REPUBLIC OF TURKEY

MINISTRY OF TRANSPORT, MARITIME AFFAIRS AND COMMUNICATIONS

Accident Investigation Board

Marine Casualty Safety Investigation Report
The Collision Between M/V TOLUNAY and the Coast Guard Boat TCSG-25

Istanbul Strait South Entrance
17th August 2016

37/DNZ-06/2017

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This Report is prepared by the Accident Investigation Board

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PURPOSE

This marine accident is investigated in accordance with the Bylaw on the Investigation of Marine Accidents and Incidents which came into force after being published at the Official Gazette No.29056 on 10th July 2014. Investigation procedures and principles are further applied by considering Resolutions of International Maritime Organization concerning International Standards and Recommended Applications for Safety Investigations Directed to MSC 255(84) (Accident Investigation Code) and Resolution A.1075(28) Sea Accidents or Incidents, and European Union Directive 2009/18/EC.

Purpose of the Marine Accident Investigation is to provide the improvement of the legislation and applications directed to the safety of life, goods and environment by achieving the real reasons which cause the occurrence of marine accidents, and thereby, to to avoid a repeat occurrence and to provide the mitigation of negative impacts and consequences following the accident.

Marine accident investigation shall be inadmissible in any judicial and administrative proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame

ABBREVIATIONS AND DEFINITIONS

VDR *:Voyage Data Recorder*

AIS *:Automatic Identification System*

VHF *:Very High Frequency*

ISM Code *:International Safety Management Code*

DPA *:Designated Person Ashore*

SMC *:Safety Management Certificate, Document which shows that the system established on the ship complies with the requirements of the Safety Management System.*

DOC *:Document of Compliance/The certificate which shows that the Operator complies with the ISM Code.*

SMS *:Safety Management System*

STCW *Standards of Training Certification and Watchkeeping*

IMO *:International Maritime Organization*

GT *:Gross Tonnage*

SOLAS *:Convention for the Safety Of Life At Sea*

BRM *:Bridge Resource Management*

SAHMUS *:Coast Guard VHF Enhanced Digital Safe Communication System*

SMCP *:Standard Marine Communication Phrases*

GMDSS *:Global Maritime Distress and Safety System*

VTS *:Vessel Traffic Services*

VTSO *:Vessel Traffic Services Operator*

COLREGs *:International Rules for the Prevention of Collision At Sea*

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SUMMARY

Figure 1: *Location of the Accident*

Note:All times in this Report are local (GMT +3)

MV TOLUNAY had departed from the Port of Casablanca in Morocco, in ballast condition, in order to load her cargo from the Port of Odessa in Ukraine. The vessel called İstanbul Vessel Traffic Services (VTS) AT 07:05 on 17th August 2016, informing the VTS that they entered Sector Kadıköy and they were going to pass by Haydarpaşa Lighthouse at 08:20.

TCSG 25 Boat of the Turkish Coast Guard Command started her duty at 08:14:30, to guard and escort the Russian navy ship VALENTIN PIKUL, which was making her transitpassage through İstanbul Strait (the Bosphorus Strait) from south to north. At this time, there was a distance of 771.3 meters (about 0.4 nautical miles) between the TCSG 25 Boat (Annex 1) and MV TOLUNAY.

At 08:21, while TCSG-25 Boat was still carrying on her duty to guard and escort, MV TOLUNAY, which was proceeding in the same direction and which was in an overtaking position collided with TCSG-25 Boat on her port quarter. As a result of the collision, TCSG-25 Boat capsized, whereas TOLUNAY proceeded without changing her speed and course and later on after realising the collision, she obeyed the directions of the Istanbul

VTS and taking a pilot on board, she anchored at Büyükdere Bay at Istanbul Strait, for the conclusion of the necessary investigations.

4 of the 7 crew members of TCSG-25 lost their lives and 3 crew members were rescued as a result of the search and rescue operations. No pollution was reported as a result of the accident. TCSG-25 Boat which was rendered unusable after the accident was towed to Pendik Naval Shipyard for reperations.

PART 1 – FINDINGS

1.1 Factual Information

1.1.1 M/V TOLUNAY Ship Particulars

Ship's Name	:	*M/V TOLUNAY*
Flag	:	*Cook Islands*
Classification Society	:	*Nippon Kaiji Kyokai (NKK)*
Place and Year of Build	:	*Saiki Heavy Industries - SAIKI, JAPAN / 1995*
Port of Registry	:	*Avatiu*
Ship Type	:	*Bulk Carrier*
Owner	:	*Tolunay Shipping Ltd./Liberia*
Manager	:	*Tolunay Ship Management/Mersin*
Gross Tonnage	:	*13865*
Net Tonnage	:	*7738*
DWT	:	*21964*
IMO No	:	*9085675*
Call Sign	:	*E5U2754*
LOA	:	*157,8 meters*
Breadth	:	*25 meters*
Width	:	*12,70*
Draft	:	*5,70 meters*
Main Engine	:	*MITSUBISHI 6UEC45LA / 7200 BP*
Number of Crew	:	*20*
Previous Port	:	*Casablanca/Morocco*
Varış Limanı	:	*Odessa/Ukraine*

Picture 2: *MV TOLUNAY*

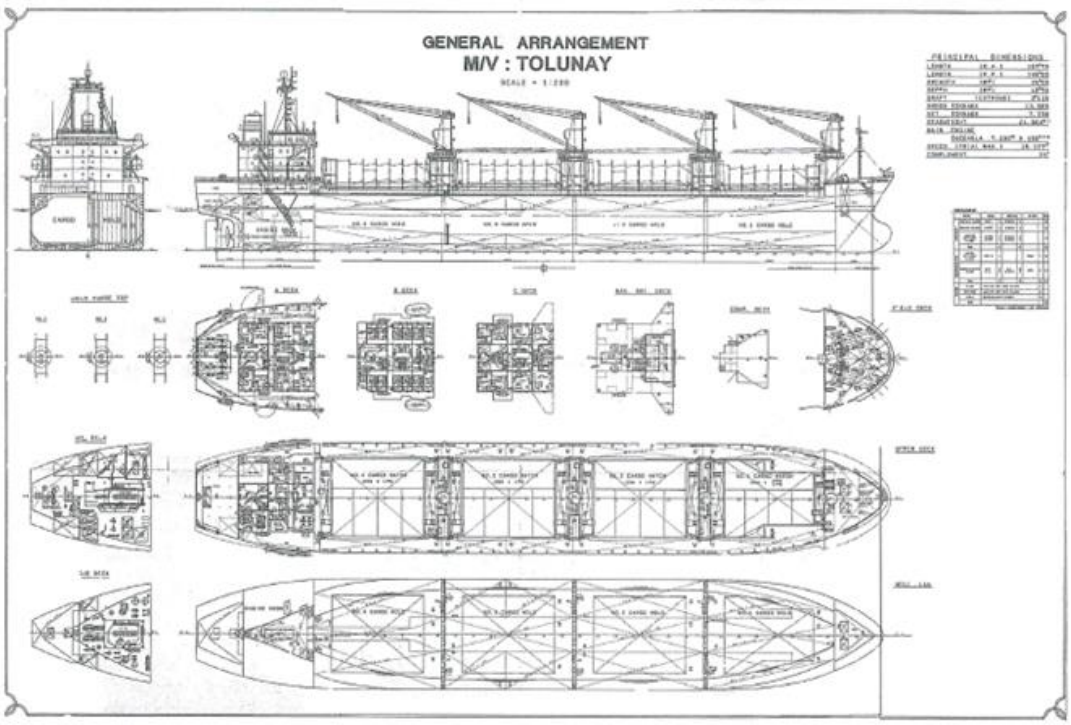


Figure 1: *General Arrangement Plan of MV TOLUNAY*

1.1.2 TCSG-25 Ship Particulars

Ship's Name : *TCSG-25*

Flag : *Türk*

Type : *Kaan 19*

Owner : *Turkish Coast Guard Command*

Place and Date of Build : *İstanbul/ 16.07.2013*

Gross Tonnage : *30*

LOA : *22,55 meters*

Main Engine Power : *2X1800 HP*

Last Port of Call : *İstanbul*

Next Port : *İstanbul*

Number of Crew : *7*

Picture 3: *TCSG 25 Boat*

1.1.3 Accident Information

Date and Time	:	*17.08.2016 / 08:21:14*
Type of Accident	:	*Very serious marine casualty*
Coordinates of Accident	:	*41° 00' 47,74"N - 028° 59' 47,11"E*
Location of Accident	:	*İstanbul Strait – Close to Haydarpaşa Northern Breakwater*
Fatalities / Losses	:	*4 crew members of TCG-25 Boat lost their lives, 3 others were injured*
Damages	:	*TCSG-25 Boat capsized*
Pollution	:	*None*

1.1.3 Weather and Sea Conditions

Estimated weather conditions in the area at the time of the accident were; wind 3 beaufort scale force from the North east (7.5-9.8 m/sec), weather clear and visibility was good.

1.2 Course of the Accident

1.2.1 Events Prior to the Accident

MV TOLUNAY departed from the port of Casablanca in Morocco in ballast condition, in order to load her cargo at the port of Odessa in Ukraine. Around 23:00-24:00 hours, vessel contacted İstanbul Vessel Traffic Service (VTS), to inform about their intention to pass through İstanbul Strait. İstanbul VTS ordered TOLUNAY to pass Haydarpaşa northern breakwater lighthouse at 08:20 on 17.08.2016. TOLUNAY called Istanbul VTS at 06:25 on 17.08.2016, while they were drifting at the South of Sivriada Island, 16 nautical miles from the entraance of Istanbul Strait and informed the VTS that they started to proceed towards the entrance, in order to pass through the Strait. TOLUNAY contacted Istanbul VTS once again through VHF at 07:05 informing that they entered Sector Kadıköy and received confirmation from the VTS that they will pass Haydarpaşa Breakwater at 08:20.

TCSG 25 Boat of the Turkish Coastguard was moored at İstinye pier inside İstanbul Strait at 23:50 on 16th August 2016 and her crew were at rest from 23:50 on 16th August until

07:30 on 17th August. TCSG 25 Boat left İstinye pier at 07:50 on 17th August 2016 for her security task at sea.

In the meantime, VTS Operator contacted Russian Federation Navy Ship VALENTIN PIKUL, which was proceeding through Istanbul Strait, at 07:54 on 17th August 2016 and required from them to increase their speed. Upon this communication, VALENTIN PIKUL expressed that they will increase their speed to 9 knots (nautical miles per hour). At 08:07, TOLUNAY called İstanbul VTS and asked whether they should maintain their speed or overtake the vessel ahead of her; İstanbul VTS, as a reply, told them to continue.***(Figure 2)***

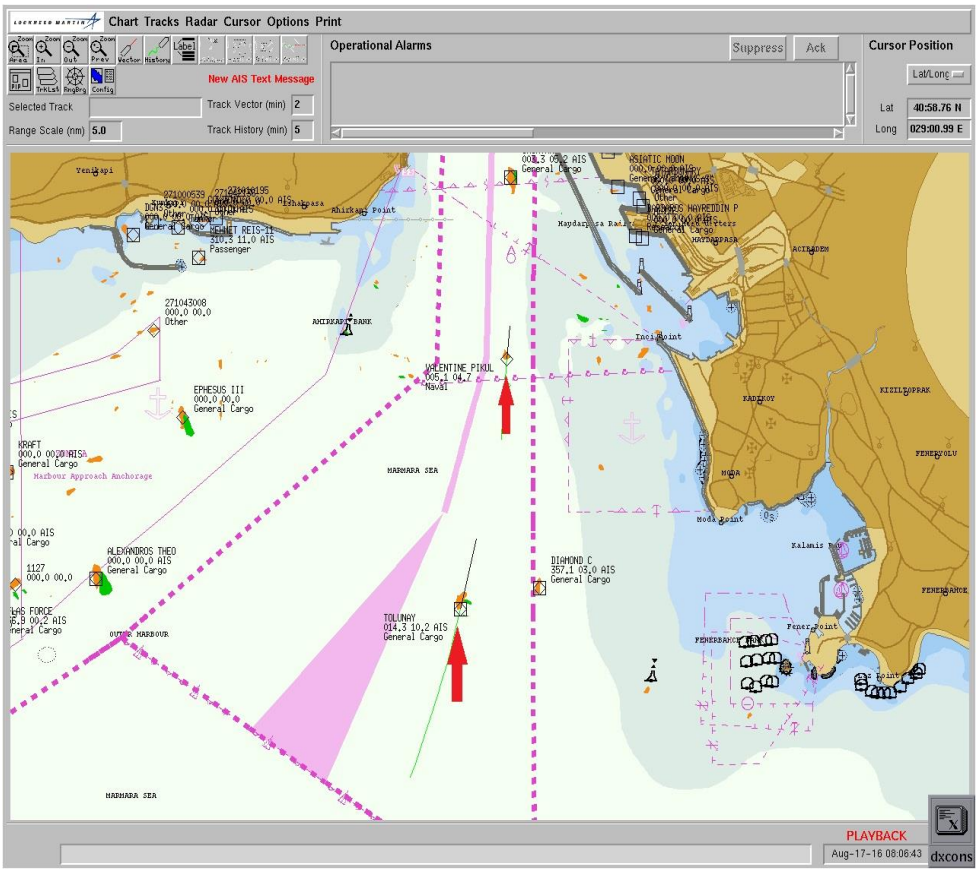


Figure-2: *Positions of TOLUNAY and VALENTIN PIKUL before the accident*

TCSG 25 Boat departing from İstinye and starting to navigate from north to south inside the İstanbul Strait, approached the fore part of TOLUNAY at a distance of nearly four cables at 08:14:30 and at this point made a U-turn at about 10,8 knots speed and placed herself at the aft of VALENTIN PIKUL to carry out her duty to escort and guard the navy vessel. After that, she started to reduce her speed gradually so that her speed would be

same as VALENTIN PIKUL and she started to alter her course towards the port quarter of VALENTIN PIKUL. Until the time of the accident, she contiued, as required by her task of escorting and guarding the navy vessel, she positioned herself at the port quarter of VALENTIN PIKUL, where she could best observe the navy vessel and also the probable dangers that could come from the surrounding areas and thus she continued to navigate in a convoy.

At the time when TCSG 25 Boat commenced her duty to guard and escort the Russian Federation Navy ship VALENTIN PIKUL, TOLUNAY was proceeding on the course 355-356, ata speed of 9,8-9,9 knot speed. At 08:15, TCSG 25 Boat contacted VALENTIN PIKUL on VHF Channel 16 and requested to switch to Channel 08, to discuss navigational security and safety issues.

1.2.2 The Accident

When TOLUNAY was entering İstanbul Strait, Captain, Chief Officer and helmsman were at the bridge and bosun was posted at the forecastle. There were 7 crew members on the bridge of TCSG 25, 3 of whom were posted as lookouts, 1 as a helmsman, 2 at the engine controls consol and the boat commander was giving commands and orders from his position close to the bridge forward windows.

TCSG 25 Boat, as a requirement of her duty of guarding and escorting, placed herself at a distance of 300 yards from the port quarter of the Russian Federation Navy ship VALENTIN PIKUL AT 08:14:30. Later on, while she gradually reduced her speed so as to be able to proceed at the same speed as VALENTIN PIKUL, she altered her course in accordance with the position of VALENTIN PIKUL, in order to carry out her duty of escorting and guarding.

At this point, there was a distance of 771.3[1] metres between MV TOLUNAY and TCSG 25 Boat.

At 08:15:00, when TOLUNAY was proceeding on the 357.7 course at a speed of 9.8 knots, her distance from TCSG 25 Boat, whose speed was 8.1 knots at the time, started to close ***(Table 1).***

[1] MV TOLUNAY's position at 08:14:28 and TCSG 25Boat's position at 08:14:30

NO	TIME	TOLUNAY		TCSG 25	DISTANCE BETWEEN THE TWO VESSELS (Metres)	TCSG 25's True Bearing From M/V TOLUNAY (Degrees)
		COURSE	SPEED	SPEED		
1	08:14:32	354	9.7	8.6	772,77	04.9
2	08:15:00	355	9.8	8.1	696.21	14.9
3	08:16:06	355	9.8	7	623.31	18.47
4	08:17:37	357	9.8	7.6	504.72	15.75
5	08:19:42	356	9.8	7.0	327.17	09.03
6	08:21:15	359	10	7	123.32	270.29

Table 1: *Speed and locations of MV TOLUNAY and TCSG 25 Boat*[2]

At 08:17:36, when TOLUNAY was proceeding on the course 002 degrees at 9,9 knots speed, TCSG 25 Boat was proceeding at 015.75 degrees true bearing at a distance of 504.2 metres ahead of TOLUNAY. At 08:19:42, while TOLUNAY was proceeding on the course 001.3 at 9,8 knots speed, TCSG 25 Boat was navigating at 009 degrees true bearing at a distance of 326.8 metres ahead of TOLUNAY. Last position information received from TCSG 25 Boat (41º 00' 47,74"N-28º 59' 47,11"E) was at 08:21:14. A few seconds later, TOLUNAY collided TCSG 25 Boat on her port quarter, as a consequence TCSG 25 Boat went down under the bulbous bow of TOLUNAY and came out of the water as she capsized, from the port side of TOLUNAY (Pictures: 4, 5, 6). One ship whistle blast was heard, simultaneously with the time of the collision.

[2] Figures at the table were taken from the VTS records and SAHMUS.

Picture 4: *Before TOLUNAY collided with TCSG 25 Boat*

Picture 5: *Time of Collision*

Picture 6: *After the Collision*

1.2.3 Aftermath of the Accident

At 08:21:35, one of the ships navigating inside the local traffic called İstanbul VTS and informed that one vessel collided with the Coast Guard Boat. Ships navigating inside the local traffic, passenger boats and fishing boats came to help the Coast Guard boat, the passenger boat HADEKA, which was close to the site of the accident, coming foremost.

Picture 7: *Passenger Boat HADEKA Arriving for Rescue*

However MV TOLUNAY continued on her course without any changes in her course and speed. Russian Federation Navy ship VALENTIN PIKUL, for which TCSG 25 Boat was carrying out her duty of escorting and guarding, also called İstanbul VTS at 08:22:00 to notify them about the accident. Immediately after they learned the accident, İstanbul VTS directed all the ships in the local traffic, as well as the rescue boats KIYI EMNİYETİ-3 and KIYI EMNİYETİ-4 and tugboats KURTARMA-8 and ŞARK of the Coastal Safety Agency from the Harem Rescue Station to the site of the accident ***(Picture 8).***

Picture 8: *The Coastal Safety General Directorate Ships Coming for Rescue*

Coast Guard Command Units and Sea Police, who had been notified about the accident started towards the site of the accident in order to join the search and rescue operations. TOLUNAY also called İstanbul VTS at 08:22:11, contact was established at 08:22:40, TOLUNAY expressed thatone boat ahead of her had capsized and that she started to alter her course to starboard. At 08:24:08, İstanbul VTS ordered TOLUNAY to keep away from the casualties, asked whether they sustained any damages and learned that there weren't damages at TOLUNAY. Starting from 08:28 rescue ships, Coast Guard units and Sea Police reached the site of the accident (Picture 9). At 08:33:39 hours, İstanbul VTS ordered TOLUNAY to proceed at minimum speed and informed that Pilot would be directed to them. TOLUNAY, having embarked the Pilot at 08:45, started to proceed towards Büyükdere anchorage area inside the İstanbul Strait.

Picture 9:*Coast Guard and Sea Police Boats Reaching the Site of the Accident*

Three crew members of the TCSG 25 Boat, which capsized immediately after the accident, came up to the water surface with their own means and they were taken to the Coastal Safety Agency ships and fishing boats in the vicinity. Rescue ships notified İstanbul VTS about the need of requesting ambulances to the Harem Rescue Station and two of these casualties were transferred to the hospital for health control. The other crew member helped to transfer information to the rescue boats which came to their help. The rescue tugboat KURTARMA 8 tied a line to TCSG 25 Boat and prevented the boat from sinking completely to the bottom of the sea.

Picture 10: *The Tugboat KURTARMA 8 that prevented TCSG 25 Boat from Sinking*

At this same time, divers from the Sea Police, Coast Guard Command and Turkish Navy dived to rescue the crew members who were still inside the capsized TCSG 25 Boat. In this rescue operation, three of the four crew members were taken out as having lost their lives, whereas one crew member was rescued as being seriously injured. The seriosly injured crew member lost his life at the hospital.

1.3 Damage

1.3.1 Damage to the TCSG 25 Boat

As a result of TOLUNAY's collision into the port quarter of TCSG 25 Boat, TCSG 25 Boat capsized, outer surface of the starboard quarter of the Boat was broken, both propellers and the propeller system was damaged. In addition, all electrical and electronic navigational aids equipments of the TCSG 25 Boat, located in the living quarters and in the engine room, as well as all materials and equipment that enable a ship to be in a viable state became unusable. ***(Pictures 11,12,13)***

Picture 11: *Recovery of TCSG 25 Boat from the sea*

Picture 12: *The damaged propellers of TCSG 25 Boat*

Picture 13:*The damage at the Port Quarter of TCSG 25 Boat*

Picture 14: *The damage inside the TCSG 25 Boat*

1.3.2 Damaged to the MV Tolunay

As a result of the accident, the only damage at TOLUNAY was on the paint of the bulbous bow, where the collision had occurred ***(Picture 15).***

Picture 15: *The damage at the Bulbous Bow of MV TOLUNAY after the collision*

1.4 TCSG 25 Boat

1.4.1 Key personnel at TCSG 25 Boat

1.4.1.1 Boat Commander

Boat's commander was 29 years old. He graduated from Naval Academy in 2008 and after graduation he worked at active navigational duties on Coast Guard vessels (2nd Commander on TCSG 87, Communication Officer on TCSG Güven Command, 2nd Officer on TCSG 88 Command). He started as the Commander of TCSG 25 Boat on 31st December 2015. During his service in the Coast Guard Command, he received and successfully completed the Coast Guard Basic Training, Coast Guard Pre-Duty Weapons Course, Naval Experience Course, Search and Rescue Ships Communication Course, Silver Life Rescue and First Aid Adaptation and Updating Training, Coast Guard Ship / Boat Command Training Course.

1.4.1.2 Navigation Petty Officer

Navigation Petit Officer was 30 years old. He graduated from Coast Guard Training and Education Comman in 2006 and after his graduation he served actively for the navigation of Coast Guard Command Ships (TCSG 63 Command Navigation Petit Officer, TCSG 93 Command Navigation Petit Officer, TCSG 308 Command Navigation Petit Officer, Commander of SAGET-3). During his service at the Coast Guard Command, he received and successfully completed the Coast Guard Basic Training, Use of Navigational Aids Course, Use of Speed Boat Training Course and SAGET Command Training Course.

1.4.2 Watch Routine

One single watch was being followed at TCSG 25 Boat. On 16th August 2016, crew of TCSG 25 Boat carried out their daily port service (berth service) between 08:00-17:00 hours. Boat was at sea (navigating) between 20:25 and 23:50 and later on Boat crew went to rest at the port premises. On 17th August 2017, Boat left the berth at İstinye and was underway until the time of collision at 08:21 for "50 minutes". Considering the work hours, it is considered that the crew were not tired and thus fatigue was not a factor in the accident.

1.4.2.1 Navigational Watch Instructions

With regard to the construction of TCSG 25 Boat, it is not possible for her crew to carry out look-out during navigation. Therefore, during navigation, look-out could be performed on the bridge.

1.5 MV TOLUNAY

1.5.1 MV TOLUNAY's Safety Management Certificate (SMC) and Document of Compliance (DOC)

Ship's Safety Managemenet Certificate was issued on 17th April 2014 and Document of Compliance (DOC) for the Company was issued on 07th April 2014 by NIPPON KAIJI KYOKAI.

In the annual surveys of the DOC Certificate, carried out in accordance with the ISM Code on 29th April 2015 and 06th May 2015 at the managing company (Tolunay Ship Management), the Company was found to be complying with the requirements of the ISM Code.

1.5.2 Key Personnel on MV TOLUNAY

In compliance with SOLAS Chapter 5, Regulation 14 and in accordance with the Minimum Safe Manning Certificate which was issued by the Flag State, TOLUNAY needs to be manned with 11 crew. On the day of the accident, there were 20 crew members on board the vessel, including the Master. Ship's crew complement were Syrian and Egyptian nationals and working language on board was Arabic.

1.5.2.1 Captain

Ship's Captain was 33 years ols. After his trainings, he started in 2008 to work as second officer. He acquired competency as Chief Officer in 2010 and starting from april in 2011, he started to work as a Captain. TOLUNAY was the 6th ship he served as a Captain. He started his service as a Captain at TOLUNAY on 13th January 2016.

1.5.2.2 Chief Officer

Chief Officer was 33 years old. He acquired competencey as a Chief Officer in 2006. He started as a Chief Officer on MV TOLUNAY on 13th January 2016.

1.5.3 Watch Routine

In contrast with the navigational watch regulations shown on the bridge ***(Annex-2)***, two different watch routines were observed at TOLUNAY, being open sea and narrow channels/straits.

1.5.3.1 Navigational Watch in Narrow Channels/Straits

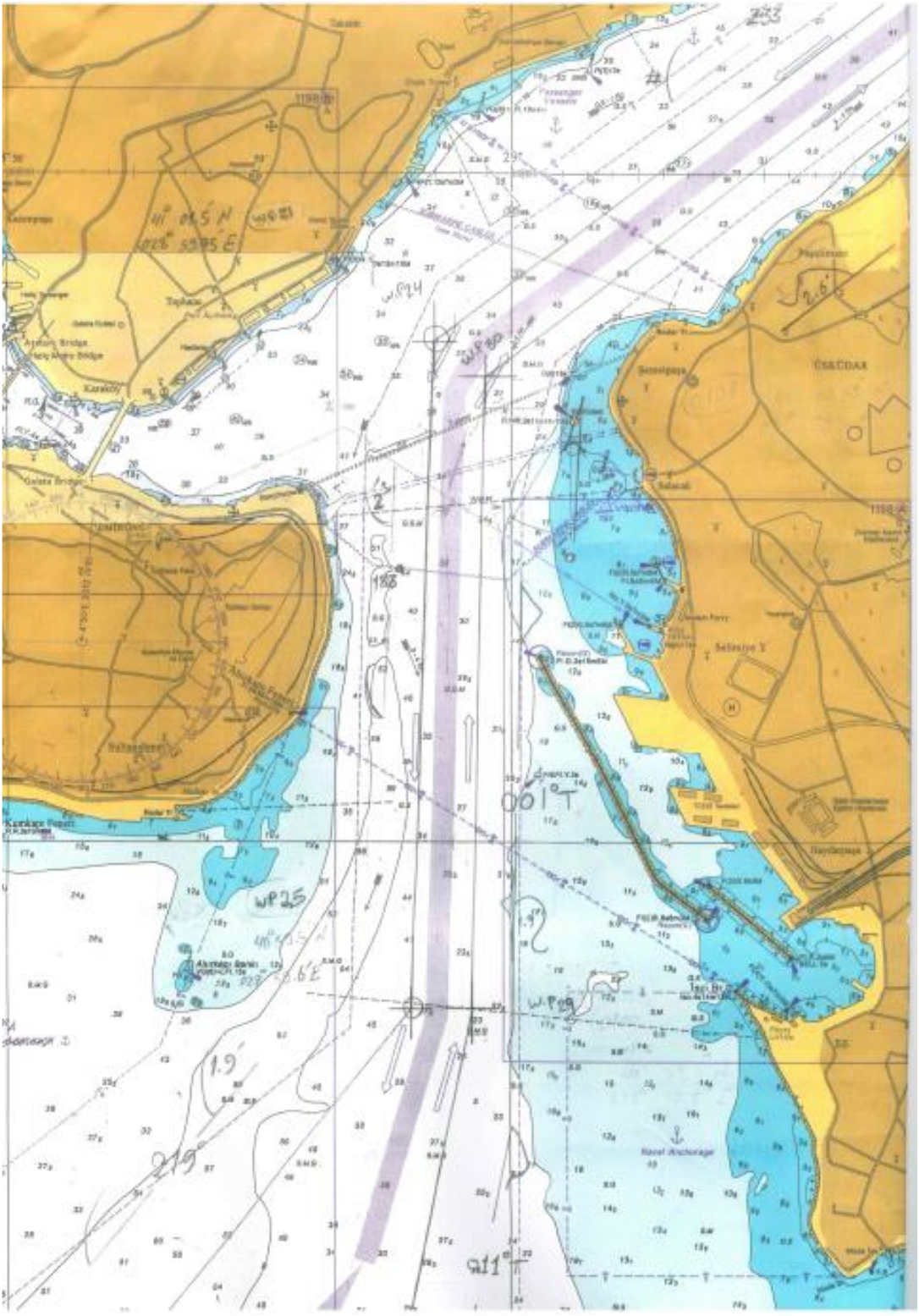
While the Captain accompanies watchkeeping officers on the bridge, watchkeeping officers were keeping navigational watches in the time periods as given below.
24:00-06:00 and 12:00-18:00 2nd Officer
18:00-24:00 and 06:00-12:00 Chf. Officer

1.5.3.2 Navigational Watch at Open Sea

24:00-04:00 and 12:00-16:00 2nd Officer
04:00-08:00 and 16:00-20:00 Chf. Officer
20:00-24:00 and 08:00-12:00 Captain

1.5.4 Navigational Charts, Radars, AIS Device and VDR

British Admiralty navigational charts were used on the ship. Chart No. 1159 of the southern entrance to İstanbul Strait was present on the ship, and it is seen that a route planning was made for the İstanbul Strait passage. However, when the map was studied, it is detected that the coordinates related to the ship's navigation were not plotted on the map ***(Picture 16).***



Picture 16: *Navigational Chart Which was Used By MV TOLUNAY At the Time of the Accident*

There are two radars right on the starboard side of the centre line of the bridge***(Picture 17).*** The Chief Officer told that he was next to the chart room right before the accident and that

he was called by the Captain to blow the whistle[3]. The Captain stated that, at the time of the accident, he was just next to the gyro compass at the centre line of the bridge, observing vessel traffic with binoculars in his hand[4]. As can be understood from the Captain's and the Chief Officer's statements, at the time of the accident, no use was being made from the ship radars and the AIS Device. However the Captain stated that he had plotted the Russian Federation navy ship on the radar before the accident.

Picture 17: *MV TOLUNAY's Radars*

It is found that, only the speed and courses of MV TOLUNAY and the Russian Federation navy ship VALENTIN PIKUL could be detected from the VDR records ***(Annex-4),*** whereas voice and radar screen pictures could not be recorded due to a defect in the VDR. Therefore, no recorded information could be reached regarding the ship's radars' operation range and their mode of use (Head Up/North Up/Course Up) at the time of the accident.

[3] Chief Officer's statement at the Administrative Investigation of the Port Authority.
[4] Captain's's statement at the Administrative Investigation of the Port Authority.

1.6 Status of Marine Traffic at Istanbul Strait

İstanbul Strait is at 17 nautical mile length in total. İstanbul Strait is the narrowest passage in which international maritime transport can be realized. Due to its geographical structure, narrowness, strong currents, sharp turns, variable climate conditions and daily maritime traffic movement of 150 transit ships, approximately 23 ship passages with dangerous goods and a total of 2500 local maritime traffic where two million people are transported, İstanbul Strait is the World's most important narrow waterway.[5]

In addition to its position between two seas which have different salinity rates at the same time, İstanbul Strait is in a position which islower than the Black Sea and higher than the Marmara Sea. Difference of level reaches up to 40 cm. between the beginning and the end of İstanbul Strait. Because of this difference, there is a continuous surface current from the Black Sea towards the Marmara Sea.although the average current speed is 3-4 knots per hour, depending on the wind, it can increase tremendously and reach the speed of river current.

As the specific gravity of the waters of the more salty Marmara Sea is greater than the Black Sea and İstanbul Strait waters, bottom currents are formed in addition to the surface currents. Additionally as the water which enters the bays and the bends of the capes on its main flowing course follows the waters on the shore and flows in the opposite direstion, eddies and adverse currents occur. In addition to surface and bottom currents, İstanbul Strait's narrow and bending structure (there are 12 big and sharp turns and these turns reach up to 80 degrees) are among the geographical properties which increase the maritime traffic risk of İstanbul Strait.

The area where the accident occurred is on the itinerary where passenger ships, passenger boats, fast ferries and sea busses which carry passengers and vehicles from one side of İstanbul to the other side (Europe and Asia). This maritime traffic is increasing especially during morning and evening hours and 08:21, the time when the accident occurred is, among the highest density hours. Thus, only within seconds after the accident, one

[5] http://www.kiyiemniyeti.gov.tr

passenger boat which was underway in the vicinity of the location of the accident, reached to help the casualties.

It is of utmost importance that ships should navigate with maximum caution, considering safety of navigation, life, property and environment, while they pass through İstanbul Strait, which experiences highest density of national and international maritime traffic and geographical properties of which also pose an additional risk factor.

PART 2 - ANALYSIS

2.1 Lookout

One of the most important duties to be carried out during a bridge navigational watch is the performing of a complete audio and visual lookout. While performing this duty, the lookout personnel shall report to the Captain/OOW, the water crafts, navigational aids such as lights and buoys which are seen in the vicinity of the vessel and which may pose a threat to the safety of navigation as well as the ships' whistle blasts that he/she hears.
In times of dense maritime traffic and inside narrow waters, lookout duty becomes even more important in order to assess the risk of collision and to perform the necessary maneouvre in due time to prevent collision.

2.1.1 Structural Analysis of MV TOLUNAY In Terms of Lookout

Upon investigation of MV TOLUNAY, both the trim to aft caused by the ballast condition of the ship and the blind sectors caused by the ships' cranes were among the contributing factors of the accident.

2.1.1.1 Blind Sector At The Bow Due To Trim

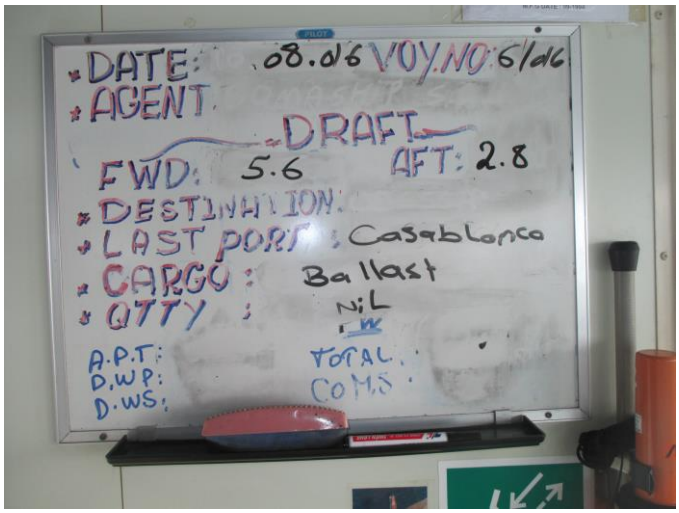
In order to calculate the blind sectorat the forward area of TOLUNAY, the draft values of the ship at the time of the accident need to be known. The draft values according to the pictures taken during the accident investigations on 26th August 2017 ***(Pictures 18,19,20)*** were as follows ;

Forward Draft: 2.6 metres,
Aft Draft: 5.8 metres,
Mean Draft : 4.2 metres.

Picture 18: *MV TOLUNAY's Forward Draft* ***Picture 19:*** *MV TOLUNAY's Aft Draft*

Picture 20: *MV TOLUNAY'S Mean Draft*

The draft values on the bridge panel ***(Picture 21)*** were; Forward Draft: 2.8 metres, Aft Draft: 5.6 metres



Picture 21: *MV TOLUNAY's Drafts*

According to the Mean Draft Calculations based on the draft values on the bridge panel;

$$\text{Mean Draft} = \frac{\text{Forward Draft} + \text{Aft Draft}}{2}$$

$$\text{Mean Draft} = \frac{2{,}8+5{,}6}{2}$$

Mean Draft = 4.2 metres

In view of the present draft values, it is observed that the ship was trimmed 2,8 metres to aft. From the table wihich is drawn for the calculation of the blind sector starting from the ship's bow due to the draft difference (Annex-3:Table of Obscured Distance) when the mean draft and trim value is entered and after the necessary corrections are applied, it is determined that there is a blind sector of **332,28** metres starting from the bow of the ship. It is obvious that this value is going to increase even more according to the pictures taken on 26th August 2016. In SOLAS Part 5, Regulation 22 "Ships of not less than 55 m in length, as defined in Regulation III/3.12, constructed on or after 1 July 1998, shall meet the following requirements:

The view of the sea surface from the conning position shall not be obscured by more than two ship lengths, or 500 m, whichever is the less, forward of the bow to 10° on either side under all conditions of draught, trim and deck cargo;

Although the TOLUNAY ship is not obliged to meet the requirements of the above rule due to its year of build (1995), the blind sector resulting from the trim to aft is 332.28 meters, which is more than twice as much as the length MV TOLUNAY (157.8x2 = 315.6). It is clear that this situation led to a negative situation for the safe navigation of the ship.

On the other hand, Article 5 of the Turkish Straits Maritime Traffic Regulation (TBDTDT) entitled "Technical Conditions and Notifications of the Vessels Passing Through the

Turkish Straits" states in subparagraph 13 of paragraph b that "The vessel shall be trimmed and loaded in such a way that the area on her bow and further will be readily visible." As it is understood from this regulation, in order to provide a clear field of view on their bow, the vessels navigating in the straits must pay attention to their trims and loading conditions. However, it is evaluated that MV TOLUNAY's 2.8 meters trim to aft and the 332.28 meter blind area due to this trim when entering the Strait is in contradiction with the regulation of TBDTDT.

2.1.1.2 Blind Sector Due To The Cranes

Over the forward to aft line of MV TOLUNAY, between the cargo holds, there are four cranes. These cranes constitute obstacles against the sight when looked from the bridge. ***(Pictures 22,23)***

Pictures 22-23: *Blind Sectors Formed By the Ship's Cranes*

Prevailing constraints regarding the ship's field of vision and according to STCW Section A – VIII/2, Part 4, Article 17 "*In determining that the composition of the navigational watch is adequate to ensure that a proper look-out can continuously be maintained, the master shall take into account all relevant factors, including those described in this section of the Code, as well as the following factors:*

.2 *traffic density, and other activities occurring in the area in which the vessel is navigating;*

…

.11 *the size of the ship and the field of vision available from the conning position;*

…

.12 *the configuration of the bridge, to the extent such configuration might inhibit a member of the watch from detecting by sight or hearing any external development;*

In the framework of these regulations, and especially considering the dense traffic conditions and the blind sector at the forward part of the vessel, it is regarded that posting of an additional lookout on the bridge for the purpose of establishing the safe navigation of the ship would be useful. Moreover, even if an additional lookout would not be posted, it is obvious that the bosun at the forecastle of the vessel could contribute to the bridge lookout duties.

2.1.2 Overview of the Structure of TCSG 25 Boat With Regard To The Lookout Duties

According to SOLAS Part 5, Regulation 22, angle of view from the conning position has been regulated as follows:

"*Ships of not less than 55 m in length, as defined in Rule III/3.12, constructed on or after 1 July 1998, shall meet the following requirements:*

…

.3 *The horizontal field of vision from the conning position shall extend over an arc of not less than 225°, that is from right ahead to not less than 22.5°, abaft the beam on either side of the ship;*

As TCSG 25 Boat is shorter than 45 meters and it is built for military purposes, it is not obliged to meet the requirements of the above-mentioned Rule. Moreover, it also has an angle of view of 225 ° thanks to the portholes located on the starboard and port sides ***(Picture 24).*** But, during the fulfillment of specific tasks such as guard and escort missions, taking additional precautions should be considered to prevent the recurrence of similar accidents.

Picture 24: *TCSG 25 Boat*

2.2 Review of TOLUNAY In Terms of Lookout

In the 1972 International Convention For The Prevention of Collision at Sea, Section 1- Conduct of Vessels in Any Condition of Visibility, Rule 5, under the title "Lookout" which reads as: "Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and or the risk of collision.", minimum requirements for the performance of lookout on ships are determined.

Moreover, in the Standardization of Training, Certification and Watchkeeping Standards (STCW) Code Section A-VIII/2 Part 4-1, under the heading "Principles To Be Observed In Keeping A Navigational Watch" the rules about "Lookout" have been given as follows:

"14 *In line with Rule 5 of the International Rules fort he Prevention of Collision At Sea, a lookout will be posted at all times …*

15 *Full attention shall be given for the performing of a proper lookout during the lookout duty and no any other duty which will impede the carrying out of this duty shall be carried out or be undertaken.*

16 *Duties of the lookout and the helmsman are seperate from one another …*

In the light of the above explanations and taking into account the fact that MV TOLUNAY was navigating in İstanbul Strait which is a narrow waterway, where marine traffic is very intense and which harbors many navigational hazards, it is of utmost importance to carry out an effective lookout on the bridge.

TCSG 25 Boat made a U-turn at about 10,8 knots speed and placed herself at the aft of navy vessel VALENTIN PIKUL to carry out her duty to escort and guard her at 08:13:58, while she was at a distance of 4,8 cables (891.10 meters) from the bow of MV TOLUNAY ***(Figure 3)***

Figure-3: *Distance between the two vessels at the time of the U-turn of TCSG 25 Boat*

Later on TCSG 25 Boat started to reduce her speed gradually so as to make her speed equal to VALENTIN PIKUL and also started to alter hercourse to VALENTIN PIKUL's port quarter. As TCSG 25 Boat's speed was decreasing, TOLUNAY closed the gap and reached TCSG 25 Boat and the accident happened when she collided her on her port quarter.

The Captain of MV TOLUNAY stated that the collision occurred within less than a minute's time after they saw TCSG 25 Boat and Chief Officer told Captain saw TCSG 25 Boat and called him to his side to be in charge of the whistle. As understood from the ship Captain's and Chief Officer's statements, they did not see TCSG 25 Boat which made a U-turn approximately 8 minutes ago and was underway in the same direction with their vessel, for a period of 7 minutes. Additionally, from the video records taken from the Russian Federation navy ship, a ship whistle blast was heard within seconds before the collision. It remains to be proved that the blowing whistle was from MV TOLUNAY. Because, there was a 327.17 meter distance between the two ships approximately one minute before the collision and the blind sector caused by the ship's trim and the cranes, made it impossible for MV TOLUNAY to see TCSG 25 Boat.

On the other hand, it is seen that the statements of the Captain and Chief Officer of MV TOLUNAY taken by the security forces and their statements taken at the Port Authority within the scope of the administrative investigation contradict with one another. This has led to confusions about the actions of TOLUNAY's Captain before and after the collision.

In addition to this, it is seen from the VTS records that, MV TOLUNAY was proceeding on the course 357.7 degrees at 08:15:00 ***(Figure 4)*** whereas her course at 08:21:14, which is the time of collision, was 004.1 degrees ***(Figue 5).*** And when TCSG 25 Boat made the U-turn at 08:14:00, TCSG 25 Boat was at a relative bearing of 10.9 degrees to starboard side from MV TOLUNAY and the distance between the two ships was 771.3 meters. Despite this, TOLUNAY's altering her course 6.4 degrees to her starboard, towards TCSG 25 Boat in other words, within the 7 minute period before the time of collision ***(Figure 6),*** proves that MV TOLUNAY did not see TCSG 25 Boat.

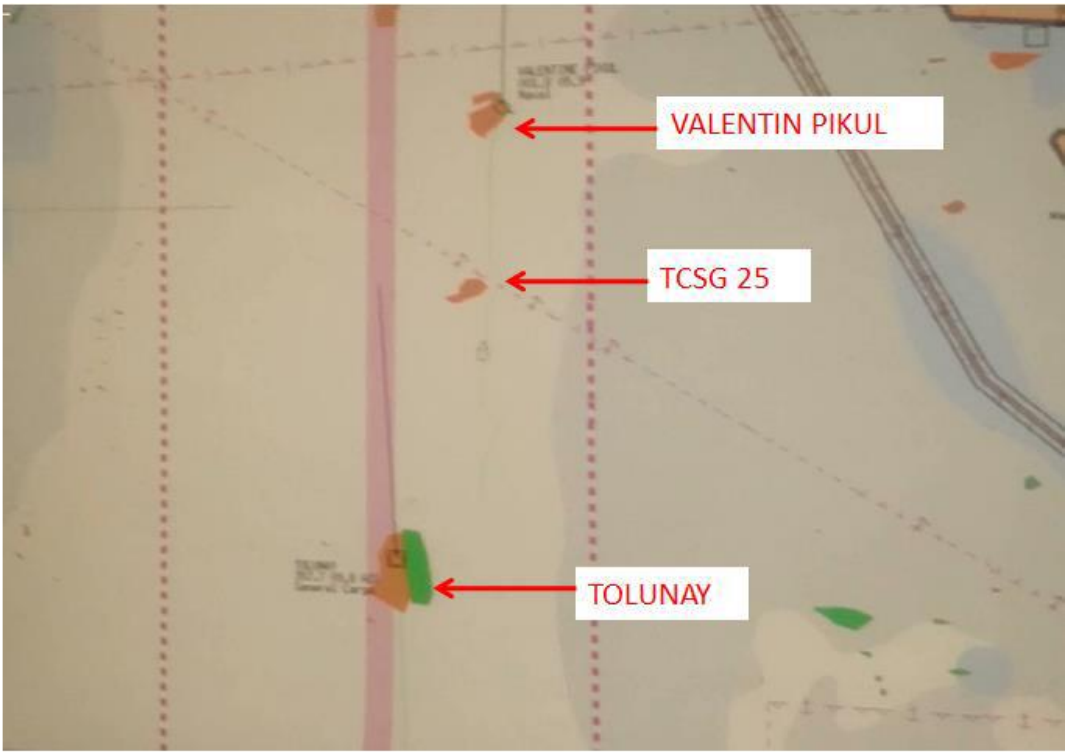


Figure-4: *Ships' Positions Relative to One Another at 08:15:00*

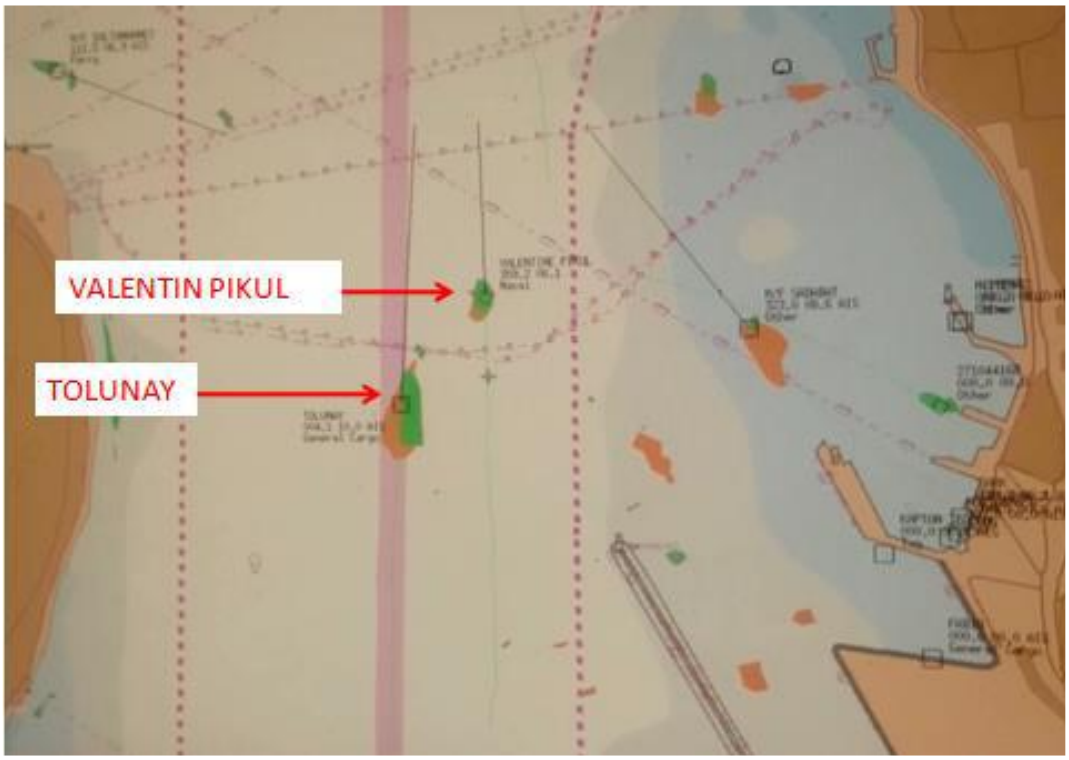


Figure 5: *Ships' Positions Relative to One Another at 08:21:14*

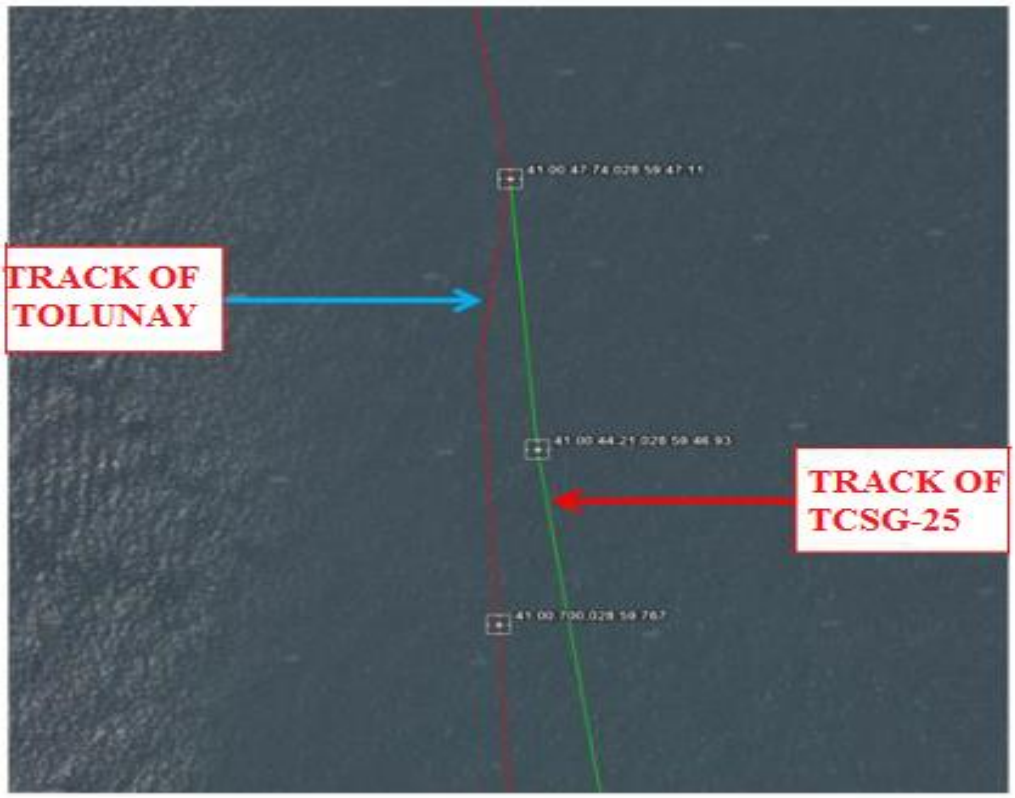


Figure 6: *Courses of the Ships Before the Accident*

On the other hand, to evaluate the positions of the crew members of MV TOLUNAY on the bridge and on the forecastle at the time of collision with regard to the lookout duty, is important. According to the statements of the Captain, Chief Officer, Bosun and the helmsman, the positions of the crew on the bridge at the time of the accident is shown at ***Figure 7***. The bosun who is not shown at ***Figure 7***, stated that he was on the forecastle for emergency anchoring, at the anchor windlass and that he did not see the accident.

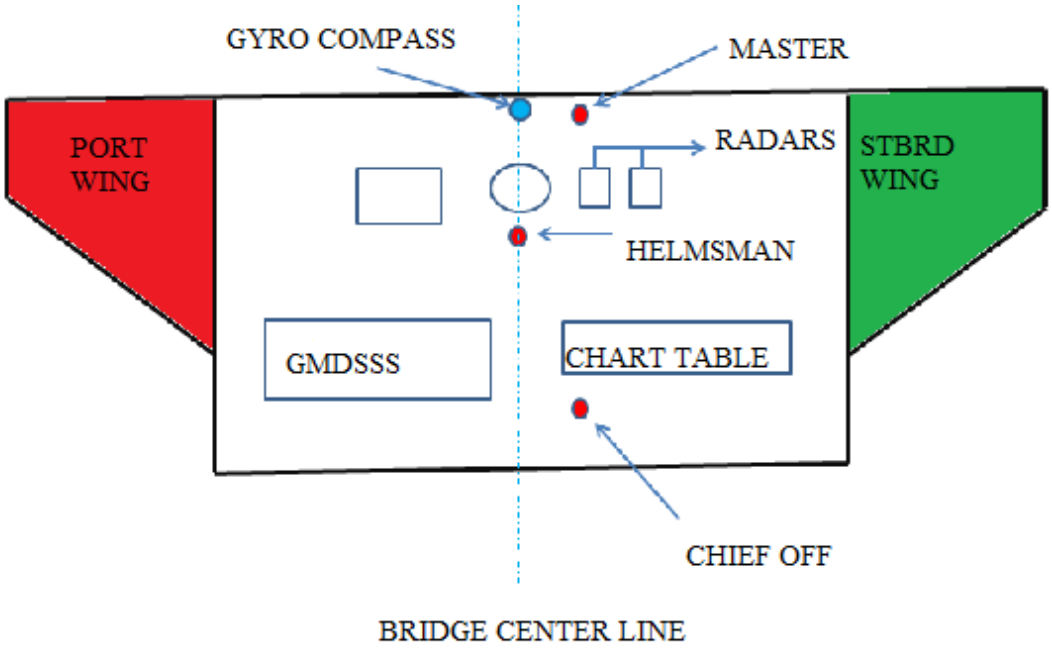


Figure-7: *Crew Locations at MV TOLUNAY's Bridge During the Accident*

Picture 25: *Bridge of MV TOLUNAY*

When the positions of the crew of MV TOLUNAY at the time of the accident and the chain of events from the time when TCSG 25 Boat made a U-turn in front of MV TOLUNAY in order to guard and escort VALENTIN PIKUL until the occurrence of the accident are reviewed, it is understood that the crew of MV TOLUNAY did not carry out a complete and effective lookout duty in line with the provisions of COLREGs and STCW Code. It is evaluated that this situation was one of the basic factors that led to the occurrence of the accident.

2.3 Positions of MV TOLUNAY and TCSG 25 Relative to One Another

Overtaking vessel is defined in the Rule 13 (titled "Overtaking") of COLREGs, paragraph "b" as; "*A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5° abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.*" ***(Figure 8)***

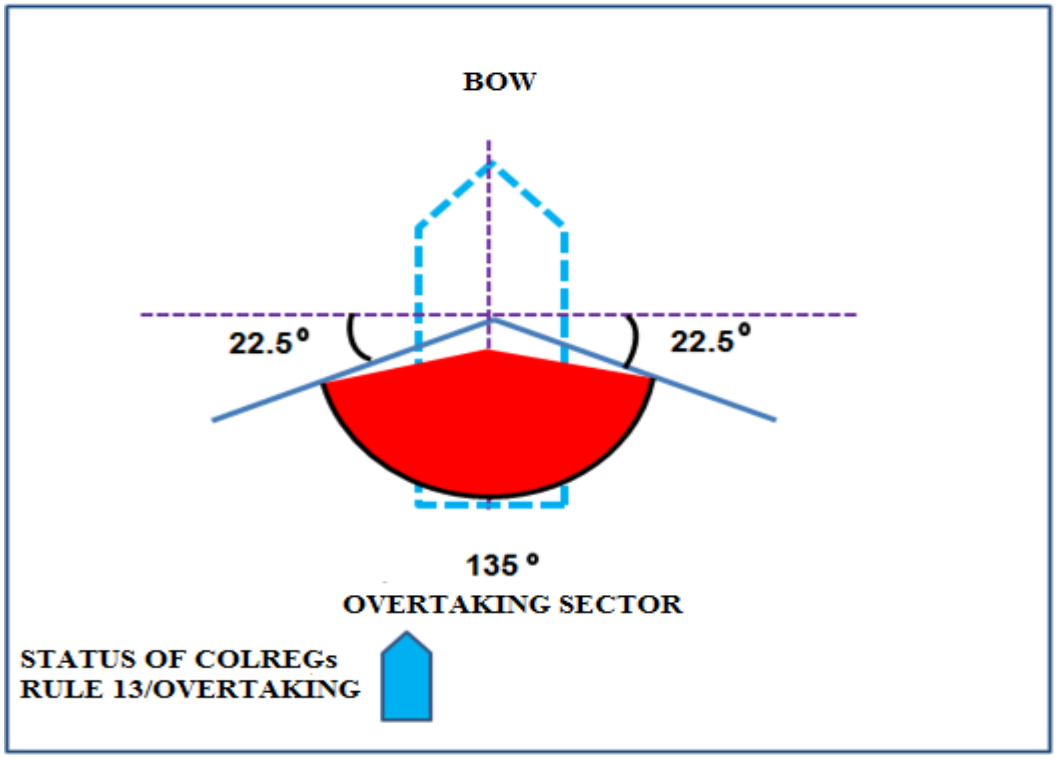


Figure 8: *Status of the Overtaking at COLREGs*

TCSG 25 Boat made a U-turn before the bow of MV TOLUNAY at 08:14:30 and placed herself at the aft of the Russian Federation navy vessel VALENTIN PIKUL to carry out her duty to escort and guard the vessel. At this time, there was a distance of 771.3 meters (approximately 4 cables) between MV TOLUNAY which was proceeding at 9.7 knots speed and TCSG 25 Boat which was proceeding at 8.6 knots speed and TCSG 25 Boat was positioned 10.9 degrees (relative bearing) to starboard side from the bow of MV TOLUNAY. ***(Figure 9)***

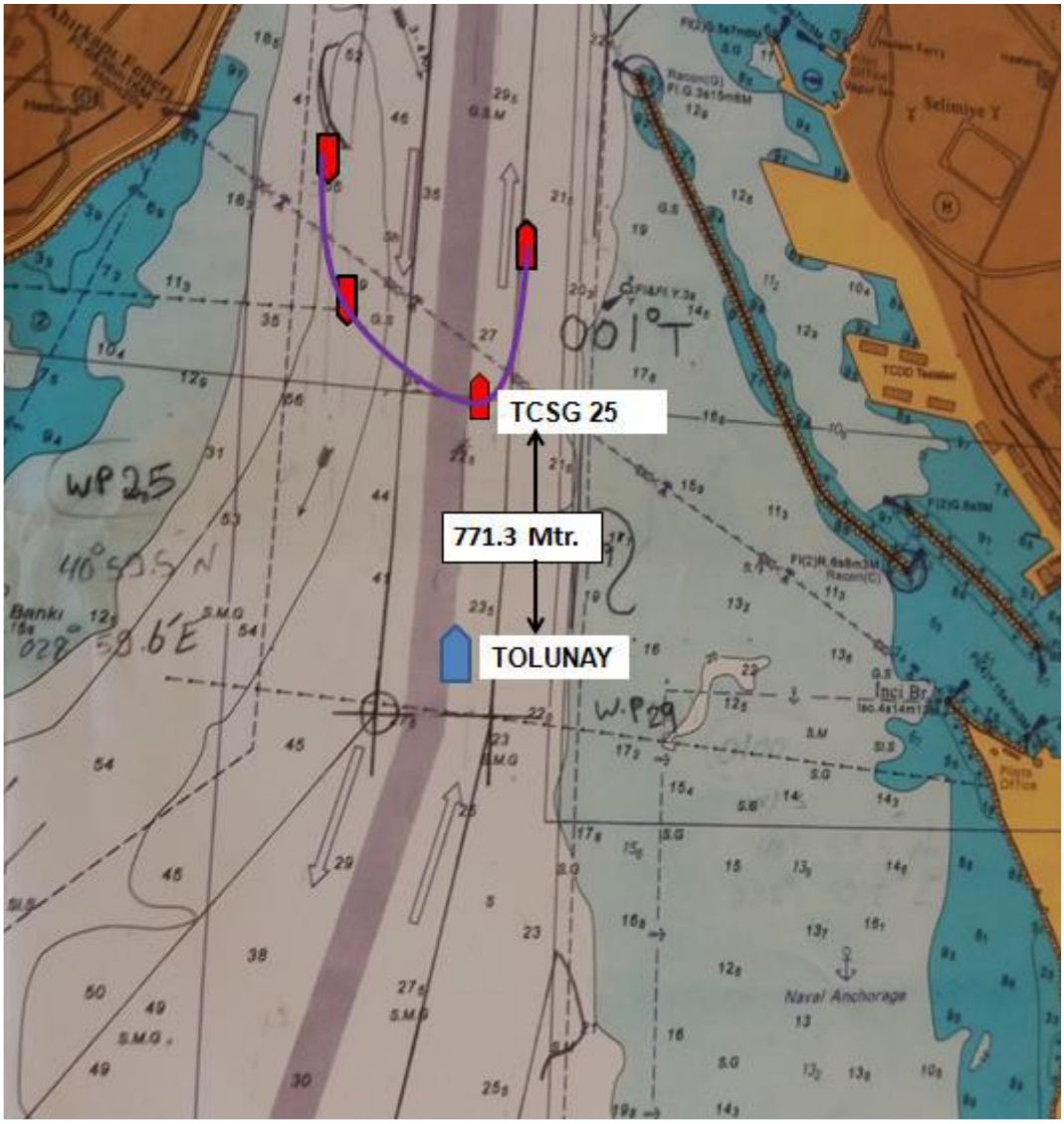


Figure 9: *Distance between the vessels after the U-turn of TCSG 25 Boat*

In the 7 minute period before MV TOLUNAY collided with TCSG 25 Boat, MV TOLUNAY was 22.5 degrees abaft of the beam of TCSG 25 Boat. In the light of these data, it is determined that MV TOLUNAY was the overtaking vessel.

In the paragraph "c" of Rule 13 of the COLREGs (titled "Overtaking"), it is determined that "*When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.*". As it is also understood from this provision, even in a doubt that MV TOLUNAY was overtaking TCSG 25 Boat, they should assume that they are overtaking TCSG 25 and arrange their moves and speed accordingly.

On the other hand, it is regulated in the Turkish Straits Marine Traffic Regulations (TBDTDT), in article 14 titled "Overtaking Vessel" "Ships passing through İstanbul and Çanakkale Straits shall not overtake the vessel ahead of them unless there is an urgent necessity". Paragraph "a" of the same Rule states that "Ships proceeding through the İstanbul and Çanakkale Straits in the same direction shall leave a minimum distance of eight cables between them. Traffic Control Center may increase this distance considering the type of the ship." In addition it is stated in paragraph "d" that: "A vessel which needs to overtake another vessel ahead of her which is proceeding slowly in İstanbul and Çanakkale Straits shall, before overtaking the vessel, learn the traffic condition in the area from the Traffic Control Station and if it's suitable, inform the vessel to be overtaken about the situation (and their intentions). Overtaking the vessel ahead of her should be on a single course as far as practicable.

Additionally, the procedures to be followed by the ships that wish to overtake one another is given in the Turkish Straits Marine Traffic Services User Guide, under the title "Procedures That Ships Will Follow", under the subtitle "Overtaking Another Vessel": "Ships shall not overtake the vessel proceeding ahead of them unless there is an urgent necessity. A vessel which needs to overtake a slower vessel proceeding ahead of her shall inform the Vessel Traffic Services Centre (GTHM) before starting to overtake. The relevant VTS (GTHM) reviews the traffic condition and gives information,

recommendations, warnings and instructions regarding the overtaking. Overtaking the vessel proceeding ahead should be on a single course as far as practicable."

TOLUNAY gemisi ile İstanbul GTH arasında gerçekleşen konuşma aşağıda yer almaktadır.
The communication between MV TOLUNAY and İstanbul VTS is given below.

08.07:52 TOLUNAY-SECTOR KADIKÖY: Proceeding the same speed or follow the vessel ahead of us
08.08:20 SECTOR KADIKÖY-TOLUNAY: Go ahead
08.08:25 TOLUNAY- SECTOR KADIKÖY: Okay proceeding full speed

As it is understood from this communication, MV TOLUNAY did not explicitly inform İstanbul VTS about his intention to overtake the vessel ahead of her, but asked only if they should remain at the same speed or follow the ship ahead of them. İstanbul VTS told them to continue and later on MV TOLUNAY stated they will increase to full speed, but did not tell İstanbul VTS that they intend to overtake the vessel ahead of them. As explained in the User Guide, MV TOLUNAY should have got permission from İstanbul VTS and İstanbul VTS should have given permission to TOLUNAY for this overtaking. In this regrad, it is considered that TOLUNAY did not comply with COLREGs and Turkish Straits Regulations.

On the other hand, under the title "Meaning of the Important Message Markers Given By the TSVTS (Turkish Straits VTS)" it is stated that; "Taking into consideration the general principle that the final decision on the safety of navigation belongs to the captain of the ship, no information, advice, warnings and instructions given by the TSVTS shall remove the master's responsibility to navigate the ship with his professional knowledge and ability and the TSVTS shall not be held responsible for the master's decisions and actions." As it is understood from this statement, the Captain claiming to have followed the instructions of İstanbul VTS although there was not an instruction from them, it is obvious that, even if the VTS had allowed them to overtake the vessel ahead of their vessel, this permission will

not remove the responsibility of the Captain for the lack of actions necessary for the safe navigation of the ship.

2.4 Audio Warning Prior to the Accident

In COLREGs Rule 9, titled "Narrow Channels" states that;*"d) i) in a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(1). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(2) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34(d).",* whereas the following paragraph states that; *"d) ii) this Rule does not relieve the overtaking vessel of her obligation under Rule 13."*

Rule 34 paragraph c, of COLREGs, titled "Manoeuvering and warning signals" states that;
When in sight of one another in a narrow channel or fairway:-
a vessel intending to overtake another shall in compliance with Rule 9(e)(1) indicate her intention by the following signals on her intention by the following signals on her whistle:

- *Two prolonged blasts followed by one short blast to mean "I intend to overtake you on your starboard side";*
- *Two prolonged blasts followed by two short blasts to mean "I intend to overtake you on your port side"*

Captain stated that he saw TCSG 25 Boat approximately 1 minute before the collision and warned them with the ship's whistle blast and that as the vessel was in ballast condition (empty-unloaded) and thier draft was high, he could not see the collision event from the bridge. Chief Officer stated that he was at the chart table when he was called by the Captain to be in charge of the ship's whistle, TCSG 25 Boat approached them from their starboard side and the collision occurred 20 seconds after they blowed the ship's whistle. However, according to the video records taken from the Russian federation Navy Ship, at the time when MV TOLUNAY collided with TCSG 25 Boat ***(Picture 26),*** one ship whistle

blast (5 seconds/long) was heard. After this first blast, 12 seconds later a long blast (7 seconds long) and 20 seconds later a short blast (2 seconds long) were heard.[6]

Picture 26: *MV TOLUNAY Colliding with TCSG 25*

In the framework of the factors which affect the field of view and which were mentioned at Part 2.1, right before the collision, TCSG 25 Boat was inside the blind sector of MV TOLUNAY's bow. The first ship to notify the collision to the VTS was another vessel and MV TOLUNAY contacted İstanbul VTS approximately one minute later (at 08:22:11 and communication was established at 08:22:40). Moreover, within the 7 minutes' period before the collision occurred, MV TOLUNAY had changed her course gradually 6.4 degrees to her starboard, in other words towards TCSG 25 and did not make any changes in her course and speed so as to avoid collision. On the other hand, it is drawing attentions that the blast that was first heard and the blasts that were heard later on were in different tones.

In the light of the above explanations, it is considered that the first blast was from the Russian Federation navy ship and the following blasts were from MV TOLUNAY. In this regard, it is found out that MV TOLUNAY did not give the sound signals that should be

[6] In COLREGs Rule 32, Definitions, paragraphs (b) and (c) the terms "short blast" and "long blast" are explained as; The term "short blast" means a blast of about one second duration.
The term "prolonged" means a blast of from four to six seconds duration.

given for overtaking a vessel ahead of her bow, in accordance with the relevant provisions of the COLREGs, and thus she was violating the relevant provisions of the COLREGs.

2.5 Determination of the Risk of Collision With the Radar

In the COLREGs Rule 7, under the title "Risk of Collision", it is regulated in paragraph "a" that: *"Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist."* and in paragraph "b" that: *"Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observations of detected objects".*

As can be understood from this provision, in order to determine the risk of collision beforehand, in addition to a complete and effective lookout, TOLUNAY should make use of her radar.

It is considered that, if a good lookout could be established using these radar or proper use of radars could be made, TCSG 25 Boat which was proceeding ahead of TOLUNAY could be detected by radar even if it could not be seen with a visual lookout and the necessary maneouver could be performed so as to avoid collision. Indeed, from the radar information screen of İstanbul VTS, in the radar screen shot 3 minutes before the collision at 08:18:34, it is seen that TCSG 25 Boat was giving a clear echo ***(Figure 10).***

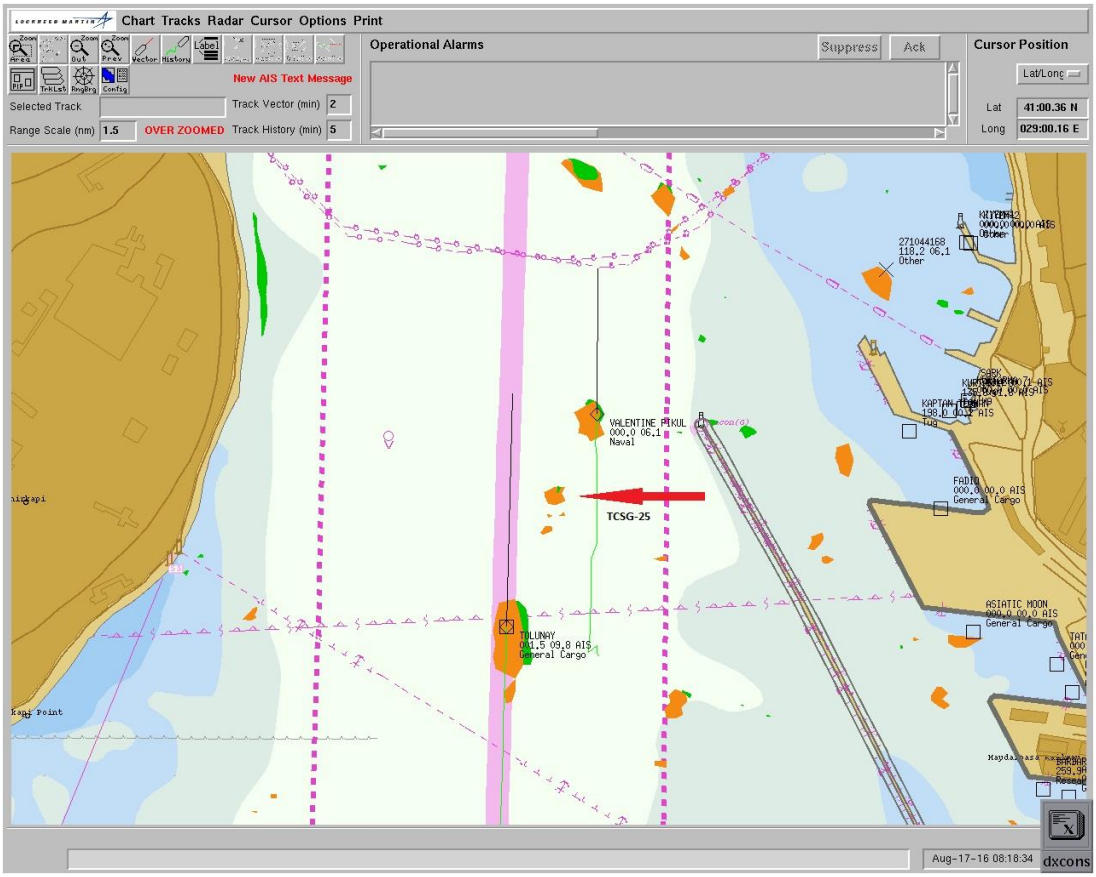
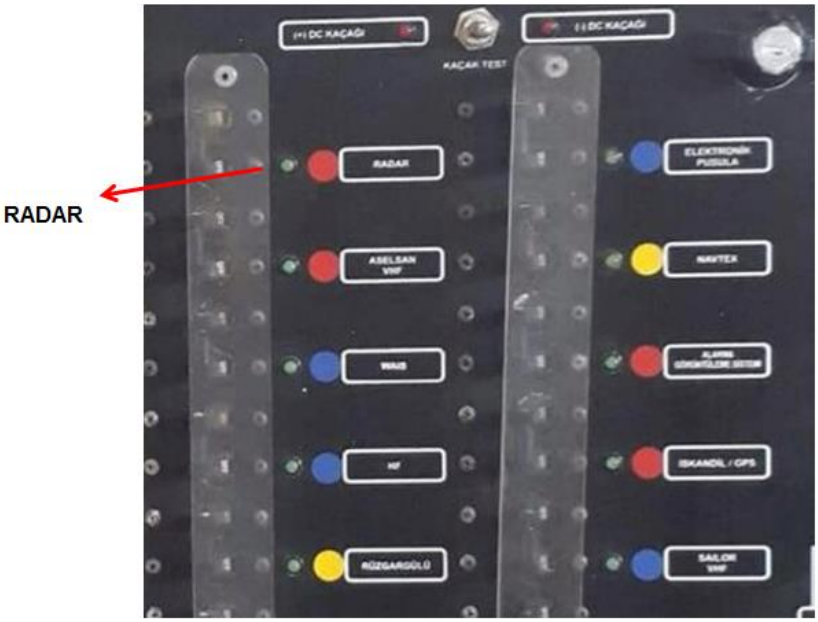


Figure 10: *View of the Radar Screen of Istanbul VTS Before the Accident*

There was one radar right on the starboard side of the bridge centre line of TCSG 25 Boat ***(Picture 27).***

Picture 27: *TCSG 25 Boat's Radar*

In the investigation on TCSG 25 Boat after the collision, it is observed that the power unit on the panel which shows the electric current that feeds the electronic devices on the bridge was green ***(Picture 28)*** and therefore it is concluded that TCSG 25 Boat's radar was not out of order. Although there is not a clear information about whether TCSG 25 Boat's radar was operating actively during her navigation, from the video display that was recorded by the Russian Federation navy ship which shows the last one minute before the collision, it is observed that TCSG 25 Boat's radar antenna was not rotating and therefore it is considered that it was not operational.



Picture 28: *TCSG 25 Boat's Electric Feed Panel*

On the other hand, although there is not any information about the usage of AIS of TCSG 25 Boat, they could not foresee before the collision, TOLUNAY's intention to reach and overtake VALENTIN PIKUL. Therefore, it can be considered that their AIS device was not used very effectively.

Rule 17 of COLREGs, paragraph b states that *"When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision."* In line with this Rule, it is considered that she could maket he necessary maneouvre to avoid collision by making use of her AIS and radar more effectively.

2.6 Consideration of TCSG 25 Boat's Position Prior to the Collision

In COLREGs Rule 17 titled "*Action By Stand-On Vessel*" paragraph a(i) the maneouver of the stand-on vessel is described as follows: *"Where one of two vessels is to keep out of the way the other shall keep her course and speed."*

The course and speed of MV TOLUNAY and VALENTIN PIKUL and the speed of TCSG 25 Boat in the time period from when TCSG 25 Boat started her mission to guard and escort the Russain Federation navy ship VALENTIN PIKUL at 08:14:30 until the time of the accident at 08:21:14, are shown in Table 2. As the course of TCSG 25 Boat was not recorded at SAHMUS which recorded the Boat's speed, her course could not be shown at the Table. However, it is determined that TCSG 25 Boat moved approximately 123 metres towards her port side from the time when she started her guard and escort mission until the time of the accident ***(Figure 11).***

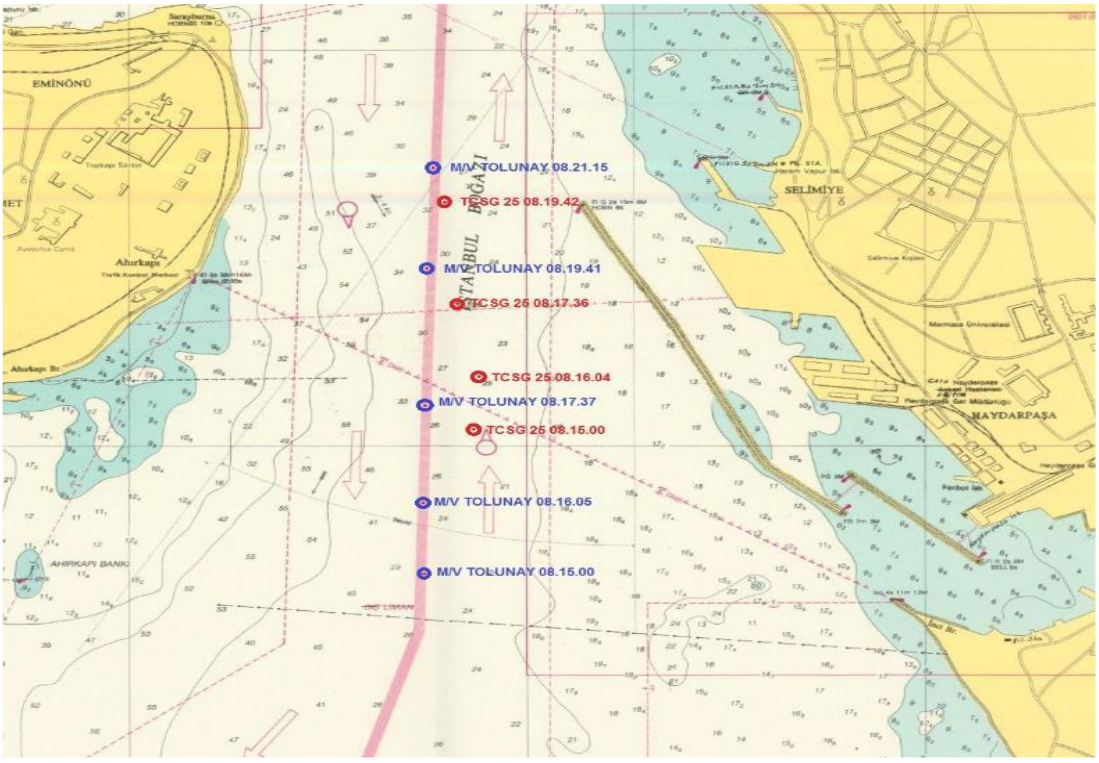


Figure 11: *TCSG 25 Boat Moving Towards Port Side After Her U-Turn*

NO	TIME	MV TOLUNAY		VALENTIN PIKUL		TCSG 25
		COURSE	SPEED	COURSE	SPEED	SPEED
1	08:14:30					8.639
2	08:15:00	357.7	9.8	001.8	5.9	8.099
3	08:15:32	358	9.8	001.8	5.8	8.099
4	08:16:04	358.5	9.9	001.8	6.0	7.019
5	08:16:34	357.9	9.8	001.8	5.9	8,099
6	08:17:36	002	9.9	359.2	6.0	7,559
7	08:18:08	001.5	9.9	359.2	6.1	7,559
8	08:18:38	002	9.9	358	6.1	7.019
9	08:19:10	001.5	9.8	357.6	6.0	7.019
10	08:19:42	001.3	9.8	359.2	6.0	7.559
11	08:20:44	003.2	9.9	000.5	6.1	7.019
12	08:21:14	004.1	10.0	359.2	6.1	7.019

Table 2: *The Ships' Courses and Speeds Prior To The Accident*[7]

The following data were acquired after comparing the speed and courses of these three vessels.

- When TCSG 25 Boat started her duty to guard and escort VALENTIN PIKUL, her speed was 8.6 knots wheras VALENTIN PIKUL's speed was approximately 5.9 knots and course 001.8.
- VALENTIN PIKUL's speed was 6.1 knots at the time of the accident.
- TCSG 25 Boat's speed was 7.019 knots at the time of the accident.
- VALENTIN PIKUL changed her course 4.2 degrees to port between 08:14:30 and 08:19:10 and altered course 1.6 degrees to starboard between 08:19:10 and 08:21:14 (time of the accident)
- MV TOLUNAY's speed was 9.8 knots at 08:15:00 and 10 knots at 08:21:14.
- MV TOLUNAY altered her course 6.4 degrees to starboard between 08:15:00 and 08:21:14.

[7] The data for MV TOLUNAY and VALENTIN PIKUL were acquired from the VTS whereas for the data for TCSG 25 Boat, SAHMUS system information was used.

When the data at ***Table 2*** are reviewed, it is seen that TCSG 25 Boat reduced her speed gradually in order to carry out her duty to guard and escort VALENTIN PIKUL and also changed her course according to the course the course of VALENTIN PIKUL. However in spite of these changes, they could not foresee the danger to their caused by TOLUNAY's course and speed which entered İstanbul Strait to make the south to north passage.

It is thought that this situation may be because TCSG 25 Boat might have assumed herself as the overtaken vessel whereas she assumed MV TOLUNAY as the overtaking vessel and assumed that MV TOLUNAY would follow the relevant provisions of COLREG sor due to the sensitivity of her duty to guard and escort, TCSG 25 Boat missed the changes in her speed and course.

On the other hand, in accordance with the provision of COLREGs Part II, Rule 13 Paragraph "a" which is titled "Overtaking" which reads "Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken", MV TOLUNAY is obliged to keep out of the way of TCSG 25 Boat. However it is clear that the provisions of the relevant rules of STCW and COLREGs could not be applied by MV TOLUNAY, which did not sufficiently perform her lookout duty and which could not detect TOLUNAY in due time.

In this current situation, TCSG 25 Boat entered the traffic seperation line 771.3 metres ahead of MV TOLUNAY whicH was proceeding inside the traffic line and started her duty to guard and escort VALENTIN PIKUL which was proceeding on a non-stop (and not berthing) transit of the Strait. In spite of the fact that she had the right of way acoording the COLREGs, it is considered that, TCSG 25 Boat should, for the sake of ensuring her own safety while performing such a sensitive duty, performing a more effective lookout and communicating with the VTS and MV TOLUNAY would enhance situational awareness and could have prevented the occurrence of this accident.

Nevertheless, according to COLREGs Rule 17 a(ii); *"The latter vessel may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in*

compliance with these rules." seeing that TCSG 25 Boat did bot give way to her, MV TOLUNAY should have taken action so as to avoid collision.

2.7 Safe Speed

It is provided in Rule 6 of COLREGs, under the title "safe speed" that; *"Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid a collision and be stopped within a distance appropriate to the prevailing circumstances and conditions."*

As of 08:14:30, TCSG 25 Boat positioned herself at the aft quarter of VALENTIN PIKUL and started to make alterations in her course and speed according to VALENTIN PIKUL. As MV TOLUNAY had to change her speed in this regard, she did not make any changes in her speed before the collision, at the time of the collision and after the collision.

2.8 Turkish Straits Vessel Traffic and Pilotage Services

With the Vessel Traffic Services (VTS), it is aimed to regulate the maritime traffic, provide safety of navigation and protect the marine environment at congested waters such as straits, canals and ports. There is a Vessel Traffic Srvice (VTS) at İstanbul Strait which enables the simoltaneous monitoring of vessels ***(Figure 12).*** Vessels' entry into and exit from İstanbul Strait is planned by the VTS.

Figure 12: *Sectors of İstanbul Vessel Traffic Services*

As understood from the communication records of the VTS with the ships, VTS contacted the Russian Federation navy ship before the accident at 07:53:54. In this communication, VTS asked VALENTIN PIKUL to increase their speed.

The communication between MV TOLUNAY and İstanbul VTS before the accident is as follows:
08.07:52 TOLUNAY-SECTOR KADIKÖY: Proceeding the same speed or follow the vessel ahead of us
08.08:20 SECTOR KADIKÖY-TOLUNAY: Go ahead
08.08:25 TOLUNAY-SECTOR KADIKÖY: Okay proceeding full speed

Communication language between the VTS and the ships is English and according to IMO Resolution A.918(22), ships and VTS Operators are recommended to use the Standard Marine Communication Phrases (SMCP).

As understood from the above communications, MV TOLUNAY did not explicitly express her intention to overtake VALENTIN PIKUL and VTS did not use an explicit statement regarding MV TOLUNAY's overtaking the vessel ahead of her. This shows that the SMCP was not used in the communications between MV TOLUNAY and the Vessel Traffic Service Officer (VTSO).

On the other hand, because of the way that the accident had occurred, it is thought that after the communication between the VTS and MV TOLUNAY, the VTS started to passively monitor MV TOLUNAY and the VALENTIN PIKUL ahead of her. If VTS and TCSG 25 Boat had acted in coordination, VTSO could have warned MV TOLUNAY which was approching TCSG 25 Boat in a dangerous manner.

For this reason, it is considered that, in the guard/escort missions that the Turkish armed forces are going to carry out in the Turkish Straits, to enhance the coordination between the VTS and the vessel that carries out the guard/escort mission will be useful fort he prevention of similar accidents.

In the 1995 IMO recommendeations, it is strongly recommended from the ship captains to use the pilotage service so that they can comply with the necessities of a safe navigation in the Turkish Straits.

It is stated in Article 27, titled "Using Pilotage", of the Turkish Straits Regulations: *"It is strongly recommended by the Traffic Control Centre that ships which will pass through the Turkish Straits without a stop (berthing/long term anchoring) to take a pilot to fort he sake of safety of life, goods, navigation and environment."* During the hours when the accident had occurred, İstanbul Strait was open to one way traffic from South to North.

It is obvious that, if MV TOLUNAY had made use of pilotage, even if he could not possibly have prevented this accident, with his experience about the local traffic and about the escort missions to foreign navy ships, the Pilot would have contributed to the Captain for a safe navigation. Thus, it is considered that the promotion of the use of pilotage services by the ships on international voyages which are transiting from the traffic seperation lines in the Turkish Straits will be very useful.

2.9 Bridge Resource Management at MV TOLUNAY

Bridge Resource Management (BRM) is the effective management and integration of human and technical resources provided to the bridge team for the safe and efficient navigation of the ship. Bridge Resource Management principles constitute an important issue for Masters and Officers who keep a navigational watch. Optimized Bridge Resource Management protects navigational safety by making full use of all the technical advantages of the bridge navigational equipment, as well as maintaining situational awareness of watchkeepers and ensuring proper communication and information exchange at all levels of the bridge team.

More specifically, the Bridge Resource Management principles are presented in STCW Code, Part A, Section VIII / 2, Part 3 under the title *"Principles applying to watchkeeping generally"*, as well as in Chapter VIII/2, 4.1, under the title *"Principles to Consider During a Navigation Watch"*

The provisions referred to here ensure that the captains take appropriate measures for the regulation of the watch and management of the bridge, and that the watchkeeping officers fulfill their duties effectively. As a result, the bridge team is assisted in making decisions, possible mistakes are prevented and precautions are taken to prevent or reduce the causes of probable marine accidents.

In his statement, the Chief Officer defined his duty as assisting the Captain by performing lookout during the strait passage, while the Captain stated that, at the time of the accident, he was monitoring the vessel traffic with binoculars in his hand just next to the gyro compass. However, as they could not detect the Coast Guard Boat (TCSG 25), which was coming from the other side of the traffic separation zone and which made a U-turn ahead of them, about 1 minute before the accident, it is obvious that they could not perform a complete and effective lookout on the bridge. Again, in his statement, the Captain stated that he saw the Russian Federation navy ship, which was proceeding ahead of their vessel, on the radar and on the AIS screen, but as there were so many small boats in the vicinity, he could not determine on the radar which one was the TCSG 25 Boat.

This shows that proper use had not been made of the navigational equipments such as the radar and AIS, a complete and effective lookout had not been perfpormed and bridge team planning was insufficient fort he strait passage. For this reason, it is considered that poor bridge resource management was one of the important factors that caused the accident.

PART 3 - CONCLUSIONS

The safety factors related to the occurrence of the accident are given below:

1. MV TOLUNAY entered Istanbul Strait with 2.8 meters to aft and due to this trim, a blind sector/area of 332.28 meters was formed on the bow of the ship.

2. The crew on board MV TOLUNAY did not perform a complete and effective lookout duty in line with the provisions of the COLREGs and STCW Code.

3. MV TOLUNAY did not act in accordance with COLREGs Rule 6 which is titled "Safe Speed".

4. MV TOLUNAY proved insufficient in detecting the existence of the danger of collision by its radar, as expressed in COLREGs Rule 7, under the title Risk of Collision.

5. MV TOLUNAY did not give the maneouvering warning signals that she ought to have given accrding to Rule 34, as indicated in COLREGs Rule 9, titled "Narrow Channels"

6. MV TOLUNAY being the overtaking vessel according to COLREGs Rule 13, did not comply with the rules given under the title "overtaking vessel".

7. MV TOLUNAY did not comply with the rule which is regulated in COLREGs Rule 17, under the title "Action By The Stand-On Vessel"

8. MV TOLUNAY did not make use of the pilotage service given in the İstanbul Strait.

9. The Bridge Resource Management that MV TOLUNAY had planned for the passage of İstanbul Strait proved to be insufficient.

10. TCSG 25 Boat made a U-turn inside the traffic seperation zone and placed herself infront of MV TOLUNAY, however as they could not assume that MV TOLUNAY would pose a danger for themselves, she did not follow the relevant provisions of COLREGs Rule 17, titled “Action By The Stand-On Vessel”.

11. TCSG 25 bot was delayed in taking effective measures against dangerous situations that could arise from her maneouvers as she was making changes in her speed and course during her mission to guard and escort VALENTIN PIKUL.

12. TCSG 25 Boat did not make effective use of her electronic navigational aids (Radar and AIS), as indicated in COLREGs Rule 7, under the title “Risk of Collision”, in order to determine the risk of collision with MV TOLUNAY.

13. No proof of communication could be found to show that a coordination was established between İstanbul VTS and TCSG 25 Boat.

14. SMCP was not used properly by MV TOLUNAY and the VTSO.

15. Although the weather and sea conditions prevailing in the region at the time of the accident don’t have an effect on the occurrence of the accident, the effect of the dominant current in İstanbul Strait to the accident could not be evaluated.

PART 4 - RECOMMENDATIONS

4.1 Operator of MV TOLUNAY is recommended to;

4.1.1 Inform the ships in their fleet or the ships under their management to comply diligently with the COLREGs and STCW rules, so as to ensure safety of watchkeeping and navigation,

4.1.2 Review the requirements of watchkeeping procedures and effective Bridge Resources Management in the framework of Safety Management System.

4.1.3 Review their Safety Management System in view of the proper use of the SMCP by Captains and Officers on the ships in their fleet or under their management.

4.1.4 Use the Pilotage Service on the ships in their fleet or under their management during their passage through the Turkish Straits, so as to ensure the requirements of safe navigation.

4.2 The Coast Guard Command is recommended to;

4.2.1 Make use of the electronic navigational aids on their boats, especially during their guard and escort missions.

4.2.2 Inform the boats on guard and escort missions to ships in their transit passages throught the Turkish Straits, to be in a more effective coordination with the VTS Centers and when necessary with the ships in the vicinity.

4.2.3 Consider what contribution to the safety of navigation (advantages) could be achieved by equipping their boats with suitable cameras.

4.3 General Directorate of Coastal Safety is recommended to;

4.3.1 Inform the VTS operators to use the SMCP more properly in their communications with the vessels.

4.3.2 To be in continous coordination with the ships and boats on their guard and escort missions during the transits through the Straits.

The contents of this Report cannot be used to blame persons or to apportion resposibility/liability between the parties.

ANNEXES

Annex 1 - TCSG 25's Track, Speed and Location Information

Telsiz Kimliği	Tarih	Platform Adı	Koordinatlar	Durum Tipi	Hız
11295454	8/17/2016 7:58:26 AM	TCSG-25	41°02'28,03"K 29°01'13,75"D	MÜSAIT	14,579 D. Mili
11295454	8/17/2016 7:58:56 AM	TCSG-25	41°02'23,93"K 29°01'06,22"D	MÜSAIT	14,579 D. Mili
11295454	8/17/2016 7:59:28 AM	TCSG-25	41°02'20,18"K 29°00'57,69"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 7:59:58 AM	TCSG-25	41°02'16,99"K 29°00'51,07"D	MÜSAIT	11,339 D. Mili
11295454	8/17/2016 8:00:30 AM	TCSG-25	41°02'13,24"K 29°00'44,52"D	MÜSAIT	11,339 D. Mili
11295454	8/17/2016 8:01:00 AM	TCSG-25	41°02'10,43"K 29°00'38,00"D	MÜSAIT	11,339 D. Mili
11295454	8/17/2016 8:02:34 AM	TCSG-25	41°02'01,24"K 29°00'17,57"D	MÜSAIT	11,879 D. Mili
11295454	8/17/2016 8:03:06 AM	TCSG-25	41°01'57,81"K 29°00'10,46"D	MÜSAIT	11,879 D. Mili
11295454	8/17/2016 8:03:36 AM	TCSG-25	41°01'54,49"K 29°00'03,62"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:04:08 AM	TCSG-25	41°01'50,13"K 28°59'57,30"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:05:40 AM	TCSG-25	41°01'35,27"K 28°59'42,38"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:06:12 AM	TCSG-25	41°01'29,56"K 28°59'38,25"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:06:44 AM	TCSG-25	41°01'23,71"K 28°59'34,23"D	MÜSAIT	11,879 D. Mili
11295454	8/17/2016 8:07:14 AM	TCSG-25	41°01'17,89"K 28°59'31,99"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:07:46 AM	TCSG-25	41°01'11,54"K 28°59'30,18"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:08:16 AM	TCSG-25	41°01'05,58"K 28°59'28,92"D	MÜSAIT	11,879 D. Mili
11295454	8/17/2016 8:08:48 AM	TCSG-25	41°00'59,16"K 28°59'28,50"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:09:18 AM	TCSG-25	41°00'53,02"K 28°59'28,48"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:09:50 AM	TCSG-25	41°00'46,41"K 28°59'28,83"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:10:20 AM	TCSG-25	41°00'40,16"K 28°59'27,71"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:11:24 AM	TCSG-25	41°00'26,50"K 28°59'26,99"D	MÜSAIT	12,959 D. Mili
11295454	8/17/2016 8:11:54 AM	TCSG-25	41°00'20,03"K 28°59'26,59"D	MÜSAIT	12,959 D. Mili
11295454	8/17/2016 8:12:26 AM	TCSG-25	41°00'13,20"K 28°59'27,34"D	MÜSAIT	12,419 D. Mili
11295454	8/17/2016 8:12:56 AM	TCSG-25	41°00'07,32"K 28°59'30,14"D	MÜSAIT	11,879 D. Mili
11295454	8/17/2016 8:13:28 AM	TCSG-25	41°00'02,07"K 28°59'34,98"D	MÜSAIT	11,339 D. Mili
11295454	8/17/2016 8:13:58 AM	TCSG-25	40°59'59,44"K 28°59'41,37"D	MÜSAIT	10,799 D. Mili
11295454	8/17/2016 8:14:30 AM	TCSG-25	40°59'59,86"K 28°59'47,77"D	MÜSAIT	8,639 D. Mili
11295454	8/17/2016 8:15:00 AM	TCSG-25	41°00'02,20"K 28°59'52,38"D	MÜSAIT	8,099 D. Mili
11295454	8/17/2016 8:15:32 AM	TCSG-25	41°00'06,15"K 28°59'52,80"D	MÜSAIT	8,099 D. Mili
11295454	8/17/2016 8:16:04 AM	TCSG-25	41°00'10,24"K 28°59'52,80"D	MÜSAIT	7,019 D. Mili
11295454	8/17/2016 8:16:34 AM	TCSG-25	41°00'13,97"K 28°59'51,80"D	MÜSAIT	8,099 D. Mili
11295454	8/17/2016 8:17:36 AM	TCSG-25	41°00'21,71"K 28°59'50,21"D	MÜSAIT	7,559 D. Mili
11295454	8/17/2016 8:18:08 AM	TCSG-25	41°00'25,80"K 28°59'49,94"D	MÜSAIT	7,559 D. Mili
11295454	8/17/2016 8:18:38 AM	TCSG-25	41°00'29,52"K 28°59'49,04"D	MÜSAIT	7,019 D. Mili
11295454	8/17/2016 8:19:10 AM	TCSG-25	41°00'33,19"K 28°59'48,16"D	MÜSAIT	7,019 D. Mili
11295454	8/17/2016 8:19:42 AM	TCSG-25	41°00'36,91"K 28°59'47,20"D	MÜSAIT	7,559 D. Mili
11295454	8/17/2016 8:20:44 AM	TCSG-25	41°00'44,21"K 28°59'46,93"D	MÜSAIT	7,019 D. Mili
11295454	8/17/2016 8:21:14 AM	TCSG-25	41°00'47,74"K 28°59'47,11"D	MÜSAIT	7,019 D. Mili

Annex 2 - Watchkeeping Schedule

T.S.M.LTD
TOLUNAY SHIP MANAGEMENT LTD

DECK SCHEDULE WATCH KEEPING

OFFICER NAME & RANK & TIME OF DUTY :

DUTY OFFICER	RANK	FROM	TO
ABDULLAH HAMADI	MASTER	0800	1200
		1200	2400
ALLAM FATTOUH	CH/OFF	0400	0800
		1600	2000
AHMAD SALEH	2ND OFF	0000	0400
		1200	1600

A/B NAME & TIME OF DUTY :

DUTY A/B	RANK	FROM	TO
ABDOU AMER	A/B 1	0400	0800
		1600	2000
SAMIR KARA ALI	A/B 2	0000	0400
		1200	1600
JAMAL MALLOUK	A/B 3	0800	1200
		2000	2400

MASTER

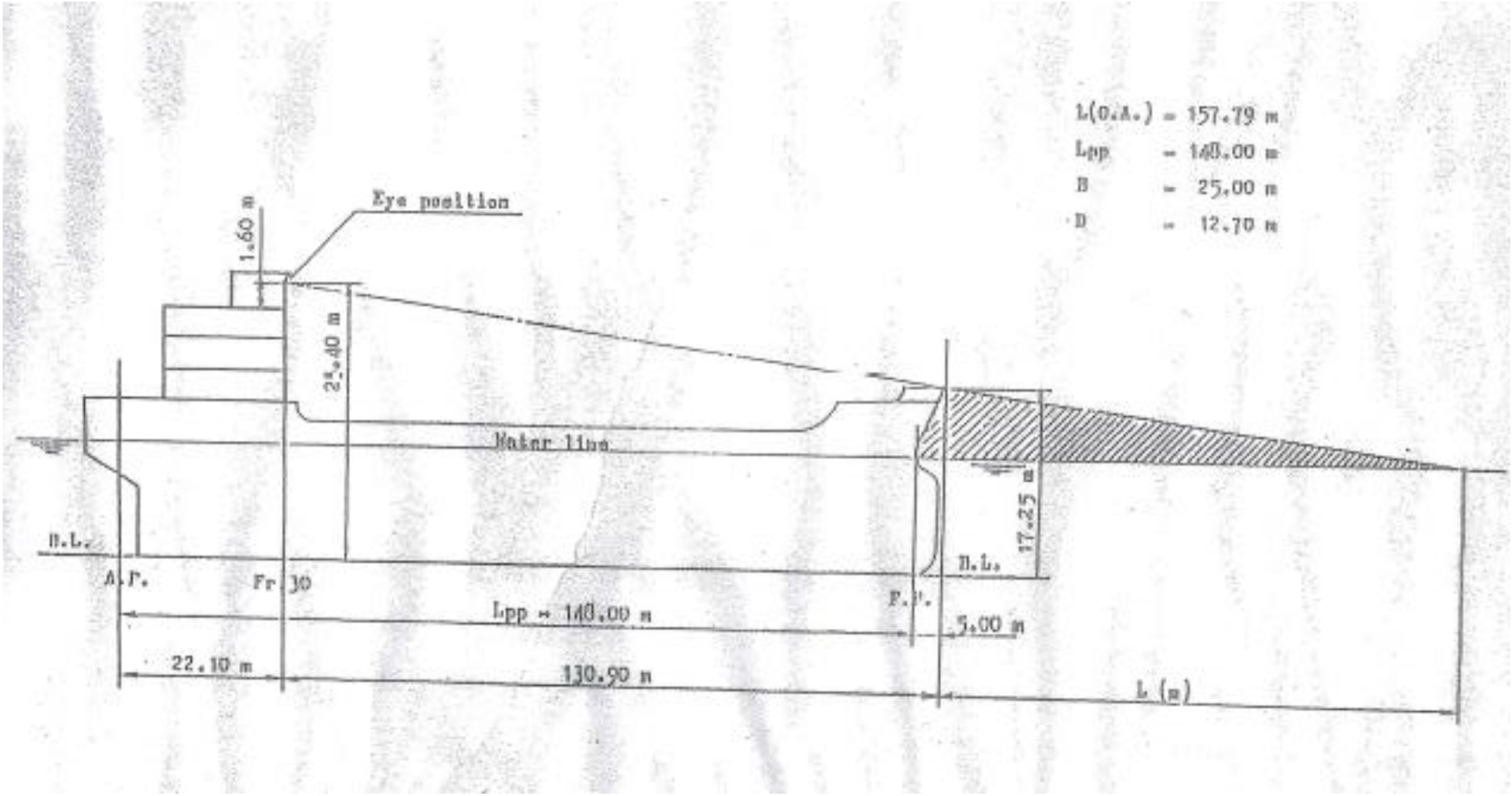
M/V TOLUNAY
AVATIU Cook Islands

M/V : TOLUNAY

TABLE OF OBSCURED DISTANCE

DISTANCE FROM FORE END (UNIT .. METRIC)

MEAN DRAFT (M)	TRIM BY STERN (-SHOWN : BY BOW) (M)													
	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
2.00	200	213	228	245	264	284	308	335	366	401	443	493	554	629
2.50	193	206	221	237	255	275	298	324	355	389	430	479	539	612
3.00	186	199	213	229	247	266	289	314	344	377	417	465	523	594
3.50	179	191	205	221	238	257	279	304	332	366	404	451	507	577
4.00	172	184	198	213	230	248	270	294	321	354	392	437	491	559
4.50	165	177	190	205	221	239	260	283	310	342	379	422	476	541
5.00	158	170	183	197	213	230	250	273	299	330	366	408	460	524
5.50	151	163	175	189	204	221	241	263	288	318	353	394	444	506
6.00	144	155	167	181	196	212	231	253	277	306	340	380	429	489
6.50	137	148	160	173	187	203	222	242	266	294	327	366	413	471
7.00	131	141	152	165	179	194	212	232	255	282	314	352	397	454
7.50	124	134	144	157	170	185	202	222	244	270	301	337	381	436
8.00	117	126	137	149	162	176	193	212	233	258	288	323	366	419
8.50	110	119	129	141	153	167	183	201	222	247	275	309	350	401
9.00	103	112	122	133	145	158	174	191	211	235	262	295	334	383
9.50	96	105	114	124	136	149	164	181	200	223	249	281	319	366


L(O.A.) = 157.79 m
Lpp = 140.00 m
B = 25.00 m
D = 12.70 m
Eye position
1.60 m
23.40 m
Water line
17.25 m
B.L.
B.L.
A.P.
Fr 30
F.P.
Lpp = 140.00 m
5.00 m
22.10 m
130.90 m
L (m)

Annex 4 - VDR Records of M/V TOLUNAY

TIME (GMT +3)	*COURSE OVER GROUND*	*COURSE OVER SEA*	*SPEED*	*LONGITUDE*	*LATITUDE*
05:13:20	236.6	154.5	8.9 KTS	028 59.747E	40 59.396N
05:13:28	3.8	356	9.9	028.59.749	40 59.421
05:13:32	2.6	356	9.9	028.59.750E	40.59.432
05:13:36	2.8	355	9.9	028.59.750E	40.59.446
05:13:40	2.0	355	9.9	028.59.750	40.59.449
05:13:46	0.2	355	9.8	028.59.751	40 59.471
05:13:50	359	355	9.8	028 59.751	40 59 479
05:13:54	359.5	355	9.8	028 59. 751	40 59 490
05:14:02	359.1	355	9.8	028 59.750	40.59.512
05:14:06	359.2	355	9.8	028 95 750	40 59 520
05:14:12	359.5	354	9.8	028 59.750	40 59.539
05:14.20	359.2	354	9.8	028 59.749	40 59.561
05.14.24	358.5	354	9.8	028.59.749	40.59.575
05:14:28	358.7	354	9.8	028.59.749	40 59.583
05:14:32	358.5	354	9.7	028 59.748	40 59.597
05:14:36	358.2	354	9.8	028.59.747	40 59.613
05:14:44	357.6	354	9.8	028 59.747	40 59.630
05.14:48	358.3	354	9.8	028.59.746	40 59.641
05:14:52	358.1	354	9.8	028 59.746	40 59.646
05:14:56	357.6	355	9.8	028.59.745	40 59.660
05:15:00	358.4	355	9.8	028 59.745	40 59.674
05:15:05	358.2	355	9.8	028 59.744	40 59.685
05:15:07	358.5	355	9.8	028 59.744	40 59.690
05.15:16	358.7	355	9.8	028 59.743	40 59.715
05.15:19	358.8	355	9.8	028 59.743	40 59.723
05:15:21	358.7	355	9.8	028 59.743	40 59.728
05:15:24	358.7	355	9.9	028.59.743	40 59.743
05:15:28	358.4	355	9.9	028 59.742	40 59.747
05:15:34	358.5	355	9.9	028 59.742	40 59.764
05:15:37	358.6	355	9.8	028 59.741	40 59.772
05:15:41	358.5	355	9.8	028 59.741	40 59.783
05:15:43	358.8	355	9.9	028 59.741	40 59.789
05:15:50	358.9	355	9.8	028 59.740	40 59.808
05:15:53	359.1	355	9.9	028 59.740	40 59.816
05:15:57	359.5	355	9.8	028 59.740	40 59.827
05.16:00	359.2	355	9.8	028 59.740	40 59.835
05:16:06	359.5	355	9.8	028 59.739	40 59.852
05:16:09	359.4	355	9.8	028 59.739	40 59.860
05:16:13	359.5	355	9.8	028 59.739	40 59.871
05:16:17	358.7	355	9.8	028 59.739	40 59.882
05:16:21	358.4	355	9.8	028 59.738	40 59.893
05:16:25	358.1	355	9.8	028 59.738	40 59.904
05:16:29	358	355	9.8	028 59.737	40 59.917
05:16:34	358	355	9.8	028.59.736	40 59.928

05:16:37	358.1	356	9.8	028 59.736	40 59.936
05:16:43	359.2	356	9.8	028 59.735	40 59.953
05:16:46	359.6	356	9.8	028 59.735	40 59.961
05:16:54	359.9	357	9.8	028 59.735	40 59.983
05:16:58	0.1	357	9.8	028 59.735	40 59.994
05:17:01	0.4	357	9.8	028 59.735	41 00.002
05:17:05	0.6	357	9.8	028 59.736	41 00.013
05:17:09	1.1	357	9.8	028 59.736	41 00.024
05:17:12	1.2	357	9.9	028 59 736	41 00.032
05:17:18	1.6	357	9.8	028 59.737	41 00.048
05:17:23	1.9	357	9.8	028 59.737	41 00.062
05:17:26	1.8	357	9.9	028 59.738	41 00.070
05.17:30	2.2	357	9.8	028 59.739	41 00.084
05.17:32	2.3	357	9.9	028 59.739	41 00.087
05:17:37	1.6	357	9.8	028.59.739	41 00.100
05:17:41	1.6	357	9.8	028 59.740	41 00.111
05:17:45	1.7	357	9.8	028 59.740	41 00.122
05:17:49	1.6	357	9.8	028 59.740	41 00.133
05:17:52	1.7	357	9.8	028 59.741	41 00.142
05:17:57	1.5	357	9.9	028 59.741	41 00.156
05:18:01	1.6	357	9.8	028 59.741	41 00.167
05:18:04	1.3	357	9.8	028 59.742	41 00.175
05:18:06	1.2	357	9.8	028 59.742	41 00.180
05:18:12	1.5	357	9.8	028 59.742	41 00.197
05:18:15	1.3	357	9.8	028 59.743	41 00.205
05:18:19	1.6	357	9.8	028 59.743	41 00.216
05:18:23	1.9	357	9.8	028 59.743	41 00.227
05:18:29	2.0	357	9.8	028 59.744	41 00.246
05:18:33	2.0	357	9.8	028 59.745	41 00.255
05:18:38	1.8	357	9.9	028 59.745	41 00.268
05:18:43	1.8	357	9.8	028 59.746	41 00.282
05:18:48	1.7	357	9.8	028 59.746	41 00.296
05:18:53	1.2	357	9.8	028 59.746	41 00 310
05:18:56	1.1	357	9.8	028 59.747	41 00.318
05:19:01	1.2	357	9.8	028 59.747	41 00.332
05:19:04	0.9	357	9.7	028 59.747	41 00.340
05:19:08	1.5	357	9.8	028 59.747	41 00.351
05:19:11	1.6	357	9.8	028 59.748	41 00.359
05:19:16	1.7	357	9.8	028 59.748	41 00.373
05:19:21	2.0	357	9.8	028 59.749	41 00.387
05:19:24	1.7	357	9.8	028 59.749	41 00.395
05:19:28	1.7	357	9.8	028 59.750	41 00.409
05:19:33	1.0	356	9.6	028 59.750	41 00 420
05:19:36	1.3	356	9.8	028 59.750	41 00.428
05:19:41	1.0	356	9.8	028 59.750	41 00.441
05:19:45	0.7	356	9.8	028 59.751	41 00.452
05:19:49	0.1	357	9.8	028 59.751	41 00.463
05:19:53	359.7	357	9.8	028 59.751	41 00.471

05:19:57	0.0	357	9.8	028 59.751	41 00.485
05:20:02	0.1	358	9.8	028 59.751	41 00.499
05:20:05	0.8	358	9.8	028 59.751	41 00.507
05:20:09	1.1	359	9.8	028 59.751	41 00.518
05:20:15	2.9	359	9.8	028 59.752	41 00.535
05:20:19	3.7	359	9.8	028 59.753	41 00.546
05:20:23	3.9	359	9.8	028 59.754	41 00.557
05:20:26	4.2	359	9.8	028 59.755	41 00.565
05:20:30	4.1	359	9.9	028 59.756	41 00 576
05:20:36	3.2	359	9.9	028 59 757	41 00.592
05:20:40	3.1	359	9.9	028 59.758	41 00.603
05:20:43	3.0	359	9.8	028 59.759	41 00.612
05:20:48	2.9	359	9.9	028 59 .760	41 00.625
05:20:53	3.5	0	9.9	028 59.761	41 00.639
05:20:59	4.2	0	9.9	028 59.762	41 00.656
05:21:03	5.6	0	9.9	028 59.764	41 00.667
05:21:07	4.3	0	10	028 59 765	41 00.678
05:21:12	4.5	0	10	028 59.766	41 00.692
05:21:15	4.4	359	10	028 59.767	41 00.700
05:21:20	3.7	359	9.9	028 59.768	41 00.714
05:21:24	3.3	359	10	028 59 769	41 00.725
05:21:28	3.9	359	9.8	028 59.770	41 00.736
05:21:32	3.2	359	9.9	028 59.771	41 00.747
05:21:36	3.8	359	9.9	028 59.772	41 00.758
05:21:39	3.1	359	10	028 59.772	41 00.766
05:21:44	3.5	359	9.9	028.59.773	41 00.780
05:21:48	3.4	359	9.9	028 59.774	41 00.791
05:21:51	2.3	359	9.8	028 59 .774	41 00.799
05:21:55	3.1	0	9.9	028 59.782	41 00.976
05:21:59	2.1	0	9.9	028 59.783	41 00.987
05:22:03	0.8	0	9.9	028 59 783	41 00.998
05:22:07	359.4	1.0	9.9	028 59.783	41 01.009
05:22:13	359.2	2.0	10	028 59.782	41 01.026
05:22:18	1.9	3.0	9.7	028 59.782	41 01.048
05:22:27	2.2	0	9.9	028 59.778	41.00.899
05:22:29	1.8	0	9.9	028 59.778	41 00.904
05:22:33	1.8	0	9.8	028 59.779	41 00.915
05:22:37	1.8	1.0	9.9	028 59.779	41 00.926
05:22:42	1.8	1.0	9.9	028 59.780	41 00.940
05:22:47	2.4	1.0	9.9	028 59.781	41 00.954
05:22:50	2.8	1.0	9.9	028 59.781	41 00.962
05:22:54	3.2	0	9.9	028 59.782	41 00.973
05:22:59	2.1	0	9.9	028 59.783	41 00.987
05:23:02	1.2	0	10	028 59.783	41 00.996
05:23:05	0	0	9.9	028 59.783	41 01.004
05:23:09	359.2	1.0	9.9	028 59.783	41 01.015
05:23:13	359.2	2.0	10	028 59.782	41 01.032
05:23:18	359.7	3.0	9.9	028 59.782	41 01.046

05:23:24	1.4	4.0	9.8	028 59.782	41.01.059
05:23:28	1.5	4.0	9.9	028 59.783	41 01.068
05:23:33	2.4	5.0	9.9	028 59.783	41.01.081
05:23:38	3.8	6.0	9.7	028.59.785	41 01.095
05:23:43	4.4	7.0	9.8	028 59.786	41 01.109
05:23:46	4.2	7.0	9.8	028 59.787	41 01.117
05:23:49	4.0	7.0	9.9	028 59.787	41 01.125
05:23:53	4.5	9.0	9.9	028 59.789	41 01.136
05:23:58	5.9	10.0	9.8	028 59.790	41 01.153
05:24:03	6.9	10.0	9.9	028 59.792	41 01.164
05:24:08	7.9	11.0	9.9	028 59.795	41 01.177
05:24:12	8.6	12.0	9.9	028 59.797	41 01.188
05:24.15	9.1	12.0	9.9	028 59.798	41.01.197
05:24:20	10.6	13.0	9.9	028 59.803	41 01.218
05:24:25	9.7	13.0	9.9	028 59.805	41 01.227
05:24:29	9.5	14.0	9.9	028 59.807	41 01.235
05:24:31	9.4	15.0	9.9	028 59.808	41 01.240