

MA2015-12

**MARINE ACCIDENT
INVESTIGATION REPORT**

November 26, 2015



The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Norihiro Goto
Chairman,
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

MARINE ACCIDENT INVESTIGATION REPORT

Vessel type and name: Cargo ship JIA HUI

IMO number: 8660911

Gross tonnage: 2,962 tons

Vessel type and name: Cargo ship EIFUKU MARU No.18

Vessel number: 141410

Gross tonnage: 498 tons

Accident type: Collision

Date and time: At around 01:22 on September 27, 2013 (local time, UTC + 9 hours)

Location: Approximately 265° true and 5.6 nautical miles from Izu Oshima Lighthouse off the west of Izu Oshima Island, Oshima-machi, Tokyo
(approximately 34°47.46'N 139°15.53'E)

November 12, 2015

Adopted by the Japan Transport Safety Board

Chairman Norihiro Goto

Member Kuniaki Shoji

Member Satoshi Kosuda

Member Toshiyuki Ishikawa

Member Mina Nemoto

SYNOPSIS

< Summary of the Accident >

The cargo ship JIA HUI with the master, the officer of the watch and 11 other crew members on board sailing southwest to Busan, South Korea, and the cargo ship EIFUKU MARU No.18 with the master, the chief officer and 4 other crew members on board sailing northeast to Chiba port, Chiba prefecture collided off the west of Izu Oshima, Tokyo at about 1:22 on September 27, 2013.

EIFUKU MARU No.18 capsized and all 6 crew members were killed dead, and JIA HUI had damage on the bow but no one was injured or killed dead.

< Probable Causes >

It is probable that this accident occurred by the collision of both ships at night off the west of Izu Oshima Island, because when JIA HUI proceeded to southwest and EIFUKU MARU No.18 proceeded to northeast, the officer of the watch of JIA HUI attempted to pass EIFUKU MARU No.18 with the starboard facing it and continued to proceed by repeatedly veering to the port, and the chief officer of EIFUKU MARU No.18 proceeded almost the same course and speed.

The reason why the officer of the watch of JIA HUI continued to proceed by repeatedly veering to the port by attempting to pass EIFUKU MARU No.18 with the starboard facing it was that he thought that he could pass in front of EIFUKU MARU No.18 and did not confirm the change of bearing of EIFUKU MARU No.18 with a compass. It is probable that he did not notice the bearing of EIFUKU MARU No.18 turning to port.

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

The cargo ship JIA HUI with the master, the officer of the watch and 11 other crew members on board sailing southwest to Busan, South Korea, and the cargo ship EIFUKU MARU No.18 with the master, the chief officer and 4 other crew members on board sailing northeast to Chiba port, Chiba prefecture collided off the west of Izu Oshima, Tokyo at about 1:22 on September 27, 2013.

EIFUKU MARU No.18 capsized and all 6 crew members were dead, and JIA HUI had damage on the bow but no one was injured or dead.

1.2 Outline of the Accident Investigation

1.2.1 Setup of the Investigation

The Japan Transport Safety Board appointed an investigator-in-charge and 2 other investigators to investigate this accident on September 27, 2013.

1.2.2 Collection of Evidence

On-site investigation and interview on September 28, and October 7, 8, 30 of 2013.

Interview and collection of questionnaire on September 30, October 1, 7, 8, 10, 17, 18, 30 of 2013 and January 28, September 8, 16, October 18, November 5, December 24, 30 of 2014.

Collection of questionnaire on October 11, 15, November 8, December 9, 12, 13, 17 of 2013, and January 23 of 2014.

1.2.3 Tests and Researches by Other Institutes

In the investigation of the accident, researches on the size of the hole of EIFUKU MARU No. 18 and the process of flooding were entrusted to the National Maritime Research Institute.

1.2.4 Comments from the Parties Relevant to the Cause

Comments on the draft report were invited from the parties relevant to the cause of the accident.

1.2.5 Comments from the Flag State

Comments on the draft report were invited from the flag state of JIA HUI.

Comments on the draft report were invited from the substantially interested state of JIA HUI.

2 FACTUAL INFORMATION

2.1 Events Leading to the Accident

2.1.1 Navigational Track Recorded by Automatic Identification System

According to the record of Automatic Identification System *¹(AIS) received by a private company (hereinafter referred to as “AIS record”), the navigational tracks of JIA HUI (hereinafter

*¹ An automatic identification system (AIS) is a device that can automatically sends and receives information such as identification number, type of ship, name, position, course, speed, destination, and navigational status, and exchange it with other ships or with land based navigational aids.

referred to as “Vessel A”), EIFUKU MARU No.18 (hereinafter referred to as “Ship B”), and the ferryboat which was navigating nearby area at the time of the accident (hereinafter referred to as “Ship C”) from 01:06:02 to 01:23:39 on September 27, 2013 were as shown in the following Table 2.1-1 to Table 2.1-3.

Table 2.1-1 AIS Record of Vessel A (Extract)

Time (Hours: Minutes: Seconds)	*Vessel position		*Heading (°)	*Course over the ground (°)	Speed over the ground (knots (kn))
	North latitude (°-'-")	East longitude (°-'-")			
01:06:02	34-49-09.5	139-17-49.2	236	238.2	9.2
01:07:01	34-49-04.4	139-17-39.9	235	234.9	9.2
01:07:51	34-49-00.3	139-17-31.9	233	238.3	9.3
01:08:51	34-48-55.2	139-17-22.5	234	235.1	9.2
01:10:01	34-48-49.4	139-17-11.4	232	236.3	9.3
01:10:22	34-48-47.6	139-17-08.3	233	236.6	9.3
01:11:02	34-48-44.1	139-17-01.9	233	237.0	9.3
01:11:32	34-48-41.6	139-16-57.3	237	236.0	9.3
01:12:02	34-48-39.2	139-16-52.4	236	239.3	9.4
01:12:22	34-48-37.6	139-16-49.1	236	240.1	9.3
01:13:02	34-48-34.3	139-16-42.5	235	238.1	9.4
01:13:22	34-48-32.8	139-16-39.4	234	239.7	9.4
01:13:41	34-48-31.3	139-16-36.2	227	239.5	9.4
01:14:02	34-48-29.3	139-16-33.1	229	231.2	9.0
01:14:22	34-48-27.5	139-16-30.2	228	232.4	9.1
01:14:41	34-48-25.9	139-16-27.4	222	233.8	9.1
01:15:02	34-48-23.8	139-16-24.4	217	229.4	9.0
01:15:22	34-48-21.5	139-16-21.8	216	221.5	8.9
01:16:52	34-48-11.4	139-16-11.0	217	222.8	9.2
01:18:02	34-48-03.4	139-16-02.6	218	221.4	9.2
01:18:41	34-47-58.7	139-15-57.6	216	220.3	9.3
01:20:02	34-47-49.0	139-15-47.9	215	218.3	9.2
01:20:31	34-47-45.5	139-15-44.5	211	219.7	9.3
01:21:02	34-47-41.5	139-15-41.0	207	211.9	9.3
01:21:31	34-47-37.7	139-15-38.3	208	210.5	9.2
01:22:02	34-47-33.7	139-15-35.3	203	208.1	9.1
01:22:41	34-47-29.2	139-15-32.5	193	221.8	5.7
01:23:02	34-47-28.6	139-15-31.8	184	212.6	2.1
01:23:31	34-47-28.1	139-15-28.1	177	213.1	1.4

*Vessel position indicates the position of the GPS antenna installed on the top of the bridge (the same shall apply hereinafter). Heading and course over the ground are in true bearings (the same shall apply hereinafter).

AIS provides the values up to the first decimal place for the course over the ground (0.0° to

359.9°), and integral values (0°to 359°) for heading.

Table 2.1-2 AIS Record of Ship B (Extract)

Time (Hours:Minutes:Seconds)	Ship position		Course over the ground (°)	Speed over the ground (kn)
	North latitude (°-'-")	East longitude (°-'-")		
01:08:01	34-45-45.8	139-12-54.6	050.8	11.8
01:08:31	34-45-49.5	139-12-59.5	048.3	11.3
01:10:33	34-46-05.0	139-13-21.0	048.1	11.1
01:11:01	34-46-08.4	139-13-25.5	043.7	11.1
01:11:32	34-46-12.5	139-13-31.1	048.0	11.4
01:12:02	34-46-16.3	139-13-36.2	045.2	11.7
01:12:31	34-46-19.9	139-13-41.2	050.1	11.5
01:13:02	34-46-23.6	139-13-46.5	047.0	11.4
01:13:32	34-46-27.5	139-13-51.6	049.8	11.1
01:15:03	34-46-38.9	139-14-07.2	050.3	11.8
01:15:31	34-46-42.2	139-14-12.3	055.1	12.1
01:16:01	34-46-45.7	139-14-17.8	048.3	11.5
01:17:02	34-46-52.3	139-14-29.6	053.4	11.6
01:18:02	34-46-58.7	139-14-41.2	052.5	11.8
01:19:02	34-47-05.3	139-14-52.5	059.2	11.5
01:20:31	34-47-14.7	139-15-09.5	058.0	11.0
01:21:02	34-47-18.3	139-15-15.3	049.9	11.6
01:22:01	34-47-24.7	139-15-26.8	050.1	11.8
01:23:31	34-47-25.0	139-15-31.3	181.9	1.6

*Heading is not recorded as AIS is a simplified one.

Table 2.1-3 AIS Record of Ship C (Extract)

Time (Hours:Minutes:Seconds)	Ship position		Heading (°)	Course over the ground (°)	Speed over the ground (kn)
	North latitude (°-'-")	East longitude (°-'-")			
01:07:56	34-43-24.7	139-11-28.7	044	043.2	19.9
01:08:44	34-43-36.1	139-11-41.7	045	043.8	19.9
01:09:14	34-43-43.4	139-11-50.0	044	042.8	20.0
01:10:14	34-43-58.0	139-12-06.7	044	044.0	20.0
01:11:14	34-44-18.3	139-12-30.1	045	042.9	20.0
01:12:08	34-44-25.6	139-12-38.3	044	043.5	19.9
01:12:33	34-44-31.7	139-12-45.3	045	043.1	20.0
01:13:03	34-44-38.7	139-12-53.4	044	043.3	20.1
01:13:38	34-44-47.3	139-13-03.4	045	043.9	20.0
01:14:03	34-44-53.3	139-13-10.4	044	043.3	20.0

01:14:38	34-45-01.9	139-13-20.0	045	043.1	19.9
01:15:03	34-45-07.7	139-13-26.7	045	042.9	19.9
01:15:27	34-45-13.7	139-13-33.6	044	043.3	19.9
01:16:03	34-45-22.2	139-13-43.4	044	043.2	20.0
01:16:45	34-45-32.6	139-13-55.3	045	043.3	20.0
01:17:03	34-45-37.0	139-14-00.3	044	043.3	20.2
01:17:38	34-45-45.5	139-14-10.1	045	043.7	20.0
01:18:03	34-45-51.3	139-14-16.9	045	043.7	20.0
01:18:33	34-45-58.6	139-14-25.6	045	043.8	20.1
01:19:03	34-46-05.7	139-14-33.7	045	043.2	20.1
01:19:33	34-46-13.0	139-14-42.2	046	044.6	20.1
01:20:09	34-46-21.7	139-14-52.9	048	046.5	20.1
01:20:38	34-46-28.3	139-15-01.6	049	047.6	20.1
01:21:02	34-46-34.0	139-15-09.2	049	047.7	20.1
01:21:33	34-46-40.7	139-15-18.2	049	047.9	20.1
01:22:02	34-46-46.2	139-15-27.0	049	048.5	20.1
01:22:33	34-46-53.8	139-15-36.4	050	048.6	20.1
01:23:15	34-47-03.4	139-15-49.6	050	048.8	20.2
01:23:39	34-47-08.2	139-15-56.3	050	048.8	20.1

2.1.2 Events Leading to the Accident according to the Statement of Crew Members

(1) Vessel A

The events were as follows according to the statement of the master of Vessel A (hereinafter referred to as “Master A”), the officer of the watch (hereinafter referred to as “Officer A”), the ordinary seaman on the watch (hereinafter referred to as “Ordinary Seaman A”) and the representative of JIA HUI SHIPPING CO., LTD. which is an operation company (hereinafter referred to as “Company A”).

Vessel A uses the time zone which is one hour behind the Japan Standard Time (JST) as its on-board time, and in the following, all are converted into JST.

Vessel A, with Master A, Officer A, and 11 other crew members on board (12 Chinese and one Myanmar), left Keihin Port in Kawasaki Ward for Busan Port at around 19:05 on September 26, 2013.

At around 00:15 on the 27th, Officer A came to the bridge to take over the bridge watch from Master A and third officer, stood at starboard back of the console installed in the center of the steering room, and assigned Ordinary Seaman A to engage in manual steering.

Officer A activated the radar in the starboard side of the console, set the radar in 6M range, Head Up*² and Off-Center*³ mode to make it possible to monitor ahead of the vessel up to about 9M, and headed southwest at a speed of about 9kn (Speed over the ground, the same

*² “Head up” refers to the display method (relative bearing indication) in which the direction on the bow of the ship is the top direction of the radar display. Because the heading (heading flash) is fixed on the radar display, if the course is changed, the images such as those for the surrounding ships, shore, and breakwaters will move.

*³ “Off-center” refers to the movement of the position of the ship (a central bright point) on the radar display, and it is used to expand the forward scope of detection (the navigation direction) when the ship's position is opposite (backward) from the navigation direction.

shall apply hereinafter).

While heading southwest off the west of Izu Oshima, Officer A recognized a masthead light of a ship ahead and white deck light in the front side of the bridge of the ship, confirmed that the distance was about 5M by the radar, and found from the AIS information that it was Ship B heading northeast.

When Ship B was at the distance of about 3M, Officer A saw the sidelights of two ships on head-on course at the portside back of Ship B, thought that turning starboard sharply to pass the three ships on the opposite way including Ship B on her portside will result in receiving wind and wave abeam, and cause bigger rolling, then Officer A altered the course 5° to port in order to pass Ship B on her starboard and flashed a few times using a portable daylight signal light in order to alert Ship B.

When Ship B approached to about 2.6M in the nearly head-on direction, Officer A altered the course 10° to port, attempting to pass ahead of Ship B.

Officer A thought that Vessel A could pass in front of Ship B as Ship B was seen in the starboard bow direction of Vessel A, and continued to sail southwest. When Ship B approached within about 1M in the starboard bow direction, he altered the course further 10° to port to take longer distance in passing ahead of Ship B.

Officer A found the port side light of Ship B approaching closely, recognized for the first time that Vessel A would collide with Ship B, shifted the engine to neutral, and held the wheel by himself to steer hard starboard, but-Vessel A collided with Ship B.

(See Photo 2.1-1)



Photo 2.1-1 Vessel A

(2) Ship B

The events were as follows according to the statement of a representative of Marunaka Kaiun.Co.,Ltd (hereinafter referred to as “Company B”) which is the operating company of Ship B.

Ship B, with the master (hereinafter referred to as “Master B”), the chief officer (hereinafter referred to as “Chief Officer B”), and 4 other crew members on board, left Nagoya Port, Aichi Prefecture for Chiba Port, and while sailing northeast off the west of Izu Oshima, collided with Vessel A.

(See Photo 2.1-2)



Photo 2.1-2 Ship B

(3) Situation of Vessel A and Ship B witnessed by Vessel C

The events were as follows according to the statement of the master of Vessel C (hereinafter referred to as “Master C”), the second officer (hereinafter referred to as “Second Officer C”) and the helmsman (hereinafter referred to as “Helmsman C”).

Second Officer C was on the bridge watch and, while sailing northeast off the west of Izu Oshima towards Keihin Port, recognized the stern light of Ship B with a slow speed in the port ahead.

Second Officer C altered Vessel C to starboard as Ship B altered the course to starboard a little and it became a situation that its course crosses with Vessel C. As Second Officer C was monitoring the movement of Ship B, Vessel A approached Ship B from the port bow of Ship B and the sidelights of both ships overlapped after that. As the images of both ships on the radar were not separated, Second Officer C thought that they have collided.

Master C received the report from Second Officer C that Vessel A and Ship B were getting close, came to the bridge and found that the sidelights of both ships were overlapped. He then reported the situation to the Coast Guard by VHF radiotelephone (hereinafter referred to as “VHF”).

Although Helmsman C had heard communications on the VHF about the intention of ship maneuvering between two ships getting close in the past, he did not hear such communication at the time of this accident.

The accident occurred at around 01:22 on September 27, 2013, at about 265° (in true bearing, the same applies hereinafter), 5.6M from Izu Oshima Lighthouse. (See Figure 1: Navigation Routes (No.1), Figure 2: Navigation Routes (No.2))

2.1.3 Situation from Collision to Capsize

The events were as follows according to the statement of Master A, Officer A, and boatswain of Vessel A.

Officer A was upset about the collision, but went down from the bridge to report about the collision to Master A in master’s cabin, and came back to the bridge.

Master A came to the bridge, saw the bow of Vessel A stuck in the port side midship of Ship B, reported to the Japan Coast Guard and, as Ship B looked leaning toward Vessel A, Master A felt danger and instructed Officer A to shift the engine into astern.

As Officer A, previously having heard that in a situation when a ship collides and sticks the

other ship, it is important to support the other ship by moving forward, thought that Ship B would sink if Vessel A moved away by astern engine, but he shifted the engine into astern as Master A instructed.

Vessel A moved away from Ship B about 1 minute 30 seconds to 2 minutes later sterner the collision by astern engine.

The boatswain who was taking rest in his room was instructed by chief engineer to confirm the condition of the damage of Vessel A, and went to the bow castle deck to look at Ship B drifting at about 50m in the heading direction, and saw Ship B capsize after about 3 to 5 minutes.

2.1.4 Information Regarding Rescue after the Capsize

The events were as follows according to the statement of Master A, Officer A, Ordinary Seaman A, and a representative of Company A, postmortem certificate and information from the Japan Coast Guard.

Master A instructed Ordinary Seaman A to inform the surrounding ships through VHF about the position of Vessel A and that Vessel A collided with Ship B.

Master A raised an emergency alarm inside the ship, mustered the crew members, and instructed third officer who came to the bridge to confirm the condition of the damage of Vessel A with Officer A, and other crew members to search for the crew of Ship B which had its bottom facing upward by lighting Ship B with a searchlight, but they could not find anyone.

Later, Vessel A moved to off Shimoda Port, Shizuoka Prefecture by the instruction of the Japan Coast Guard and anchored at around 12:45 on the 27th.

Ship B went adrift with its bottom facing upward about 1m above the sea surface, and as a result of the search inside the ship by the divers of the Japan Coast Guard from around 16:00, Master B, vice master, chief engineer and vice chief engineer were found in accommodation area, Chief Officer B was found in the stern of the wheel house, and first engineer was found at around 15:35 on October 1 in the engine room, and no one wore a lifejacket and they were confirmed dead at the hospital where they were transferred.

Ship B was towed to Shimoda Port by a towing vessel on September 29, and then was moored to the barge for scrapping, but while it was being towed from the port by a tag boat escaping from an approaching typhoon, the towing line was cut off due to the stormy weather, and Ship B sank on October 16 and became a total loss.

2.2 Injuries to Persons

(1) Vessel A

According to the statement of Master A, there were no injuries.

(2) Ship B

According to the postmortem certificate, 6 crew members died, including first engineer by drowning and other 5 crew members by aspiration of water to be drowned.

2.3 Damage to the Vessels

(1) Vessel A

Vessel A had the crown and arm part of the port anchor detached, crushing on the port bell mouth, holes in the bow area, and dent damage with crack in the bulbous bow. (See Photo 2.3-1 to Photo 2.3-3)

Crush on the Port Bell
Mouth

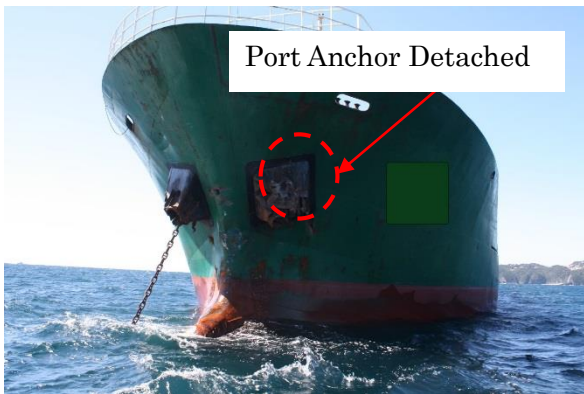


Photo 2.3-1 Damages at the Port Anchor

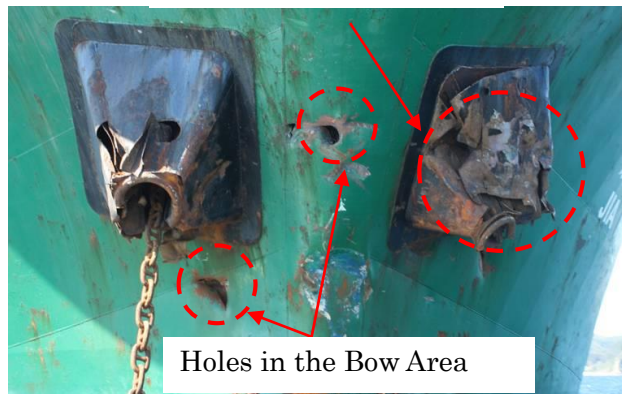


Photo 2.3-2 Damages in the Bow Area

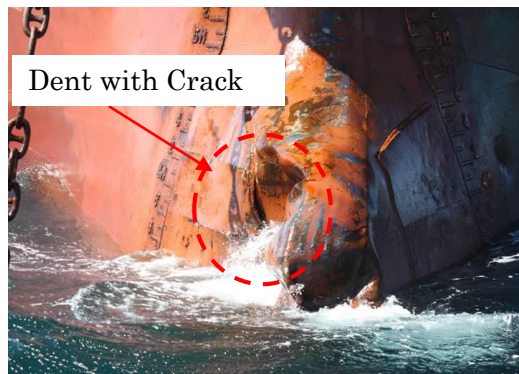


Photo 2.3-3 Damages in the Bulbous Bow.

(2) Ship B

According to the reply to the questionnaire by Salvage Co., Ltd. (hereinafter referred to as "Company D") and information from the Japan Coast Guard, Ship B had a hole of about 3.5m in width and about 5.5m in height at the outside planking of the shipboard in the portside midship. (See Figure 2.3-1)

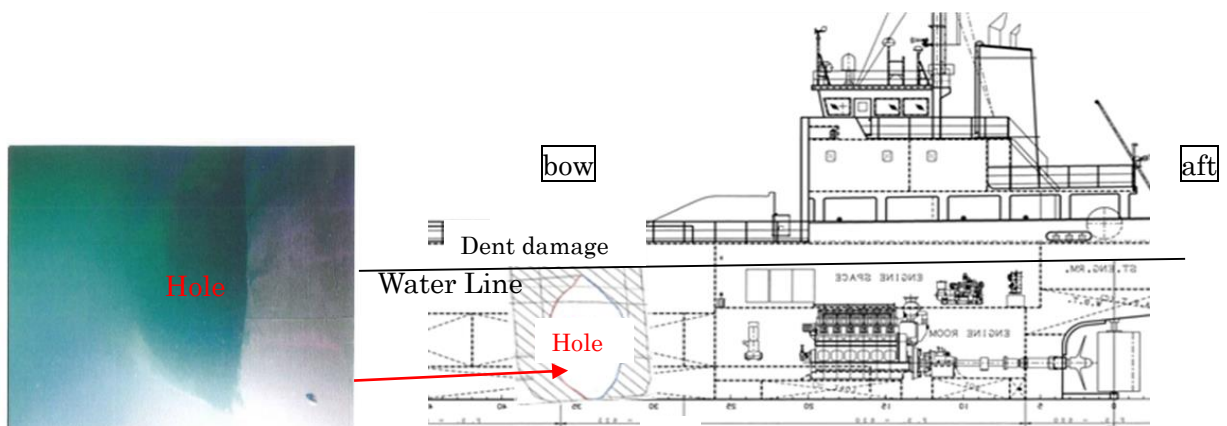


Figure 2.3-1 Damage Conditions of Ship B (Photo was provided by Company D)

2.4 Crew Information

(1) Gender, Age, and Certificate of Competence

1. Master A: Male, 41 years old

Nationality: People's Republic of China

Endorsement attesting the recognition of certificate under STCW (issued by Republic of Sierra Leone): master

Date of issue: July 8, 2013

(Valid until December 31, 2016)

2. Officer A: Male, 35 years old

Nationality: People's Republic of China

He had a Certificate of Competence of Officer to serve on ships under 3,000 gross tonnages and within the coastal and near-coastal area of the People's Republic of China, but did not have the endorsement attesting the recognition of certificate under STCW issued by the flag state.

3. Master B: Male, 62 years old

Fourth grade maritime officer (navigation)

Date of issue: May 21, 1982

Date of revalidation: June 18, 2008

Date of expiry: June 14, 2014

4. Chief Officer B: Male, 29 years old

Fourth grade maritime officer (navigation)

Date of issue: May 17, 2007

Date of revalidation: February 9, 2012

Date of expiry: May 16, 2017

(2) Major Seagoing Experience

According to the statement of Master A, Officer A, representatives of Company A and Company B, seafarers list of Company B and seaman's book of Officer A, Master B and Chief Officer B, their experiences were as follows.

1. Master A

Master A served as a master of cargo ship, engaged on international voyages since around 2007 and as master of Vessel A since May 2013. He was in good health at the time of the accident.

2. Officer A

Officer A received a Certificate limited to the coast of China in 2009, has served as third officer of domestic cargo ship for 1 year and 4 months in total since November of the same year, and served as second officer of Vessel A while engaging on domestic voyages for about 1 year and 5 months since August 2011.

Ever since Vessel A started international voyages from May 2013, Officer A has been on board under the title of apprentice in order to work clerical work such as communicating with Company A and purchasing the articles for ships. He was in good health at the time of the accident.

3. Master B

Master B joined Company B in October 1979, served as officer on a cargo ship owned by Company B, served as master from around 1984, and had plenty of experience on navigation off west of Izu Oshima. He did not look like having any health problems at the time of

departure from Nagoya Port.

4. Chief Officer B

After serving as Chief Officer B for about 4 years and 9 months in deep-sea fishing vessel, Chief Officer B joined Company B in May 2007, served as officer on cargo ships owned by Company B, served as sole bridge watch between Nagoya Port and Keihin Port, and had plenty of experience on navigation off west of Izu Oshima.

He did not look like having any health problems at the time of departure from Nagoya Port.

2.5 Ship Information

2.5.1 Particulars of Ship

(1) Vessel A

IMO number: 8660911

Port of registry: Free Town in Republic of Sierra Leone

Owner: NINGHAI ZHONG SHIPBUILDING CO.LTD., two other persons (People's Republic of China)

Operator: Company A (People's Republic of China)

Management company: JUN HAO MARINE SHIPPING CO.LTD., (hereinafter referred to as "Company E") (People's Republic of China)

Class of ship: Sing-Lloyd

Gross tonnage: 2,962 tons

L×B×D: 104.80m x 16.20m x 6.80m

Hull material: Steel

Engine: 1 diesel engine

Output: 1,765kW

Propulsion: Single fixed pitch propeller

Date of launch: January 31, 2005

(2) Ship B

Ship number: 141410

Port of registry: Owase City, Mie Prefecture

Owner: Company B

Operator: Company B

Management company: Maruta Unyu Inc.

Gross tonnage: 498 tons

L×B×D: 76.26m x 11.30m x 7.10m

Hull material: Steel

Engine: 1 diesel engine

Output: 1.471kW

Propulsion: Single fixed pitch propeller

Date of launch: January 21, 2011

2.5.2 Loading Condition

(1) Vessel A

According to the statement of Master A and Officer A, Vessel A was loaded with about 4,078t scraps when the ship left Keihin Port and the draught was about 4.65m at the bow

and about 5.40m at the stern.

(2) Ship B

According to the statement of a representative of Company B and the collection of questionnaire by Company B, Ship B was loaded with about 1,300t steels when the ship left Nagoya Port and the draught was about 3.19m at the bow and about 4.49m at the stern.

2.5.3 Navigation Equipment, etc.

(1) Vessel A

1. Hull structure, etc.

Vessel A is a cargo ship of flush-decked stern bridge with the bow poop and a distance about 87m from the front of steering room to the edge of the bow, and there was no structure to be an obstacle for the front lookout.

2. Navigation equipment

Vessel A had a console at about 1m behind from the front part of the steering room, the wheel was installed at the center of the console, the radar and AIS were installed on its portside, the engine telegraph, electric chart display and information system and radar were installed on the starboard side, the VHF were installed at both sides of the console respectively, and the portable daylight signal light was equipped in front of the steering room. Moreover, there was no autopilot and automatic radar plotting aid. (See Photo 2.5-1, Photo 2.5-2)

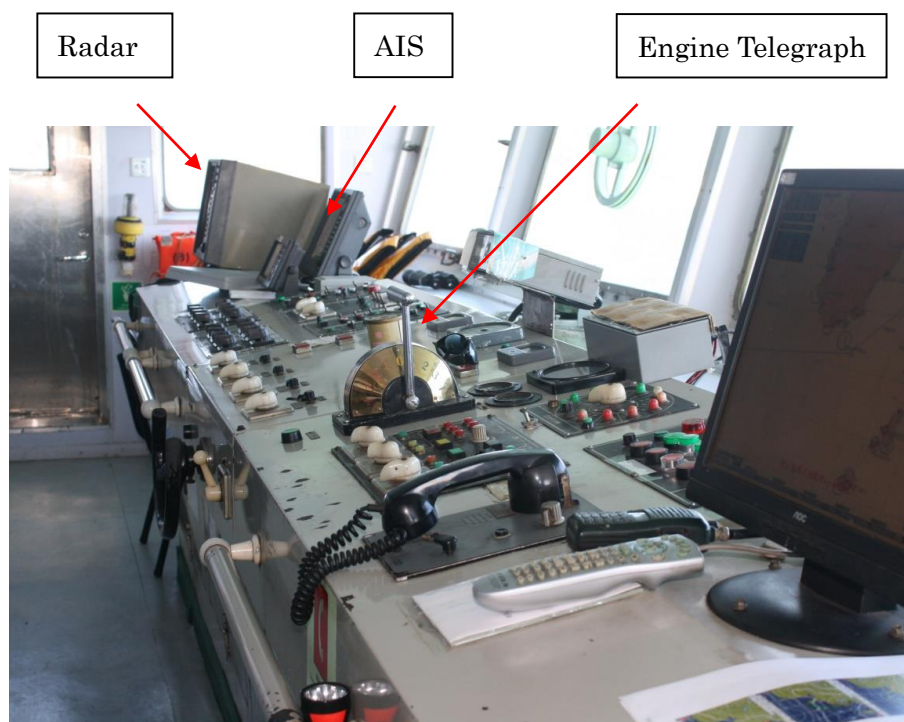


Photo 2.5-1 Nautical Instrument of Vessel A (Port side of Console)

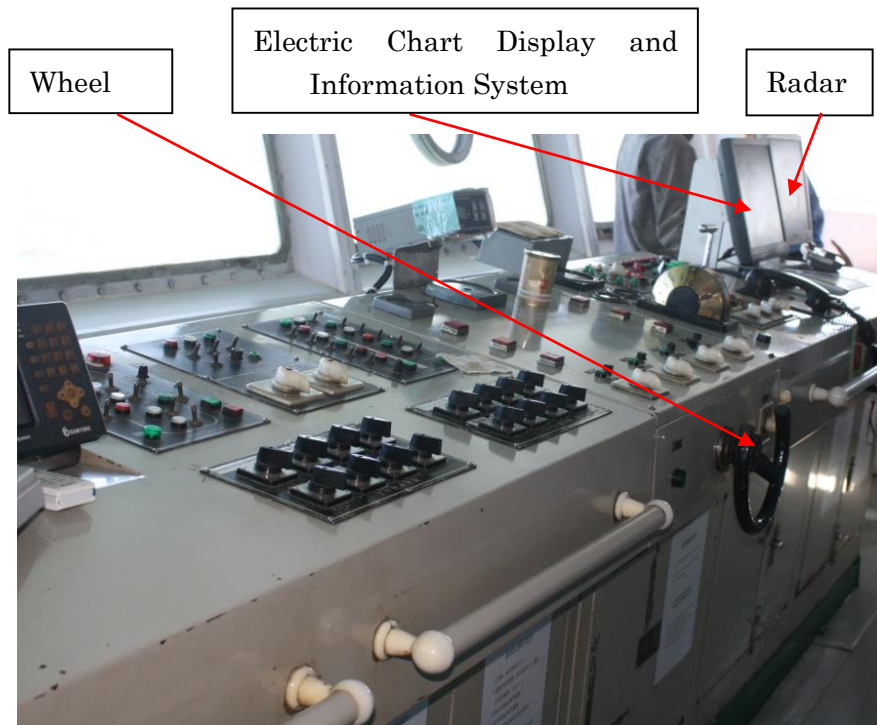


Photo 2.5-2 Nautical Instrument of Vessel A (Starboard side of Console)

3. Hull and main engine condition at the time of the accident

According to the statement of Master A and Officer A, there were no faults or failures involving the hull, the engine, and the equipment.

(2) Ship B

According to the statement of a representative of Company B, and general arrangement plan and tank capacity plan, the ship was as follows.

1. Hull structure, etc.

Ship B is a cargo ship of docking bridge type with thorough two-decker. In front of the engine room, there was a cargo hold of 38.0m in length and 8.6m in width, and a deck store in front of the cargo hold, the fuel oil tank and ballast tank were in the lateral side of the cargo hold and at the double bottom, and there was a portside fuel oil tank of 42.45m³ capacity (hereinafter referred to as “FOT (P)”) at the port side cargo hold closer to the engine room at the double bottom, and port No.4 ballast tank of 87.68 m³ (hereinafter referred to as “No.4 WBT (P)”). (See Figure 2.5-1)

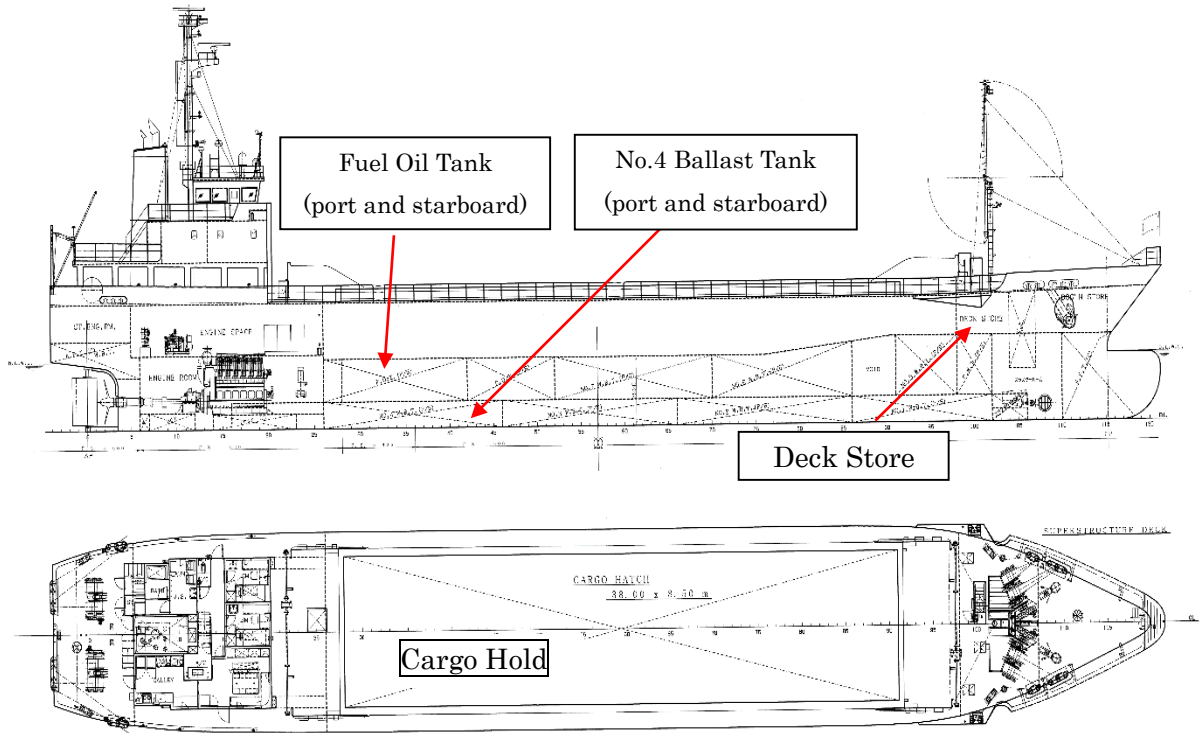


Figure 2.5-1 General Arrangement of Ship B

2. Navigation equipment

Ship B had 2 radars, GPS, AIS, electric chart display and information system, and VHF was installed in the steering room. (See Figure 2.5-2)

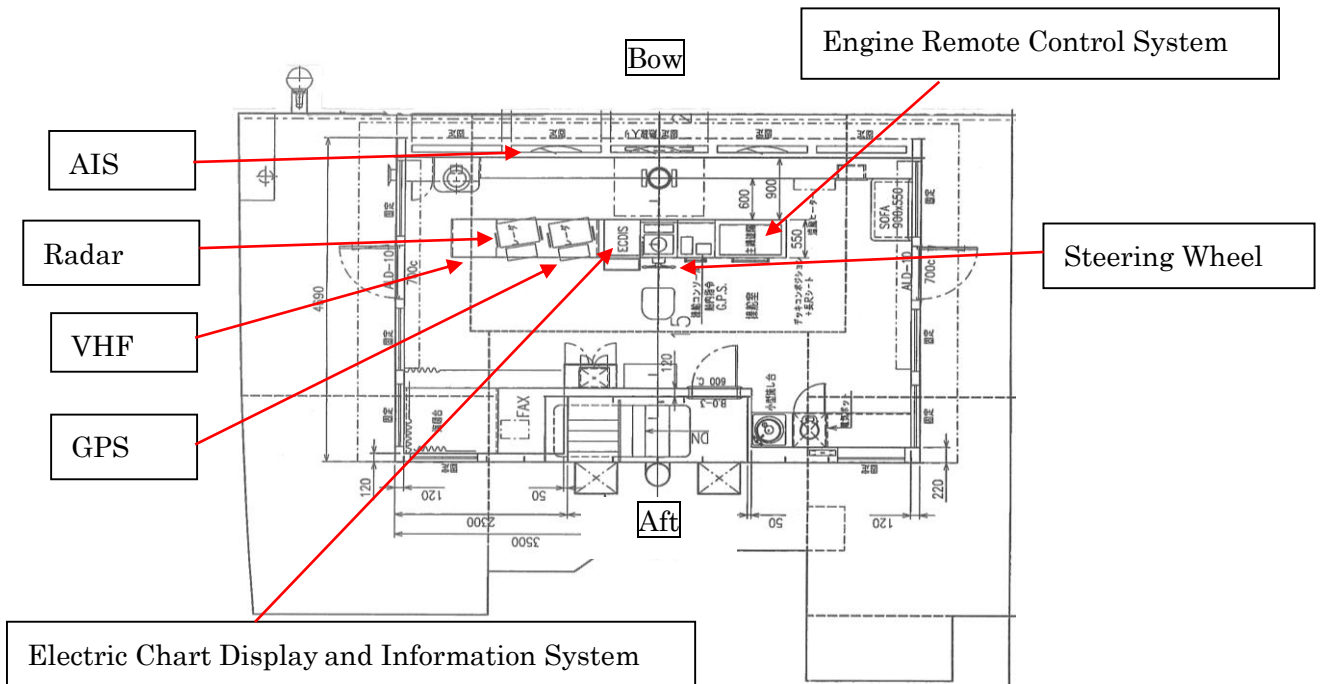


Figure 2.5-2 Arrangement of Ship B Steering Room

3. Hull and Main Engine Condition

There were no faults or failures involving hull, engine, and equipment when Ship B left Nagoya Port.

2.5.4 Maneuverability of the Ship

(1) Vessel A

The statement of Officer A and maneuverability table of Vessel A indicated as follows.

1. Result of Astern Test

Condition at the time of Order to Astern	Stopping Distance (M)
Half speed	0.31
Full speed	0.42

2. Result of turning test (Advancing at full speed, rudder angle at 35°)

Type	Advance * 4(m)	Time (min.:sec.)	Tactical Diameter *5(m)	Time (min.:sec.)
Right Turn	385	1:35	378	2:58
Left Turn	380	1:32	378	3:00

3. Speed

Navigation speed of Vessel A was about 11.0kn.

(2) Ship B

The statement of a representative of Company B and certificate of sea trial indicated as follows.

1. Speed standard (Advancing)

Type	Engine (revolutions per min.)(rpm)	Speed(kn)
Full Speed	273	13
Half Speed	240	11
Slow Speed	200	7
Dead slow speed	150	5

2. Results of astern test with normal ballast condition (Speed 14.1kn)

Type	Time (min.:sec.)	Distance run (m)
Order to Astern ~ Neutral of Main Engine	0:10	—
Order to Astern ~ Stoppage of the Ship	2:44	636

3. Result of turning test with normal ballast condition (Speed 14.1kn, Rudder angle 35°)

Type	Advance	Time	Tactical	Time
------	---------	------	----------	------

*4 "Advance" refers to an advancement distance of the center of ship gravity toward the original course from the center of ship gravity at the start of turning to when the ship is turned 90°.

*5 "Tactical diameter" refers to a lateral movement distance of the center of ship gravity on the original course from the center of ship gravity at the start of turning to when the ship is turned 180°.

	(m)	(min.:sec.)	Diameter (m)	(min.:sec.)
Right turn	221	0:40	214	1:21
Left turn	196	0:40	194	1:18

2.5.5 Installation of the Sidelights of Vessel A

According to the statement of Master A and Officer A, it was as follows.

- (1) Vessel A had the sidelights installed in front of both edges of the bridge wing, and the expansion work of the bridge wing to engage on international voyage was performed at the dockyard in the People's Republic of China from December 2012 to April 2013.
- (2) When the sidelights of Vessel A were removed once due to the expansion work, and then restored, although the horizontal shine range of the sidelights (hereinafter referred to as "specified value") specified by the international rules on preventing collision at sea was 22.5° of abeam from each straight heading, the bow direction was hidden by the inner partition in the front, and the sidelights could not be sighted in the range of about 5.4° on the starboard side and about 3.3° on the port side from the front of the straight heading. (See Photo 2.5-3, Photo 2.5-4, Figure 2.5-3, Figure 2.5-4)

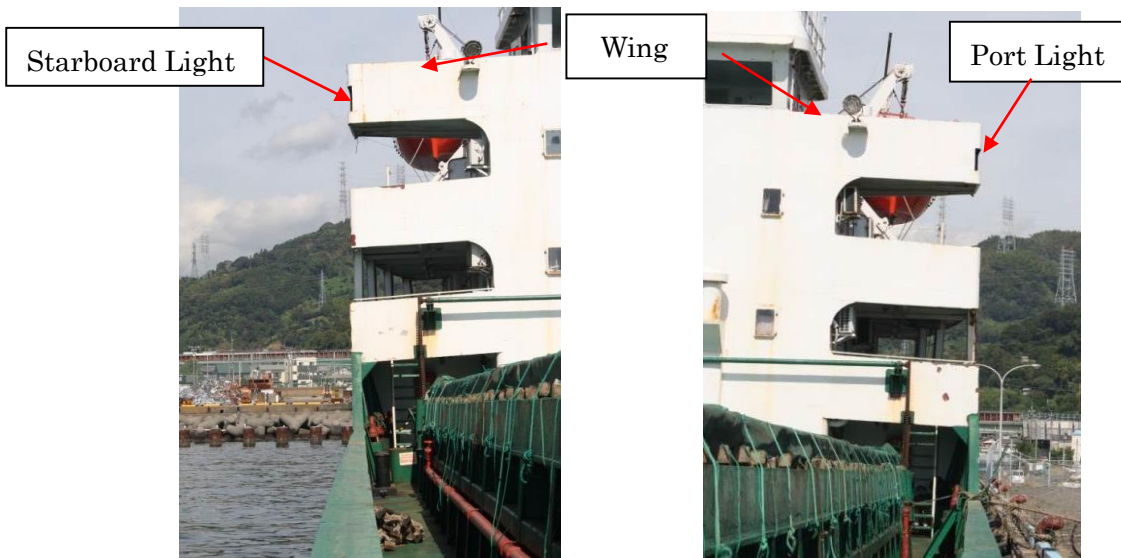


Photo 2.5-3 Installation of the Sidelights

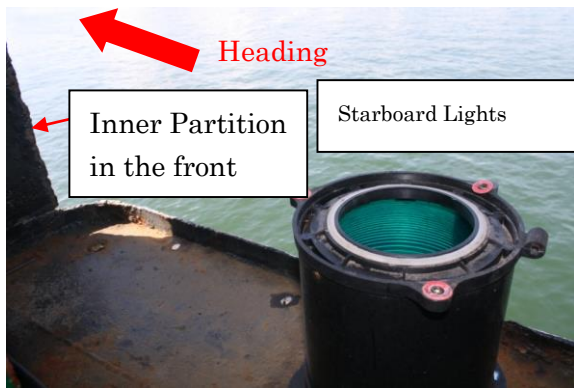


Photo 2.5-4 Starboard Lights Component

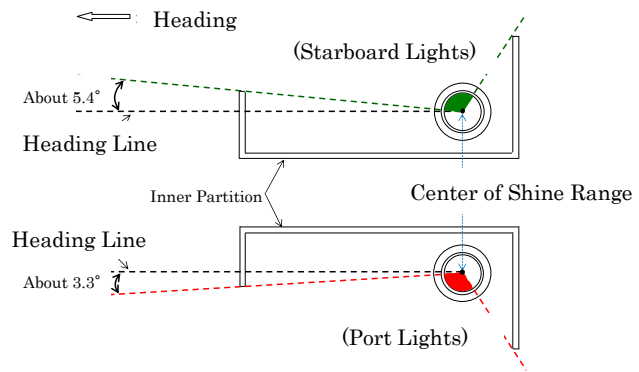


Photo 2.5-3 Outline Drawing of Sidelights Installation

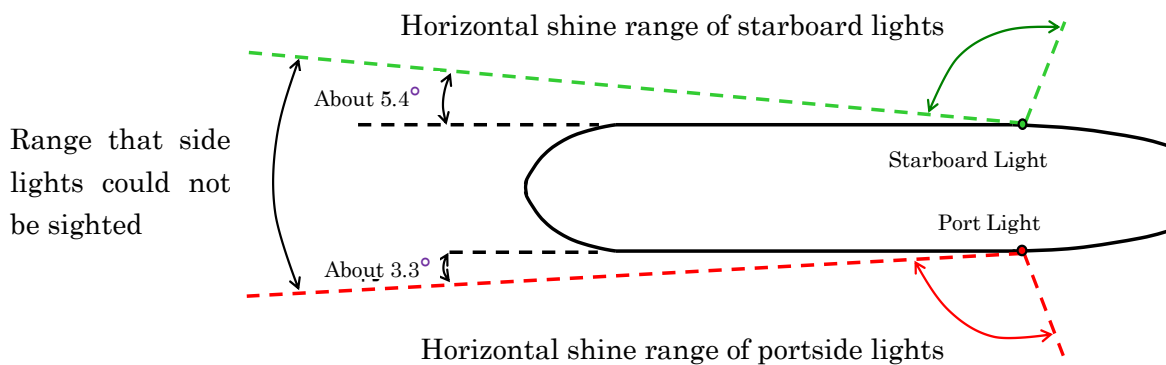


Figure 2.5-4 Outline Drawing of Shine Range of the Sidelights

2.6 Weather and Sea Conditions

2.6.1 Weather Data

The weather data at the time of the accident observed at Oshima Weather Service Center located about 10km away to east southeast from the location of accident was as follows.

September 27

Time: 01:00 Wind direction: NE, Wind speed: 8.6m/s, and Temperature: 18.8°C

01:10 Wind direction: NE, Wind speed: 8.6m/s, and Temperature: 18.8°C

01:20 Wind direction: NE, Wind speed: 8.8m/s, and Temperature: 18.8°C

01:30 Wind direction: NE, Wind speed: 8.4m/s, and Temperature: 18.7°C

2.6.2 Observations by Crew Members

According to the statements of Officer A, the weather was good and the winds were blowing northeast and the wind speed was about 8 to 9m/s, the wave height was about 2.5m from northeast, and visibility was about 7M.

2.7 Characteristics of the Area

2.7.1 Information by Nautical Publications of South/East Shore of Honshu

Information by nautical publications of south/east shore of Honshu published by the Japan Coast Guard indicated as follows.

The north and south side of Oshima is a navigation route to and from Hanshin and Kyushu area.

Although this route, especially the north side is relatively busy with domestic ships, this coast is generally deep steeply and there is no risk of stranding.

Course method

Navigation to West

1. Tsurugasaki Coast or Nojima Coast to Mikomotoshima Coast

(1) In case of passing north of Oshima

	<i>Veering Target and Approximate Position</i>	<i>Veering Point and Course</i>
1	Tsurugasaki Lighthouse 35°08.5'N 39°40.6'E	South southeast about 4M 237°
2	Izu Oshima Lighthouse 34°47.9'N 139°22.3'E	Abeam about 5M 218°
3	Mikomotoshima Lighthouse 34°34.5'N 138°56.5'E	Southeast about 4M 270°

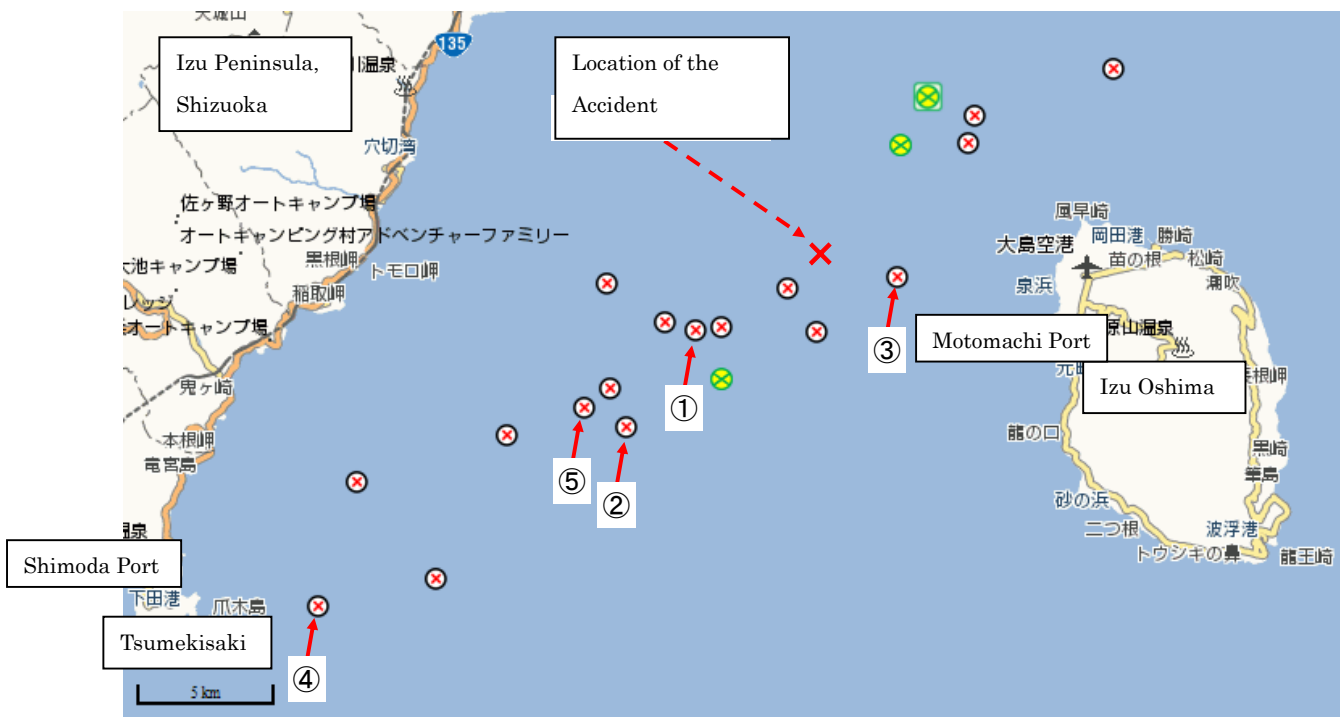
The rest is omitted.

Navigation to East

Reverse navigation of each course in the above 1 to 4


2.7.2 Examples of Collision Accidents

According to the Japan-Marine Accident Risk and Safety Information System*6, the number of collisions after January of 1987 prior to this accident in the vicinity of the area near the location of this accident was 20, and among the collisions while sailing, except for the condition where the visibility was limited, 5 collision accidents occurred at night. (See Figure 2.7-1, Attached Table 1 Examples of Past Accidents)



*6 The Japan-Marine Accident Risk Safety Information System consists of an Internet service from the Japan Transport Safety Board that displays information on marine accidents and marine safety on a world map. URL:<http://jtsb.mlit.go.jp/hazardmap>

 Collision accident which occurred before JTSB was established after January of 1987 (October 1, 2008)

 Collision accident which occurred after JTSB was established and until this accident occurred

No.1 to 5 corresponds to the numbers in Attached Table 1.

Figure 2.7-1 Location of Collision accident

2.8 Status of the Provision of Safety Orders and Bridge Watch for Crew Members

2.8.1 Status of Navigational Management of Vessel A

The navigation manual based on the navigational watch sheet and the International Safety Management Code^{*7} (ISM code made by Company E) indicated as follows. (Extract)

- When a ship gets close to another ship, the bridge watch shall communicate with the other ship by VHF at the earliest possible time so as not to be confused by the delay to avoid maneuvering, and shall adjust the course and speed.
- The bridge watch shall keep at least one radar in a standby condition, and when another ship was found, activate the radar and confirm by radar plotting if there is a danger of collision with the other ship.
- A bridge watch takes command on the board time as follows respectively; third officer from 00:00 to 04:00 and from 12:00 to 16:00, chief officer from 04:00 to 08:00 and from 16:00 to 20:00, and master from 08:00 to 12:00 and from 20:00 to 24:00.

2.8.2 Status of Bridge Watch of Officer A

The statement of Master A, Officer A and a representative of Company A, logbook, and the commission made by Company E indicated as follows.

- (1) Officer A was asked by Master A to take over the bridge watch from third officer who had only about 1 year of experience on board as officer, and he served as bridge watch from 00:00 to 04:00 and from 12:00 to 16:00.
- (2) A representative of Company A found out that Officer A served as bridge watch at the end of June 2013, and issued a commission dated July 1 describing the job assignment of Officer A so that he does not serve as bridge watch, but Officer A served as bridge watch even after that.
- (3) The logbook of Vessel A had the signature of third officer in the column for the person on watch during the above time slots (1).

2.8.3 Status on Bridge Watch of Ship B

According to the statement of a representative of Company B and second officer of Ship B who was on holiday and not on board at the time of the accident, Ship B left Nagoya Port for Chiba Port on September 26 at around 12:00. Master B was supposed to be the sole bridge watch from departure until around 18:00, vice master from around 18:00 to around 22:00, and Chief Officer B

^{*7} International Management Code for the Safe Operation of Ship and for Pollution Prevention (ISM Code) was adopted as IMO assembly resolution on November 4, 1993 with the aim of enhancing the safety of ship operation and the protection of marine environment. The code was incorporated into the annex to the International Convention for the Safety of Life at Sea (SOLAS) 1974, and came into effect on July 1, 1998 after the amendment of the Convention in 1994. ISM code applies to all passenger ships and other vessels of 500 gross tonnages and upwards engaged on international voyages.

afterwards until around the vicinity of the entrance into Tokyo Bay respectively.

2.9 Situation of Sidelights Sighted and Situation of Blowing the Whistle of Ship B

According to the statement of Master A, Ordinary Seaman A, Second Officer C, Helmsman C, and a representative of Company B, it was as follows.

- (1) Officer A could not sight the sidelights until collision because the sidelights were blended into the white working lamps lit by Ship B, and did not hear the whistle from Ship B.
- (2) The door of the steering room of Vessel A was closed at the time of the accident.
- (3) Ordinary Seaman A sighted the sidelights of Ship B when approaching Ship B, but did not see the bright lamps except for the sidelights and did not hear the whistle from Ship B.
- (4) Second Officer C and Helmsman C sighted the starboard light of Ship B when passing over from the starboardside of Ship B, but there was no white working lamps preventing sighting.
- (5) Company B has instructed the crew members of Ship B to make an early whistle signal to the ships with suspicious movement.

2.10 Analysis by the National Maritime Research Institute

Result of analysis regarding the size of the hole of Ship B and the process of flooding entrusted to the National Maritime Research Institute was as follows.

2.10.1 Outline of Research and Analysis

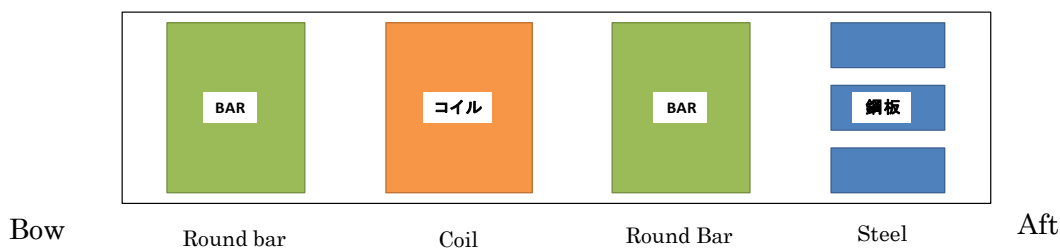
(1) Loaded condition and dimension of hole

1. The cargo holds had 255t of steel, 424t of round bars, 158t of coils, 463t of round bars loaded in that order from the bow, and GM was 1.46m (See Figure 2.10-1)
2. The area of the hole was about 12.99m².

(2) Prerequisites for research

1. The load will not shift even when listing of the ship occurs.
2. There is no damage on the hull except for the hole.
3. The effect of tide and wind will not be considered.

(Floor plan of cargo hold)



Thorough Erection Deck (Cross-section diagram of the cargo hold)

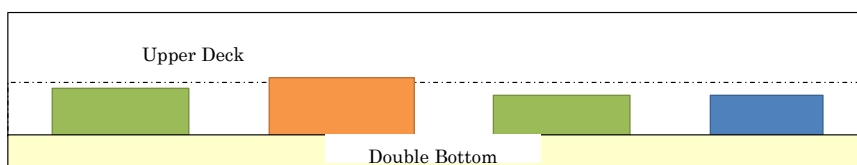


Figure 2.10-1 Stowage of the cargo

(2) Flooded compartments by water from the hole

The flooded compartments were the cargo hold, deck store, FOT (P) and No.4WBT(P).
(See Figure 2.10-2)

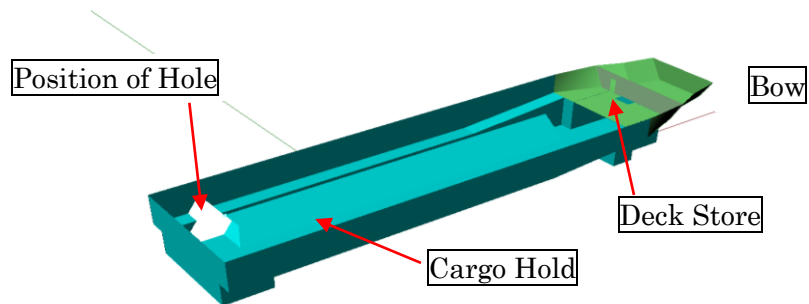


Figure 2.10-2 Outline Drawing of Flooded Compartments

(3) Analysis of stability

The postural change and capsizing conditions which used the flooding volume from the hole and the stability calculation program were as follows.

1. Flooding volume

Time series variation of the flooding volume from the time when Vessel A moved away by shifting the engine into astern was as shown in the following figure. (See Figure 2.10-3)

After Vessel A moved away, No.4 WBT(P) and FOT(P) tanks of Ship B became fully flooded after 10 seconds. The hull listed to the port side, and the flooding volume to the cargo hold and deck store was about 820m³ after 1 minute, about 1,210m³ after 2 minutes, and about 1,540m³ after 3 minutes.

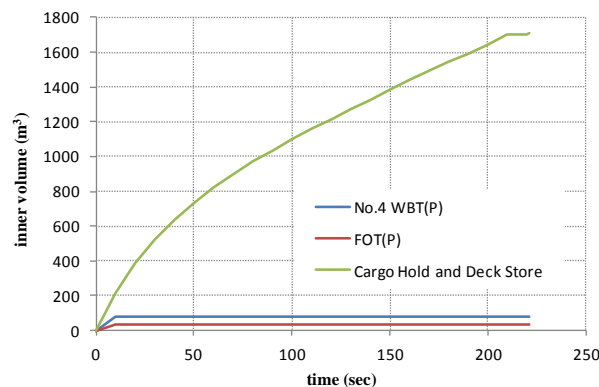


Figure 2.10-3 Time Series Variation of the Flooding Volume

2. Posture change

Time series variation of the trim angle, heel angle (port side) and sinkage of Ship B after Vessel A moved away were as shown in the figure below; however, a negative (-) trim angle indicates the listing to the stern side.

The sinkage indicates the values at the center of gravity at the time immediately before this accident, and the center of gravity is located at 3.33m above the base line and 0.90m to the stern side from the center of the hull. (See Figure 2.10-4 to Figure 2.10-6)

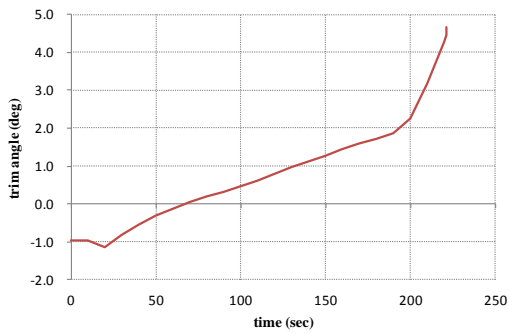


Figure 2.10-4 Change in the Trim Angle

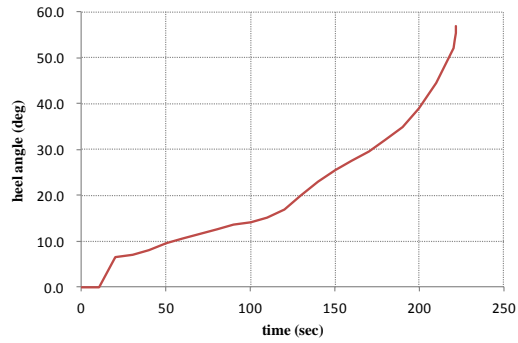


Figure 2.10-5 Change in the Heel Angle

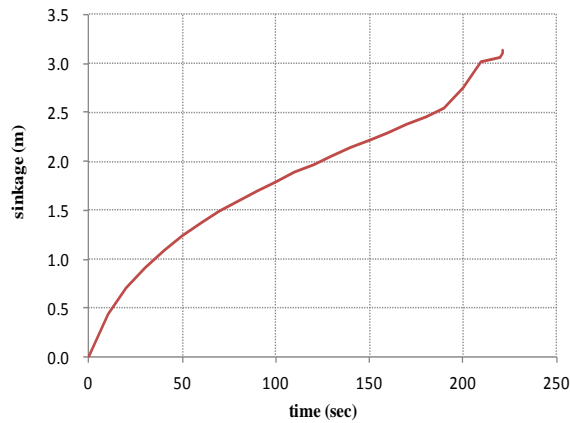


Figure 2.10-6 Change in Sinkage

After Vessel A moved away from Ship B, the area near the engine room of the cargo hold of Ship B was flooded. The buoyancy on the stern side was secured and the bow was sinking, because there was no damage in the area behind the bulkhead at the front part of the engine room.

Sinkage increased sharply when the flooding started, and as the difference between the sea surface and the water level in the ship became smaller, it increased at an almost constant ratio afterwards and reached about 1.2m after 1 minute, about 1.9 m after 2 minutes, and about 2.4m after 3 minutes.

The following figure is a three-dimensional postural change of Ship B; however, a negative (-) trim shows the listing to the stern side. (See Figure 2.10-7 to Figure 2.10-10)

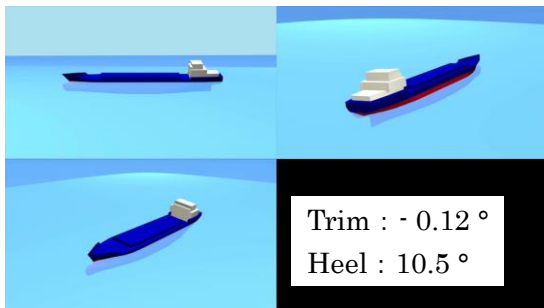


Figure 2.10-7 1 Minute after Flooding Started

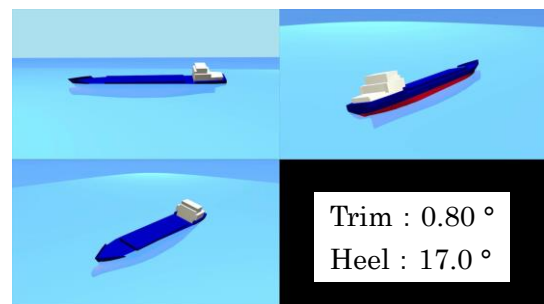


Figure 2.10-8 2 Minutes after Flooding Started

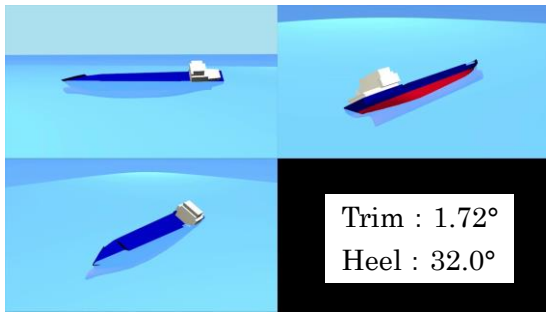


Figure 2.10-9 3 minutes after Flooding Started

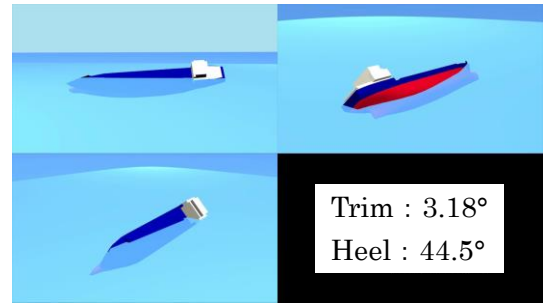


Figure 2.10-10 3 minutes and 30 seconds after Flooding Started

Before 1 minute after Vessel A moved away, Ship B sank rapidly, listed sideways about 10.5° further to the port, then the sinkage and listing to the port side increased further; the port edge on the deck reached to sea level after 2 minutes, the port deck was under the water after 3 minutes, and a large part of the hull was under water after 3 minutes and 30 seconds.

2.10.2 Result of Analysis

- (1) Ship B had enough stability before the flooding started, but it is considered probable that the hull started to sink as the flooding volume increased, the listing to the stern side proceeded rapidly, and became capsized after 3 minutes and 40 seconds.
- (2) The gap between the shape of the hole of the Ship B and the bow of Vessel A at the time of the collision was around 10% of the hole area, thus the flooding volume from this gap would be about 870m^3 after 10 minutes. As the flooding volume at the time of capsizing was about $1,750\text{m}^3$, the flooding volume in about 10 minutes would not have changed the position significantly if Vessel A had not moved away.

2.11 Engine Maneuvering after the Collision

*⁸Reference 1 and *⁹Reference 2 described as follows.

Reference 1

Chapter 8 Procedure of Ship Maneuvering at the Time of Marine Accident

8.2.1 Procedure on Ship Maneuvering Immediately after the Collision

(1) *When the bow of the ship penetrates the hull of another ship, stop the main engine without moving astern and let the ships go adrift in the condition of being in close contact and pushing against the other ship. If the ship moves astern in haste without measures to prevent flooding, the hole will not only widen, but a large amount of flooding will occur from the hole which poses a risk of sinking the ship.*

(2)~(3) (omitted)

*⁸ Reference: "Introduction to ship maneuvering" written by Keinosuke Honda, published by Seizando-Shoten Publishing Co., Ltd (issued on June 28, 2008)

*⁹ Reference: "Theory and practice of ship maneuvering" written by Kinzo Inoue, published by Seizando-Shoten Publishing Co., Ltd (issued on March 8, 2011)

Reference 2

Part III Actual Ship Maneuvering

Chapter 6 Ship Maneuvering at the Time of Emergency

4. Type of Accident and Rescue Condition

4.2 Collision and its Procedure

As the collision is an accident that could affect people's lives, proper actions must be taken immediately as shown below.

- 1. Stop the engine immediately to stop the forward movement. If there is no danger of flooding from the spot of the collision, the ship can move away by moving astern, but if not, take actions such as keep pushing at very slow speed.*
 - 2. Investigate about the hazard to human lives, damage on the hull, and loading condition*
- 3-8 (omitted)

3 ANALYSIS

3.1 Situation of the Accident Occurrence

3.1.1 Course of the Events

From 2.1, the course of events occurred as follows

(1) Vessel A

1. It is probable that Vessel A left Keihin Port in Kawasaki Ward for Busan Port at around 19:05 on September 26, 2013.
2. It is probable that Vessel A proceeded at a heading of about 235° and a speed of about 9.3kn off the west of Izu Oshima from 01:06:02 to 01:13:02 on the 27th.
3. It is probable that Vessel A altered the course to about 230° at around 01:13:30 when she approached about 3M, about 220° at around 01:14:30 when she approached about 2.6 M, and about 210° at around 01:20:00 when she approached about 0.9M to Ship B respectively.
4. It is probable that Vessel A turned the engine to neutral at a heading of about 203° and a speed of about 9.1kn, and collided with Ship B while decreasing the speed and turning to the port.

It is probable that Vessel A steered fully to the starboard but collided.

(2) Ship B

1. It is probable that Ship B left Nagoya Port for Chiba Port at around 12:00 on September 26.
2. It is highly probable that Ship B proceeded about 055° at a course over the ground and 12.1kn of a speed off the west of Izu Oshima at around 01:15:31 on the 27th.
3. It is probable that Ship B altered her course to the starboard about 5° by the change of the course over the ground at around 01:16 when she approached Vessel A at about 2.2M.
4. It is probable that the following show that Ship B proceeded almost the same course and speed after turning to starboard.
 - a Ship B's track as shown in Figure 2, Navigation Routes (No.2)
 - b According to the AIS record of Ship C, as the difference between the heading and the course over the ground from 01:17:38 to 01:23:39 which corresponds to the position of Ship B at 01:17:02 and nearly constant at 0.5° to 1.8°, it is probable that the effects of the wind and tide during this period were nearly constant.

3.1.2 Approaching Situation of Vessel A and Ship B

From 2.1.1, it is probable that the bearing of Ship B which was seen from Vessel A and the distance between both ships were as shown in the following table.

Table 3.1 Bearing and Distance of Ship B Viewed from Vessel A

Time (H : M)	Bearing (°)	Relative Bearing(°)	Distance(M)
About 01:08	229.6	P5.4	4.97
About 01:09	229.4	P5.6	4.63
About 01:10	229.1	P5.9	4.28
About 01:11	228.9	P6.1	3.94
About 01:12	228.6	P6.4	3.60
About 01:13	228.0	P7.0	3.26
About 01:14	227.5	P2.5	2.92
About 01:15	227.2	S7.2	2.58
About 01:16	227.2	S7.2	2.24
About 01:17	226.7	S6.7	1.90
About 01:18	226.1	S6.1	1.56
About 01:19	225.5	S5.5	1.22
About 01:20	224.2	S4.2	0.87
About 01:21	222.4	S12.4	0.53
About 01:22	217.9	S7.9	0.20

*"S" indicates the starboard side and "P" indicates the port side.

Relative bearing is calculated from changing the course of the time of Vessel A in 3.1.1 (1).

3.1.3 Date and Time and Place of Accident Occurrence

It is probable from the following that this accident occurred at around 01:22 on September 27, 2013 in the vicinity of 265° 5.6M from Izu Oshima Lighthouse.

- (1) From 2.1.1, Vessel A altered the course over the ground from 208.1° to 221.8° between 01:22:02 and 01:22:41, and changed the heading from 203° to 193° and the speed from 9.1kn to 5.7kn respectively.
- (2) From 2.1 and 2.5.4, the course over the ground of Ship B changed from 050.1° to 181.9° between 01:22:01 and 01:23:31, and the speed changed from 11.8kn to 1.6kn, and also the speed decreased by 10.2kn in 1 minute and 30 seconds compared to the result of astern test result of Ship B (2 minutes and 44 seconds from 14.1kn to the stoppage of the ship).
- (3) From 2.1.1, the position of Vessel A at 01:22:02 was 34°47'33.7"N 139°15'35.3"E, and the position of Ship B at 01:22:01 was 34°47'24.7"N 139°15'26.8E, and the distance between the GPS antennas of Vessel A and Ship B was about 350m.

3.1.4 Damage to the vessels

From 2.3 and 2.10, the situation was as follows

- (1) Vessel A had the crown and arms of the port anchor fallen off, the port bell mouth collapsed, and there were holes in the bow area and a dent with cracks in the bulbous bow.
- (2) It is probable that Ship B had a hole of about 3.5m in width, about 5.5m in height, and about

12.99m² on the shell plate in the portside midship and capsized.

3.1.5 Situation of Collision

It is probable from 2.1.1, 2.1.2, and 3.1.4, the bow of Vessel A collided with the outside planking of the shipboard in the portside midship of Ship B.

3.1.6 Situation of Capsized Ship B

From 2.1.3 and 2.10, it is probable that Ship B sank after Vessel A moved away by shifting the engine into astern and the flooding volume from a hole increased, the list to the stern side proceeded rapidly and she capsized after about 3 minutes and 40 seconds.

3.1.7 Injuries to Persons

From 2.1.4 and 2.2, it was as follows.

- (1) Vessel A: No one was injured or dead.
- (2) Ship B: All 6 crew members were dead, one person died from drowning, and the cause of death of the other 5 crew members was the aspiration of near-drowning.

3.2 Causal Factors of the Accident

3.2.1 Crew Members

From 2.4, the situation was as follows

- (1) Master A had a legal and valid endorsement attesting the recognition of certification. It is probable that he was in good health at the time of the accident.
- (2) Officer A had a Certificate of Competence of Officer issued by the People's Republic of China and had an experience to serve as navigation officer on domestic cargo ships under 3,000 gross tonnages for 2 years and 9 months, but it is probable that he did not have a legal and valid the endorsement attesting the recognition of certification.
It is probable that he was in good health at the time accident.
- (3) It is probable that Master B had a legal and valid Certificate of Competence of Officer. He was in good health at the time of departure from Nagoya Port.
- (4) First Officer B had a legal and valid Certificate of Competence of Officer. He had a wealth of experience on navigation in the ocean off west of Izu Oshima. It is somewhat likely that he was in good health at the time of departure from Nagoya Port.

3.2.2 Situation of the Ships

From 2.5.3, 2.5.5 and 3.1.1(1) 3., the situation was as follows.

- (1) When a ship was in the range of about 3.3° in the starboard bow and about 5.4° in the port bow of Vessel A, and looked at Vessel A, there were cases that the sidelights of Vessel A could not be sighted and the movement of Vessel A could not be properly judged, but at around 01:14:30, after Vessel A turned its course to the port, Ship B approached from the horizontal shine range of the sidelights which Ship B could sight the starboard light, it is probable that the sidelights of Vessel A, which were not satisfying the specified value, had no possibility of being associated to the occurrence of this accident.
- (2) It is probable that Vessel A had no faults or failures involving the hull, engine, and equipment, except for the installment of the sidelights.
- (3) When Ship B left Nagoya Port, it is probable that there were no faults or failures involving

the hull, engine, and equipment.

3.2.3 Situation of Lookout, Maneuvering, etc.

From 2.1.1, 2.1.2, 2.8, 2.9 and 3.1.2, it is probable that the situation was as follows.

(1) Vessel A

1. It is probable that Vessel A had Officer A and Ordinary Sea Man A served as bridge watch, Officer A served as lookout and took command on ship maneuvering, and ordinary seaman engaged in manual steering respectively at 00:30 on the 27th.
2. It is probable that Officer A set the radar at port side at 6M range, Head-up, and Off-Center mode to head southwest to make it possible to watch the heading up to about 9M.
3. It is probable that Officer A sighted one masthead light at about 5M in the heading and knew that it was Ship B heading northeast from AIS information.
4. It is probable that at around 01:08 to 01:13, Officer A recognized two ships on the opposite way at the back of the portside of Ship B, though Ship B was located at the port bow and its bearing was changed to about 1.6° to the port (from P5.4° to P7.0° for relative bearing), thought that turning sharply starboard to pass the three ships on the opposite way including Ship B with the portside facing them will result in catching the wind and wave from the horizontal direction and cause bigger rolling, thus in order to pass Ship B with the starboard facing it, he altered the course with less rolling by turning port.
5. It is probable that Officer A was in a situation to recognize Ship B at about 2° to the port bow by turning about 5° to the left at around 01:13:30, and recognize Ship B at about 7° to the starboard bow by turning about 10° to the port at around 01:14:30.
6. At around 01:15 to 01:20, Officer A thought that he could pass in front of Ship B as Ship B could be seen at the starboard bow of Vessel A, though the bearing of Ship B altered about 3° to the port (from S7.2° to S4.2° for the relative bearing). It is probable that at around 01:20:00, when Ship B approached to about 4⁰.9M of starboard bow, he altered the course about 10° to the port.
7. It is probable that Officer A found the port light of Ship B approaching closely, felt the danger of collision, then he turned the engine to neutral, and operated the wheel by himself to steer fully to the starboard.
8. From the description of 4 to 6 above, Officer A turned about 5° to the port in a situation when the bearing of Ship B that he recognized in the port bow altered about 1.6° to the port during 5 minutes, and was in a situation to recognize Ship B in the starboard bow by turning about 10° to the port at around 01:14:30, then as he turned about 10° further to the port in a situation that the bearing of Ship B altered about 3° to the port during 5 minutes, it is probable that he thought he could pass in front of Ship B and did not confirm the change of bearing of Ship B with a compass.

(2) Ship B

1. It is probable that Chief Officer B was the sole bridge watch of Ship B at the time of the accident.
2. At around 01:16, it is probable that Chief Officer B altered the course to about 5° to the starboard when Vessel A approached to about 2.2M, and then continued to proceed almost the same course and speed.
3. Regarding the lookout situation and blowing the whistle by Chief Officer B, the situation could not be determined as he was dead by this accident.

4. Regarding the white working lamps of Ship B, Officer A stated that he could not sight the sidelights because the sidelights were blended into the white working lamps, whereas Ordinary Seaman A stated that he sighted the sidelights, and Second Officer C and Helmsman C stated that they did not sight the white working lamps which might prevent sighting the sidelights. Although they stated different statements, since all the crew members of Ship B were dead by this accident and Ship B became a total loss, the lighting situation could not be determined.

3.2.4 Situation of Weather and Sea State

From 2.6, it is probable that the weather was good and the winds were blowing northeast and the wind speed was about 8 to 9m/s, the wave height was about 2.5m from northeast, and visibility was about 7M at the time of this accident.

3.2.5 Analysis of the Area

From 2.7.2, it is probable that the situation was as follows.

- (1) For the collision accident off the west of Izu Oshima in the past, the number of accidents after January of 1987 prior to this accident was 20, and a lot of them occurred on the navigation route from off the north of Izu Oshima to off the east of Tsumekisaki, Shizuoka Prefecture.
- (2) Among the collisions while sailing, except for the condition where the visibility was limited, the lookout condition of 5 accidents that occurred at night indicated that the bridge watch of both or one of the ships did not continuously confirm the movement of the other ship sighted once at the stage where they were approaching.

3.2.6 Analysis on Occurrence of the Accident

From 2.8, 3.1.1, and 3.2.3, the accident occurred as follows:

(1) Vessel A

1. It is highly probable that Vessel A was proceeding off the west of Izu Oshima at around 01:06:02 to 01:13:02 on the 27th at a heading of about 235° and at a speed of about 9.3kn.
2. It is probable that Officer A attempted to pass Ship B with the starboard facing it, by turning to the port even though the bearing of Ship B located at the port bow has altered to about 1.6° to the port.
3. It is probable that Officer A was in a situation to recognize Ship B at about 2° to the port bow by turning about 5° to the port at around 01:13:30
4. Officer A was in a situation to recognize Ship B at about 7° to the starboard bow by turning about 10° to the port at around 01:14:30, and the bearing of Ship B has altered about 3° to the port at around 01:20, but it is probable that he did not notice it as he thought that he could pass in front of Ship B and did not confirm the bearing of Ship B with a compass, and turned to the port about 10° toward the front side of Ship B which approached about 0.9M.

(2) Ship B

1. It is highly probable that Chief Officer B was the sole bridge watch on Ship B and proceeded at the speed of 055° 12.1kn for the course over the ground at about 01:15:31 on the 27th off the west of Izu Oshima.
2. At around 01:16, it is probable that Chief Officer B approached to about 2.2M to Vessel A, altered the course to about 5° to the starboard, and then proceeded almost the same course and speed.

3.3 Analysis on Damage Relief Measure

From 2.1.3, 2.1.4, 2.10, 2.11 and 3.1.6, the situation was as follows.

- (1) It is probable that Vessel A moved away by shifting the engine into astern after collision, and Ship B capsized in a short time as the seawater entered rapidly from the hole.
- (2) When the bow of Vessel A penetrated the side of Ship B, it is probable that Vessel A could delay the capsizing of Ship B by preventing a rapid flooding if she maintained a condition of pushing against Ship B.
- (3) If Ship B had enough time until she capsized, it is probable that the crew members of Ship B could have escaped to outside of the ship.

4 CONCLUSIONS

4.1 Probable Causes

It is probable that this accident occurred by the collision of both ships at night off the west of Izu Oshima Island, because when Vessel A proceeded to southwest and Ship B proceeded to northeast, Officer A of Vessel A attempted to pass Ship B with the starboard facing it and continued to proceed by repeatedly veering to the port, and Chief Officer B of Ship B proceeded almost the same course and speed.

The reason why Officer A of Vessel A continued to proceed by repeatedly veering to the port by attempting to pass Ship B with the starboard facing it was that he thought that he could pass in front of Ship B and did not confirm the change of bearing of Ship B with a compass. It is probable that he did not notice the bearing of Ship B turning to port.

4.2 Other Identified Safety Issues

When the bow of Vessel A penetrated the side of Ship B, it is probable that Vessel A could delay the capsizing of Ship B by preventing a rapid flooding if Vessel A maintained a condition of pushing against Ship B.

5 SAFETY ACTIONS

For the safety actions to prevent similar accidents, when the staff who served as bridge watch finds a ship to the heading, it is necessary to judge if there is a risk to collide or not by observing the change of bearing, radar plotting, etc., and take an action to avoid collision at the proper moment as well as immediately sending a warning signal if there is doubt on the movement of the other ship while approaching.

Master should not let the crew who had no legal and valid Certificate of Competence of Officer serve as a staff for bridge watch.

When the bow penetrated the hull of the other ship by collision, master is required to make an effort to prevent flooding, and also judge carefully the proper moment to move away as the other ship might be in a danger of capsizing in a short time if the ship moved away by shifting the engine into astern.

5.1 Safety Actions Taken After the Accident

5.1.1 Safety Actions Taken by Company B

Company B informed all the owned ships about the outline of this accident, and instructed them to confirm the name of the ship by AIS information for the ship sighted by radar or with naked eye during the bridge watch at night, and if the ship is found to be a foreign flag vessel, keep a lookout with caution on its movement, and maneuver the ship by showing early and clear intension when the other ship makes a suspicious movement or gets closer, in order to avoid getting into a dangerous situation facing each other.

5.2 Safety Actions Required

Master and bridge watch are required to thoroughly do the following.

- (1) Bridge watch must perform the proper lookout by observing the change of bearing, radar plotting, etc. when he/she finds a ship in the heading.
- (2) Master must have bridge watch who is a staff with a legal and valid Certificate of Competence of Officer to maintain a proper bridge watch system.
- (3) Bridge watch must take an action to avoid the collision at the proper moment as well as sending a warning signal immediately if the ship is approaching another ship and there is doubt on the movement of the other ship.

Figure 1 Navigation Routes (No.1)

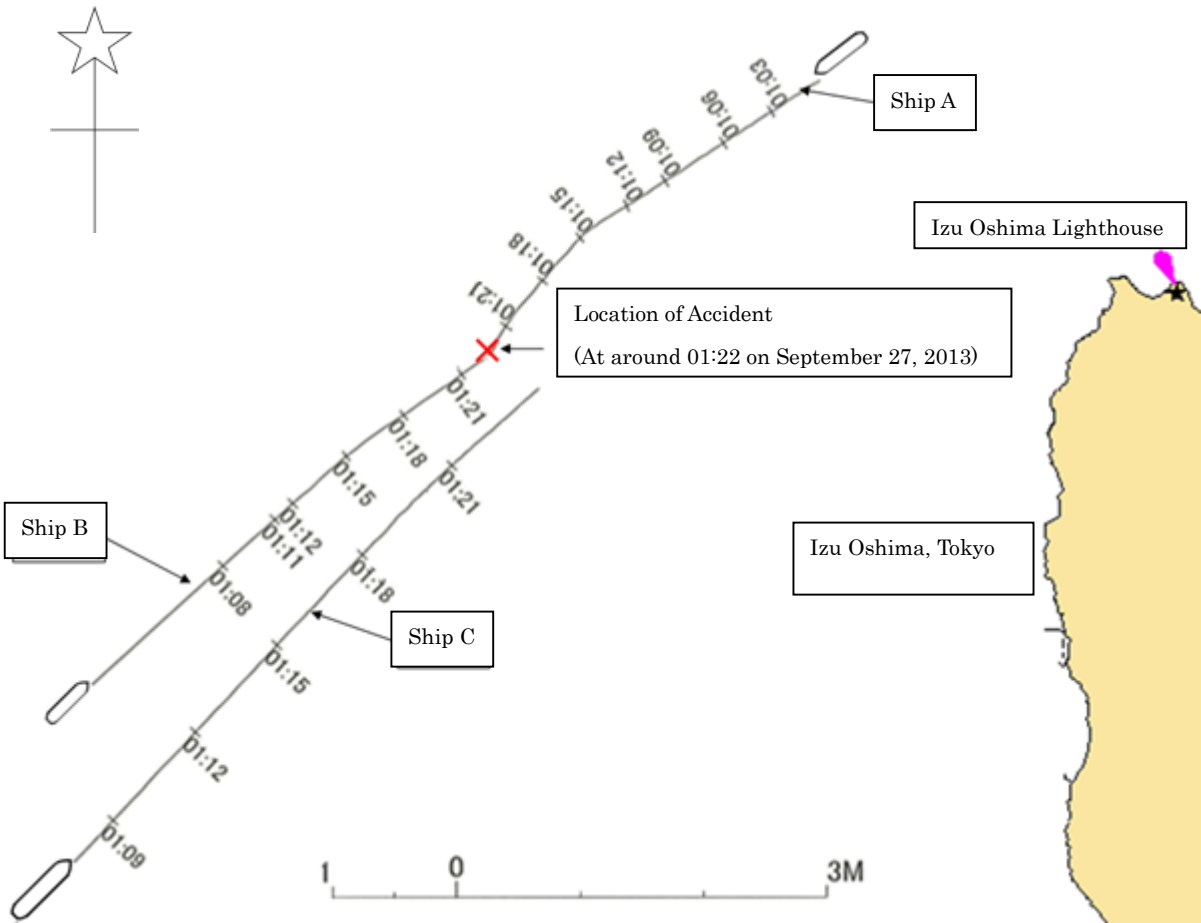
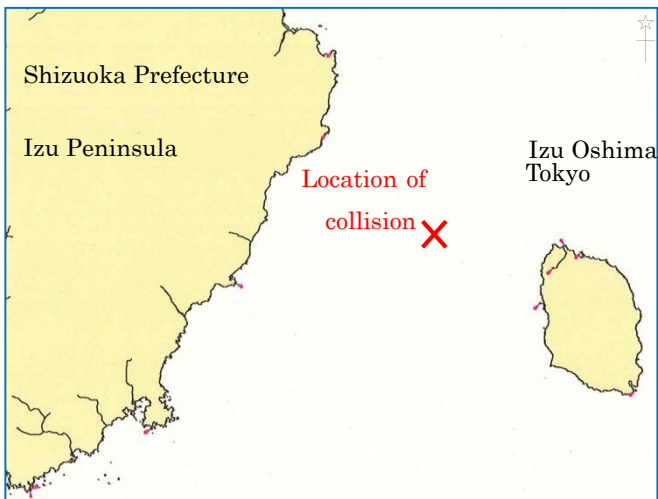


Figure 2 Navigation Routes (No.2)

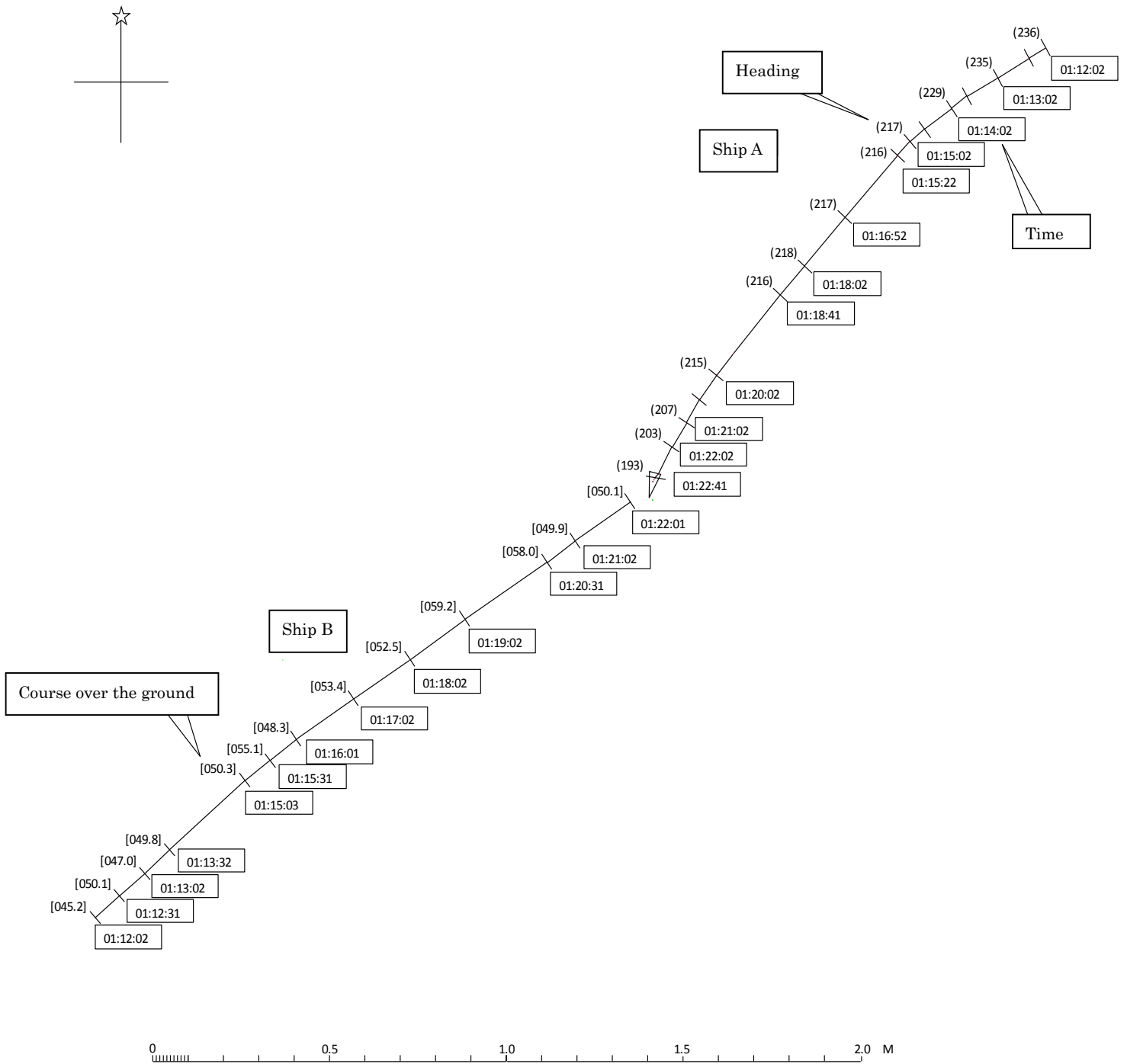


Table 1 Examples of Past Accidents

No.	Date/Time	Type of vessel (total tons)	Location of the accident	Outline of the accident
1	August 7, 1989 Around 23:10	Cargo ship A (18,775 tons)	255°8.9M from Izu Oshima Lighthouse	Vessel A departed Yokosuka Port, Kanagawa prefecture and was proceeding southwest at about 17.3kn for Kanda Port, Fukuoka prefecture. Vessel B departed Kamaishi Port, Iwate prefecture and was proceeding southwest at about 10kn for Udono Port, Mie prefecture. Watch Officer A recognized several lights of navigating vessels in front and proceeded without identifying the stern light of Vessel B approaching to pass over, and also Master B recognized the lights of Vessel A at about 50° 2M abaft the starboard beam, thought that Vessel A would avoid his vessel, and proceeded without thoroughly confirming the movement, and the two vessels collided.
		Cargo ship B (499 tons)		
2	July 23, 1993 Around 21:01	Tanker A (699 tons)	113°6.5M from Inatorimisaki Lighthouse	Vessel A departed Himeji Port, Hyougo prefecture and was proceeding northeast at about 7.6kn for Chiba Port, Chiba prefecture. Vessel B departed Keihin Port, Yokohama and was proceeding south-southwest at about 18.4kn for Incheon Port, South Korea. Boatswain A recognized Vessel B in the position to cross in front toward the right, and then noticed that vessel was approaching in a situation that might cause a collision, but he did not send a warning signal and proceeded without taking any cooperative measure to avoid a collision, and Third Officer B first noticed Vessel A approaching in a situation to cross to the left, but proceeded without noticing the vessel approaching in the situation that might cause a collision, and the two vessels collided.
		Cargo ship B (12,533 tons)		
3	April 9, 1996 Around 19:35	Cargo ship A (498 tons)	255°4.5M from Izu Oshima Lighthouse	Vessel A departed Osaka Port and was proceeding north at about 11.3kn for Tomakomai Port, Hokkaido. Vessel B departed Osaka Port and was proceeding northeast at about 14kn for Chiba Port. Chief Officer A thought that Vessel B would pass the starboard side of his vessel safely and proceeded without sending
		Tanker B (4,623 tons)		

				a warning signal and not taking any cooperative measure to avoid a collision. Chief Officer B thought that he could pass the starboard side of Vessel A safely and proceeded without making thorough observation of the movements and without noticing Vessel A approaching with a danger of collision, and the two vessels collided.
4	December 9, 1997 Around 00:55	Cargo ship A (409 tons)	083°2.5M from Tsumekisaki Lighthouse	Vessel A departed Shimizu Port, Shizuoka prefecture and was proceeding east-northeast at about 7.6kn for Tomakomai Port, Hokkaido. Vessel B departed Chiba Port and was proceeding southwest at about 10.9kn for Nagoya Port. Chief Officer A recognized Vessel B in front crossing to the right, then after that noticed that she was approaching in a situation that might cause a collision but thought that she would turn right if he maintained its course and speed, and passed port against port, and proceeded. Boatswain B was distracted by a vessel on the same way in port front, and did not notice Vessel A crossing in front toward the left and approaching in danger of a collision, and the two vessels collided.
		Cargo ship B (393 tons)		
5	January 16, 2003 Around 21:33	Cargo ship A (409 tons)	112°5.5M from Inatorimisaki Lighthouse	Vessel A departed Fukuyama Port, Hiroshima prefecture and was proceeding northeast at about 14.2kn for Chiba Port. Vessel B departed Shimizu Port, Shizuoka prefecture and was proceeding north-northeast at about 12.2kn for Misaki Port, Kanagawa prefecture. Ordinary Seaman A was distracted by the lights of towns on the shore in the port side, and proceeded without noticing Vessel B approaching. Master B recognized the light of Vessel A at slightly back of the port beam, and by looking briefly thought that it would be all right because it was a vessel on the same way, and proceeded without making thorough observation of the movements and without noticing Vessel A approaching and the two vessels collided.
		Fishing vessel B (379 tons)		