 The immediate cause of the accident was inaccurate situation assessment of the dynamic context on both vessels.

3.2 Latent Conditions and other Safety Factors – *Celestyal Crystal*

.1 The OOW was not aware of the vessel's position and the danger she was heading into;

.2 The OOW remained convinced that he was going to collide with *Emona*, which was on his starboard side. It was only after VTS called him a third time at 0125 that he realised he was on a collision course with *STI Pimlico*;

.3 The OOW did not check the radar and ECDIS when he decided to alter course to port;

.4 The OOW's decisions appeared to be based on a visual sighting of lights ahead rather than any of the navigational information which was available to him;

.5 The OOW's focus on a particular part of the environment could be considered as a disturbance, which led to a detachment of his understanding of the situation and the actual content outside of the bridge window;

.6 There were potential issues with the receipt of information from the navigational instruments and outside of the ship. Therefore, even at a stage where interpretation of data would not have yet started, the OOW was already experiencing problems which would eventually compromise his assessment of the situation and any (navigational) decisions which he was to take prior to the collision;

.7 The OOW was unable to make a full appraisal of the situation and/or of the risk of collision by taking visual bearings or using the radar effectively;

.8 When the master left the bridge, there was no look-out and the chief mate was effectively carrying out the duties of a look-out and the OOW;

.9 Prior to altering the vessel's course, the OOW did not establish the position of the vessel or determine whether there was any risk of collision with the two vessels in the immediate vicinity;

.10 *STI Pimlico* would not have been aware of any actions taken by *Celestyal Crystal* since the alterations of course were small to be readily apparent;

.11 It was not excluded that the chief mate's position behind the Kelvin Hughes radar, restricted his view of the ECDIS display, located on the main console, and may have contributed to the chief mate's inaccurate situational awareness;

.12 The steering position was designed as such that it required the helmsman to look down for most of the time and therefore be ineffective as a look-out with no assistance to the OOW, apart from steering the vessel.

3.3 Other Findings – *Celestyal Crystal*

.1 Fatigue and alcohol were not considered to be a contributing factor to this accident;

.2 The external environment was typical of a busy TSS, *i.e.*, multiple goals to be pursued by the OOW during his watch and a particular factor competing for the attention of the OOW;

.3 The presence of a third person who was properly integrated in to the bridge team may have provided crucial input to enhance the OOW situation awareness and avoid *Celestyal Crystal*'s progressive alteration of course to port;

.4 The situation on the bridge did not allow different bridge team members from constructing and sharing a situational model of the context and from which, potential future states of the system may have been anticipated (distribution situation awareness).

.5 The bridge was not manned in accordance with classification of navigation watch defined in the ship's SMS.

.6 Although it was not excluded that information had been verbally communicated by the pilot to the master before the pilot's disembarkation, these key issues had not been logged in the deck logbook.

.7 The deck lights of *STI Pimlico* switched on to embark the pilot obscured its navigation lights.

.8 Management experience of issues related with ECDIS and drawing up of Voyage Plan Form with an approved list of paper charts to destination port cast doubt on board *Celestyal Crystal* as to the reliability of ECDIS.

3.4 Latent Conditions and other Safety Factors – *STI Pimlico*

.1 It did not transpire that the OOW was aware of the danger of collision – even when VTS contacted *Celestyal Crystal* over VHF;

.2 *STI Pimlico* passed the pilot boarding point and entered the Strait of Çanakkale with no pilot on board.

5 RECOMMENDATIONS

In view of the conclusions reached and taking into consideration the safety actions taken during the course of the safety investigation,

Optimum Shipmanagement Service SA is recommended to:

10/2016_R1 undertake a series of navigation audits on board its managed vessels to obtain qualitative information on how the Company's bridge requirements and procedures are being implemented;

10/2016_R2 review the lessons highlighted in this safety investigation report relating to the support the master has available to him in an emergency;

10/2016_R3 review the emergency procedures and training to take into account the lessons learnt from this safety investigation;

10/2016_R4 ensure that masters serving on board Company ships and which are navigating through the Turkish Strait, keep in contact with the VTS.

The Turkish Straits Maritime Pilots are recommended to:

10/2016_R5 ensure that pilotage services are organised between the pilot stations located at each end of the Çanakkale Strait.

LIST OF ANNEXES

Annex A: Transcript of VDR, ECDIS and VHF

Time	Person	Hdg	Speed	Order or Action
01:17	Cpt	035.6	5.8	(GR) Gives instruction to overtake from port other vessel, to request other vessel to "come to starboard a little bit"
01:18	Cpt	035	9.5	Leaves Bridge
01:18:09	CO	035.2	10.3	Gives order for new course "033º"
	QM			Acknowledges new course "033º"
01:19		033.2	12.1	Speed 12 kts
	CO			(GR) Instructs AO to look at the echo sounder
01:19 to 01:21	CO and AO	033.4	13.4	Discussions in Greek. Discuss traffic Comments on many lights on vessels, they can't make out other vessels' intentions
01:22:27	CO	033	14.3	*New Course: 030º*
	QM			*Acknowledge: 030º*
01:23:05	CO	031.5	14.3	*New Course: 028º*
	QM			*Acknowledge: 028º*
01:23:20	AO	030.5	14.3	Leaves Bridge
01:23:23	CO	030.5	14.3	*New Course: 026º*
	QM			*Acknowledge: 026º*
01:23:29	CC	029	14.4	Heading 028° Speed 14.4 knots The order to steer 026° has just been given. Rate of turn is 6° minute^{-1} to port *STI Pimlico*: Bearing 034°, Distance 1.06 nm *Emona:* Bearing 060°, Distance 0.59 nm, Course 058°
01:23:31	CO	029	14.4	*New Course: 025º*
	QM			*Acknowledge: 025º*
01:23:43	CO	027	14.4	*New Course: 024º*
	QM			*Acknowledge: 024º*
01:23:54	CO	022	14.4	*New Course: 022º*

	QM			*Acknowledge: 022º*
01:23:58	CO	025	14.4	*New Course: 020º*
	QM			*Acknowledge: 020º*
	CC	024	14.4	The order to steer 020º has just been given. Rate of turn is 8º minute^{-1} to port *STI Pimlico*: Bearing 033º, Distance 0.87 nm *Emona*: Bearing 066º, Distance 0.57 nm, Course 059°
01:24:00	VTS	025	14.4	Warns C.C. of a vessel on her port side
01:24:39	VTS			Advises C.C. to come to starboard to pass port to port with oncoming vessel "Please come to starboard side immediately, pass within bound vessel port-to-port"
	CO			Replies "It's not possible now to come to starboard side, negative"
01:24:59	VTS	19.7	14.4	Asks C.C. what is your intention, where are you going, insists on coming to starboard, to pass other vessel port-to-port
01:25:11	CO	19.7	14.4	CO instructs to come easy to starboard
01:25:17	CO	19.7	14.4	Says to ECR: "Slow Down. Slow Down Quickly"
	QM			States "20"
01:25:17	CC	020	14.5	Propellers are put to astern pitch. Rate of turn is 3º minute^{-1} to starboard *STI Pimlico:* Bearing 034º, Distance 0.38 nm *Emona:* Bearing 087º, Distance 0.57 nm, Course 059º
01:25:21	CO	020	14.5	Forcefully instructs to come all to port side "Port side, Port side, All!"
01:25:24	CO	020.5	14.5	Come port, Wheel is Hard a Starboard. Rate of turn is 3°/minute to starboard.
	QM	020.5	14.5	Questions: "Hard port?" Verifies himself "Hard port"
01:25:39	CO	020.5	14.5	Changes instruction to steer to starboard: "No, No, Starboard, Starboard"
01:25:40	CO			Verifies "Starboard, Starboard"

01:25:59	QM	014.5	12.5	Answers to CO “Starboard ,captain, coming up, Hard Starboard now”
	QM			“Coming up captain”, exclaims. CO tells him not to worry
01:26:03	QM	014.5	12.5	“Hard starboard now”
01:26:05		014.5	12.5	Sound of collision

AO Apprentice officer
CC *Celestyal Crystal*
CO Chief mate
Cpt Captain
GR Greek
QM Quarter master
VTS Vessel traffic services