

MA2013-5

**MARINE ACCIDENT
INVESTIGATION REPORT**

May 31, 2013



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 OUTSAILING 9
IMO number 9546318
Gross tonnage 2,926 tons

Vessel type and name Cargo ship NISSHINMARU
Official number 131739
Gross tonnage 199 tons

Accident type Collision
Date and time Around 00:11, March 28, 2010
Location South of the Naruto Strait
 Around 084° true bearing, 280 m from the Narutotobishima
 Lighthouse, Naruto City, Tokushima Prefecture
 (Approximately 34°13.9' N, 134°39.1' E)

April 11, 2013

Adopted by the Japan Transport Safety Board

Member Tetsuo Yokoyama

Member Kuniaki Shoji

Member Mina Nemoto

SYNOPSIS

<Summary of the Accident>

At around 00:11 on March 28, 2010, while the cargo ship OUTSAILING 9 was sailing north-northwest toward the Naruto Strait boarding 14 crew members in addition to the master, and while the cargo ship NISSHINMARU was sailing south-southeast in the south of the Naruto Strait after passing under the Onarutokyo Bridge boarding 3 crew members in addition to the master, the two vessels collided with each other.

One crew member was killed on NISSHINMARU, another went missing, the port center part of the hull was breached, and the vessel sank. OUTSAILING 9 suffered a dented bow, but there were no casualties.

<Probable Causes>

It is probable that the accident occurred because, at night, in the south of the Naruto Strait, while OUTSAILING 9 was sailing north-northwest toward the strait and NISSHINMARU was sailing south-southeast in the south of the Naruto Strait after passing underneath the Onarutokyo Bridge, even though the two vessels were approaching each other on a collision course, they continued sailing without changing their course and speed until they collided with each other.

It is probable that the reason NISSHINMARU continued sailing without changing her course and speed was because the master of NISSHINMARU thought OUTSAILING 9 would turn to starboard and pass NISSHINMARU port to port, since vessels sailing north-northwest toward the Onarutokyo Bridge usually turned to starboard to keep out of the way of NISSHINMARU after NISSHINMARU passed under the bridge.

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

At around 00:11 on March 28, 2010, while the cargo ship OUTSAILING 9 was sailing north-northwest toward the Naruto Strait boarding 14 crew members in addition to the master, and while the cargo ship NISSHINMARU was sailing south-southeast in the south of the Naruto Strait after passing under the Onarutokyo Bridge boarding 3 crew members in addition to the master, the two vessels collided with each other.

One crew member was killed on NISSHINMARU, another went missing, the port center part of the hull was breached, and the vessel sank. OUTSAILING 9 suffered a dented bow, but there were no casualties.

1.2 Outline of the Accident Investigation

1.2.1 Setup of the Investigation

The Japan Transport Safety Board designated an investigator-in-charge from the Kobe Office and 2 other investigators to investigate this accident on March 28, 2010.

1.2.2 Collection of Evidence

On-site investigation and interviews: March 30, 2010

Interviews: April 22, 28 & June 8, 2010

Collection of questionnaire: April 26, 2010

1.2.3 Comments from Parties Relevant to the Cause

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

1.2.4 Comments from the Flag State and the Substantially Interested State

Comments on the draft report were invited from the flag State and another substantially interested State of OUTSAILING 9.

2 FACTUAL INFORMATION

2.1 Events Leading to the Accident

2.1.1 Voyage Conditions According to the Automatic Identification System

According to the records from the Automatic Identification System^{*1} (hereinafter referred to as “AIS Record”) received by the Japan Coast Guard Osaka Wan Vessel Traffic Service Center, the voyage conditions of OUTSAILING 9 (hereinafter referred to as “Vessel A”) between 23:54:52, March 27, 2010 and 00:11:00, March 28 were as follows.

- (1) At 23:54:52 on March 27, at Latitude 34°11'20.9" N and Longitude 134°40'42.1" E, with a heading of 338° (true bearing, the same shall apply hereinafter), a course over the ground (hereinafter referred to as “course”) of 339.6° and a speed of 10.5 knots (kn) (speed over the ground, the same shall apply hereinafter).
- (2) On the 28th (hereinafter same until (7)), at 00:06:53, at Latitude 34°13'21.5" N and Longitude 134°39'36.8" E, with a heading of 330°, a course of 326.0°, and a speed of 10.5 kn.
- (3) At 00:08:12, at Latitude 34°13'32.4" N and Longitude 134°39'27.1" E, with a heading of 330°, a course of 323.4°, and a speed of 10.4 kn.
- (4) At 00:09:01, at Latitude 34°13'39.6" N and Longitude 134°39'20.6" E, with a heading of 329°, a course of 323.5°, and a speed of 11.1 kn.
- (5) At 00:09:53, at Latitude 34°13'47.6" N and Longitude 134°39'13.8" E, with a heading of 331°, a course of 322.1°, and a speed of 11.1 kn.
- (6) At 00:10:50, at Latitude 34°13'53.6" N and Longitude 134°39'07.1" E, with a heading of 336°, a course of 304.7°, and a speed of 7.7 kn.
- (7) At 00:11:00, at Latitude 34°13'53.4" N and Longitude 134°39'06.6" E, with a heading of 345°, a course of 273.7°, and a speed of 2.6 kn.

(Refer to Attached Table 1 AIS Record of Vessel A)

2.1.2 The Operations of the Vessels as Stated by the Crew

According to statements from the second officer of Vessel A (hereinafter referred to as “Second Officer A”), a quartermaster of Vessel A (hereinafter referred to as “Quartermaster A”), the master of NISSHINMARU (hereinafter referred to as “Vessel B” and “Master B”) and

^{*1} “Automatic Identification System (AIS)” is a system through which such pieces of information as a vessel's identification, type, name, position, course, speed, destination, and voyage conditions are exchanged between vessels or between vessels and land stations, such as navigational support facilities and others.

the second officer of Vessel B (hereinafter referred to as “Second Officer B), the process leading up to the occurrence of the accident was as follows.

(1) Vessel A

The master (hereinafter referred to as “Master A”) and Second Officer A was aboard Vessel A along with 13 other crew members. At around 13:30 on March 26, 2010, Vessel A departed from Chiba Port in Chiba Prefecture with empty cargo holds and headed for Fukuyama Port.

Master A, thinking to pass the Naruto Strait at around 00:00 on the 28th when the current in the Strait would be weak, after adjusting time by turning the vessel around in the south of the Strait, at around 23:45 to 50 on the 27th, at approximately 4.5 nautical miles (M) south of the Onarutokyo Bridge, conned the vessel himself, assigned Second Officer A and Quartermaster A to lookout and to manual steering respectively, and navigated the vessel toward the Naruto Strait in a direction of approximately 340° and at a speed of approximately 10 kn.

Second Officer A, at around 23:55, while Vessel A was sailing in the vicinity of approximately 3 M south of the Onarutokyo Bridge, using a radar fitted with an ARPA*² device, recognized radar images of Vessel B and one other vessel at approximately 5 M off the bow sailing southeast to the north of the Onarutokyo Bridge. Second Officer A recognized no vessel on the stern of Vessel A.

Master A, since Vessel A was positioned to pass Vessel B in the vicinity of the narrowest part, informed Second Officer A that they would allow Vessel B to pass in the vicinity of the narrowest part first, and directed the Second Officer A to reduce the engine from full ahead to half ahead. Vessel A sailed at a speed of approximately 9 kn.

When Second Officer A sighted the port light of Vessel B in the direction of 15–20° and at a distance of approximately 1 M on her starboard bow, Vessel B emitted a flashing light once toward Vessel A. Master A therefore ordered Second Officer A to emit a flashing light once and Second Officer A emitted a flashing light once toward Vessel B using the daytime signal light at the front portside of the bridge.

Master A ordered Quartermaster A to put the rudder to starboard 20°, and once Vessel A was turned starboard so that Vessel B was visible on the portside bow, ordered “steady*³”.

*2 “ARPA”, which stands for Automatic Radar Plotting Aids, is an instrument which automatically processes the position change of other vessels detected by radar and shown on the display; indicating the course, speed, the closest point of approach (CPA) and time to the closest point of approach (TCPA); indicates the estimated position of other vessels; and warns the risk of collision with other vessels.

*3 According to the latest version of “IMO STANDARD MARINE COMMUNICATION PHRASES” (Edited

Master A, when the distance between Vessel A and Vessel B was approximately 0.4 M, as Vessel B emitted a flashing light twice and then again sent out the same flashing light signal, ordered Quartermaster A to turn the rudder to port 20°. At this moment, it seemed to Second Officer A that Vessel B was turning starboard, and Second Officer A saw a risk of collision.

Master A, as Vessel B located approximately 150 m off the bow started turning starboard, when the rudder angle was approximately 15°, ordered that the rudder be turned to starboard 20° and that the engine be shifted to neutral and then to full astern. However, at around 00:11, to the south of the Onarutokyo Bridge, the bow of Vessel A and the port center of Vessel B collided with each other almost at a right angle.

Master A had his crew check the damaged parts of the vessel and reported the occurrence of the accident to the Japan Coast Guard.

Although Master A set the engine at slow ahead in order to prevent Vessel B from drifting away from Vessel A and becoming submerged as the bow of Vessel A had dug into the port center part of the hull of Vessel B, Vessel B sank approximately 10 minutes after the collision.

Vessel A, after Vessel B sank, started rescuing crew members of Vessel B and rescued the first and the second crew members at around 00:25 and 00:50 respectively.

(2) Vessel B

Master B and Second Officer B were aboard Vessel B along with 2 other crew members. At around 12:00 on March 27, 2010, Vessel B departed from the Kure Port in Hiroshima Prefecture and headed for the Keihin Port.

At around 19:30, Master B went up to the bridge to keep watch.

Master B, expecting that the flow would be reduced down to 3–4 kn approximately 1 hour from the time when flow of the south-going current in the Naruto Strait would reach maximum, planned to pass through the Strait at around 00:00. Accordingly, after passing through the Bisan Seto East Traffic Route, Master B adjusted time by turning the vessel around on her way to the Naruto Strait.

At around 23:30, Master B handed over the watchkeeping task to Second Officer B off the north of Hyuudewan in Tokushima Prefecture, and Vessel B continued sailing

by the Maritime Bureau, the Ministry of Land, Infrastructure, Transport and Tourism and published by SEIZANDO-SHOTEN PUBLISHING CO., LTD. in 2008), “steady” means to reduce swing as soon as possible. In this regard, “steady as she goes” means to steer a steady course on the compass heading indicated at the time of the order.

on a course of approximately 112° and at a speed of approximately 10 kn. Master B continued to stay on the bridge to con the vessel through the Naruto Strait after handing over the watchkeeping task.

Approximately 1.2 M northwest of the Onarutokyo Bridge, Master B, while looking for the right time to turn the vessel to starboard toward the narrowest part of the Naruto Strait, sighted the navigation light of Vessel A sailing north-northwest by visual estimation of approximately 2 M off the starboard bow. Around the same time, Master B, after Vessel B passed through the Bisan Seto East Traffic Route, found out that the last of the 4 or 5 vessels that had overtaken Vessel B was sailing approximately 2 M off the bow of Vessel B and that a vessel was sailing 1–2 M off her stern.

Master B assigned Second Officer B to manual steering and coned the vessel himself in the vicinity of the windows on the starboard side of the bridge front. When the light of the Naruto Tobishima Lighthouse was visible on the east of the west side piers of the Onarutokyo Bridge, Master B had the vessel turn to starboard in small increments and changed her course to approximately 160° toward the narrowest part of the Naruto Strait, so that the course was almost at a right angle to the Onarutokyo Bridge. At this moment, Second Officer B sighted the port light of Vessel A.

Since Master B had experience passing through the Naruto Strait many times, he maneuvered the vessel himself by watching with the naked eye the piers of the Onarutokyo Bridge and the light of the Naruto Tobishima Lighthouse.

Second Officer B, before Vessel B passed under the Onarutokyo Bridge, emitted a flashing light once toward Vessel A using a searchlight in order to urge her to turn to starboard. Vessel B passed between the central light and the leftmost light of the Onarutokyo Bridge at a speed of approximately 12.5 kn.

Master B thought Vessel A would turn to starboard and pass Vessel B port to port, since vessels sailing north-northwest toward the bridge usually turned to starboard to keep out of the way of Vessel B after Vessel B passed under the Onarutokyo Bridge.

Master B, while Vessel B was sailing approximately 200–300m south of the Onarutokyo Bridge, as Vessel A did not seem to be turning to starboard, emitted a flashing light once toward Vessel A using a searchlight in order to urge her to turn to starboard as Vessel A was approximately 10–20° off the portside bow with the masthead light and the starboard light on. However, Vessel A did not respond to the flashing light signal, nor did she change her course.

Master B, after first sighting Vessel A, never saw the port light of Vessel A.

Master B, while Vessel B was sailing approximately 500 m south of the Onarutokyo Bridge, saw the risk of collision with Vessel A when Vessel A, with her starboard light on, approached Vessel B at approximately 5–10° and approximately 100–150 m off the portside bow.

Master B, as he was pressed for time, did not emit a flashing light 5 or more times but instead emitted a flashing light 3 times toward Vessel A in order to attract attention, and stopped the engine from the engine remote control board. Although Second Officer B turned the rudder to starboard, the port center part of the hull of Vessel B and the bow of Vessel A collided with each other.

Master B reported the occurrence of the accident to the Japan Coast Guard, escaped Vessel B as it began to tilt portside, and later was rescued by Vessel A with Second Officer B.

When Second Officer B escaped to the sea surface after the collision, he sighted the chief engineer (hereinafter referred to as “Chief Engineer B”) and the chief officer (hereinafter referred to as “Chief Officer B”) floating on the sea surface at a distance of about 10 m.

The date and time when the accident occurred was about 00:11 on March 28, 2010. The position of the occurrence was in the vicinity of 084° 280 m from the Naruto Tobishima Lighthouse.

(Refer to Attached Figure 1. Estimated Route and Attached Figure 2. Estimated Route (Enlarged))

2.2 Injuries to Persons

(1) Vessel B

Chief Officer B was found dead on May 29, 2010 off the coast of Shirahamacho in Wakayama Prefecture, and Chief Engineer B went missing. His name was later removed from the census register based on a death certificate.

Master B was hit in the back very hard due to the impact of the collision and suffered from a broken transverse process of the right lumbar vertebrae.

(2) Vessel A

There were no casualties.

2.3 Damage to Vessels

(1) Vessel A

Vessel A had a dented bow.

(Refer to Picture 1. Condition of Vessel A and Picture 2. Damage condition of Vessel A)

(2) Vessel B

Vessel B suffered a breach in the port center part of the hull and the vessel sank.

2.4 Crew Information

(1) Gender, Age, and Certificate of Competency

Master A Male, 63 years old, Nationality: People's Republic of China

Endorsement attesting the recognition of certificate under STCW regulation

I/10 Master (Issued by the Republic of the Marshall Islands)

Date of revalidation: November 19, 2009

(Valid until September 20, 2010)

Second Officer A Male, 27 years old, Nationality: People's Republic of China

Endorsement attesting the recognition of certificate under STCW regulation

I/10 Second officer (Issued by the Republic of the Marshall Islands)

Date of revalidation: January 15, 2010

(Valid until August 18, 2014)

Master B Male, 48 years old

Fifth grade maritime officer (navigation)

Date of issue: July 29, 1983

Date of revalidation: November 12, 2008

Date of expiry: March 17, 2014

Second Officer B Male, 69 years old

Sixth grade maritime officer (navigation)

Date of issue: June 30, 1992

Date of revalidation: May 31, 2006

Date of expiry: October 2, 2011

(2) Major Seagoing Experience

[1] Master A

The seagoing experience and health of Master A are unknown as it was not possible to obtain any statement from him. According to the statement from Second Officer A, Master A had previously navigated through the Naruto Strait approximately 30 times.

[2] Second Officer A

According to the statement from Second Officer A, he embarked on a vessel for the

first time as a third officer in September 2007, and was promoted to a second officer in September 2009. He embarked on Vessel A on December 3, 2009 as a second officer and became engaged in the navigation between Japan, the People's Republic of China, and the Republic of Korea. He had previously navigated through the Naruto Strait once. He was in good health and did not require corrective lenses.

[3] Master B

According to his statement, Master B embarked on oceangoing vessels for approximately 2 years starting in 1979, large-sized purse seiners for approximately 9 years, tugboats for approximately 18 years, and was in a position of master for approximately 10 years. On January 4, 2010, he embarked on Vessel B as a chief officer and when the accident happened, as the master had disembarked on vacation and he was the deputy master. He had previously navigated through the Naruto Strait approximately 60 times. He was in good health.

[3] Second Officer B

According to his statement, Second Officer B embarked on fishing vessels for approximately 12 years before embarking on domestic vessels for approximately 20 years. At the age of 58, he retired and disembarked from vessels but embarked again after one year. He had no experience as a master or a chief officer. He embarked on Vessel B on February 4, 2010 as a second officer and had never navigated through the Naruto Strait alone. His uncorrected vision is 0.8–1.0, his hearing ability is normal and he is in good health.

2.5 Vessel Information

2.5.1 Particulars of Vessels

(1) Vessel A

IMO Number	: 9546318
Port of registry	: Majuro, Republic of the Marshall Islands
Owner	: SINO HAPPY LIMITED (Republic of the Marshall Islands)
Operator	: DALIAN FIVE RESOURCES SHIPPING CO., LTD. (People's Republic of China)
Class	: CHINA CLASSIFICATION SOCIETY (People's Republic of China)
Gross tonnage	: 2,926 tons
L×B×D	: 84.25m×14.50m×9.30m

Hull material : Steel
Engine : One diesel engine
Output : 1,618 kW
Propulsion : One fixed pitch propeller
Year of construction : March 30, 2009
Crew : 15 crew members (Nationality: People's Republic of China)

(2) Vessel B

Official number : 131739
Port of registry : Etajima City, Hiroshima Prefecture
Owner : ASIA SHIP TRADER CO., LTD.
Operator : CHIDORIKAIUN CO., LTD.
(Hereinafter referred to as "Company A")
Gross tonnage : 199 tons
L×B×D : 57.14 m × 9.80 m × 5.10 m
Hull material : Steel
Engine : One diesel engine
Output : 588 kW
Propulsion : One fixed pitch propeller
Date of launch : January, 1990

(Refer to Attached Figure 3. General Arrangement Plan of Vessel B)

2.5.2 Loading Conditions

(1) Vessel A

According to the statement of Second Officer A, Vessel A was in blast condition. Her bow draft and aft draft leaving the port were 1.8 m and 4.2 m respectively.

(2) Vessel B

According to the statement from Master B, Vessel B was loaded with approximately 60 t of industrial plant material.

2.5.3 Hull Structure and Navigation Instruments

(1) Vessel A

[1] Bridge

On the bridge front, from the starboard side to the portside, a radar, the engine remote control board, and a steering stand and radar (fitted with ARPA) were installed, and the daytime signal light (60 W, 24 V) was fitted on the

front portside.

According to the statement made by Second Officer A, when the accident happened, one of the two radars that was on the starboard side was set at a 6-M range, and the other on the portside that was fitted with ARPA was set at 3 M. The displays of both radars were off-center and the starboard and portside radars were able to display a range of approximately 9 M front and approximately 4.5 M front respectively. The GPS plotter and AIS were both working.

According to the statement from Second Officer A, there was no trouble with or breakdown of the hull, engine or instruments when the accident happened.

[2]Conditions of Navigation Lights

According to the statement from Second Officer A, when the accident happened, the masthead light, the side lights and the stern light were on.

(2) Vessel B

According to the statements of Master B and Second Officer B, the details were as follows.

[1]Bridge

On the bridge front, from the starboard side to the portside, the engine remote control board, steering stand and two radars were installed, and a GPS plotter was on the starboard side front. On the bridge back were a switchboard, a VHF, a telephone, and a chart table.

When the accident happened, one of the two radars was set to 1.5-M range. The radar display was off-center and it was able to display a range of approximately 2 M front. The GPS plotter was working.

There was no trouble with or breakdown of the hull, engine or instruments when the accident happened.

[2]Conditions of Navigation Lights

When the accident happened, the masthead light, the side lights and the stern light were on.

2.5.4 Sound Signals and Flashing Light Signals

(1) Vessel A

According to the statements from Second Officer A and Quartermaster A, the details were as follows.

Second Officer A, in response to the flashing light signals from Vessel B, emitted a flashing light once toward Vessel A.

Master A did not send out any sound signals (such as whistles) to Vessel B, nor did he hear any sound signals (such as whistle) from Vessel B.

(2) Vessel B

According to the statements of Master B and Second Officer B, the details were as follows.

Although Master B and Second Officer B emitted flashing light signals, they did not send out any sound signals (such as whistles) to Vessel A, nor did they hear any sound signals (such as whistles) from Vessel A.

2.5.5 Information on Maneuvering Signals and Warning Signals

According to the Act on Preventing Collision at Sea, it was as follows.

Article 34 When vessels are in sight of one another, a power-driven vessel which is underway must change her course in accordance with the provision of this Act, or when her engine is set astern, must give out whistle signals in accordance with the items below.

(1) A short blast on the whistle when a power-driven vessel is altering her course to starboard.

(2) (Omitted)

(3) 3 short blasts on the whistle when a power-driven vessel is operating astern propulsion.

2 A power-driven vessel which is underway, when she must give out whistle signals in accordance with the provision of the previous item, may give out flashing light signals in accordance with the following items. (Omitted)

(1) When she is turning her course to starboard, emit a flashing light once.

(2) When she is turning her course to port, emit a flashing light twice.

(3) When her engine is set astern, emit a flashing light three times.

3 - 4 (Omitted)

5 When vessels in sight of one another are approaching and either vessel fails to understand the intention or actions of the other or is in doubt as to whether sufficient action is being taken by the other to avoid collision, she must give out whistle signals by giving five or more short and rapid blasts on the whistle. In this case, the vessel giving out the whistle signals may give out flashing light signals by rapidly emitting a flashing light five times or more.

2.5.6 Information on Communication etc.

According to the statements from Second Officer A, Quartermaster A and Master B, the details were as follows.

(1) Vessel A

Second Officer A, although he was listening to channel 16 on the international VHF radiotelephone equipment (hereinafter referred to as “VHF”), did not communicate via VHF with Vessel B prior to the accident as he did not know the name of Vessel B nor did he speak Japanese.

(2) Vessel B

Although the vessel was listening to VHF channel 16, it did not communicate with Vessel A via VHF prior to the accident.

2.6 Weather and Sea Conditions

2.6.1 Weather Data

The recorded data and figures on the weather observation at Nandan Local Meteorological Observatory, which is located about 6.5 km east of the site of the accident, were as follows.

00:10 Wind Direction: Northeast, Wind Speed: 0.8 m/s, Temperature: 5.2 degrees C

00:20 Wind Direction: Northeast, Wind Speed: 0.5 m/s, Temperature: 5.2 degrees C

The recorded data and figures on the weather observation at Tokushima Local Meteorological Observatory, which is located about 19.7 km south-southwest of the site of the accident, were as follows.

00:10 Wind Direction: South-southwest, Wind Speed: 0.9 m/s, Temperature: 7.9 degrees C

00:20 Wind Direction: Southwest, Wind Speed: 0.3 m/s, Temperature: 7.8 degrees C

The temperature of seawater which was pumped up at Naruto Building of the Fisheries Research Institute of the Tokushima Agriculture, Forestry, and Fisheries Technology Support Center located about 6 km west-southwest of the site of the accident, was 9.8 degrees C.

2.6.2 Tides and Tidal Currents

According to Tide Tables issued by Japan Coast Guard and 5th Coast Guard Regional Headquarters, the details were as follows.

(1) Tides

The tide was just beginning to come in at Fukura Port in Minamiawagi City,

Hyogo Prefecture, which is located approximately 4.9 km east-northeast of the site of the accident, when the accident occurred.

(2) Tidal Currents

In the vicinity of the site of the accident (the narrowest point of the Naruto Strait), the flow of the south-going current reached the strongest at 22:29 on the 27th. The speed of the current was 8.4 kn and the tide turned at 01:33 on the 28th.

At around 00:12, the speed of a tidal current immediately beneath the Onarutokyo Bridge was about 6.8 kn.

2.6.3 Observations by the Crew

(1) According to the statement from Second Officer A, the weather was fair and the wind was calm.

(2) According to the statements from Master B and Second Officer B, there was practically no wind or tide, visibility was good, and the speed of the tidal current in the vicinity of the site of the accident was about 3–4 kn.

2.7 Information on the Sea Area Where the Accident Occurred

2.7.1 Passage and Method of Passage etc.

According to the Sailing Directions for Seto Naikai published by the Japan Coast Guard (hereinafter referred to as “the Sailing Directions”), the details are as follows.

Naruto Kaikyo, diverging from the traffic route of Kii Suido, is the shortest route leading to the central part of Seto Naikai, providing an important route for small vessels. Cautions must be taken in passing since it is narrow, the tidal stream is very strong, the current direction is complicated and many head-on vessels sail here. It is particularly advisable for large vessels or vessels unacquainted with this area to not take this route. There is always a N-going and S-going current, each occurring twice a day. The maximum flow reaches 11 kn for the N-going current and 10 kn for the S-going current respectively. The area with the strongest tidal current is northward from the line connecting To Saki to Tobi Shima for the N-going current, and southward from the line connecting from Mago Saki to To Saki for the S-going current. The tidal current abruptly increases in velocity once it passes these lines with a breadth reaching about 1 km. the velocity of the strong current sometimes reaches 3kn for the N-going current and even higher than 3 kn for the S-going current about 2 hours after the turn of tidal current. When approaching the Naruto Strait, vessels should get a view of the channel from a distance of more than 1 M, confirm the main stream and other passing vessels, and sail toward the direction of 336° when going North and toward the

direction of 156° when going South, aiming for the Onarutokyo Bridge sign.

(Refer to Attached Figure 4. Estimated Routes of Two Vessels and the Method of Passage specified in the Sailing Directions)

2.7.2 Geography around the Naruto Strait

According to the Chart W112, the details are as follows.

The narrowest part of the Naruto Strait is between Hadakajima Island in Naruto City, which is located approximately 250 m south-southeast of Mago Saki and Kado Saki in Minamiawaji City. The Onarutokyo Bridge is located over the narrowest part. In the vicinity of both ends of the narrowest part, there are shallow areas and the width of the passage between these shallow areas is approximately 450–550 m. Tobi Shima Island in Naruto City is located approximately 600 m south of the Onarutokyo Bridge. Hitotsu Bae (rock above water) in Minamiawaji City is located approximately 250 m south of the Onarutokyo Bridge.

2.8 Information on Search and Rescue

(1) Vessel A

According to the statements of Second Officer A and the crew member of Vessel A, the details were as follows.

[1] Master A supervised the rescue operation on the starboard wing.

[2] The crew member of Vessel A conducted the rescue operation on board the vessel using lifebuoys, ropes, and similar equipment.

[3] As one of the two crew members of Vessel B whom Vessel A was trying to rescue was unconscious, on the order of Master A, one crew member of Vessel A jumped into the sea, tied a rope around the body of the unconscious crew member, and rescued him.

(2) Vessel B

According to the statements of Master B and Second Officer B, the details were as follows.

[1] Master B escaped from Vessel B immediately before she sank, and after coming up to the sea surface, once again submerged in seawater. When he came up to the sea surface once again, he saw Second Officer B approximately 1 m to the left and the starboard bow shell of Vessel A to his immediate right. Master B was drifted toward Vessel A on the tide.

[2] Master B grabbed the lifebuoy and the rope dropped down from Vessel A with

Second Officer B.

- [3] Master B, while trying to tie the rope around his body, could not tie the rope tight as he had no strength in his hands because of the cold. He tied the rope around his right arm 2 or 3 times and was pulled up by Vessel A before Second Officer B was rescued.
- [4] Master B was transferred by a Japan Coast Guard helicopter, as he hit his back very hard and was unable to walk.
- [5] Second Officer B, after escaping from Vessel B, saw Chief Engineer B and Chief Officer B on the sea surface at a distance of about 10m.
- [6] Second Officer B drifted on the tide and was struggling not to be drawn toward the bottom of Vessel A in the vicinity of the starboard bow of Vessel A, when a board of 10–15 m in length came floating toward him and he grabbed it.
- [7] After Master B was pulled up, Second Officer B attached the lifebuoy that had been dropped and was being pulled up when he dropped from the opening of the lifebuoy, since his body was not tied to the lifebuoy with a rope. The Second Officer B then attached the lifebuoy, dropped it again, and grabbed a ratline. After that he had no memory, and when he regained consciousness, he was on board Vessel A.

(3) Japan Coast Guard

According to the Japan Coast Guard, the details of the search and rescue operation of the accident were as follows.

Although the Japan Coast Guard conducted the rescue operation by mobilizing 11 patrol boats and 6 airplanes on the 28th and 9 patrol boats and 5 airplanes on the 29th, it was unable to find the 2 persons who were missing.

On May 29th, a drifting body was found off Shirahamacho, Wakayama Prefecture. Results on DNA testing confirmed that the body was of Chief Officer B.

3 ANALYSIS

3.1 Situation of the Accident Occurrence

3.1.1 Events Leading to the Accident

Judging from 2.1 and 2.6.2, the process leading to the accident was as follows.

(1) Vessel A

- [1] It is highly probable that Vessel A, at around 23:54:52 on the 27th, was sailing in the vicinity of 3.2 M south-southeast of the Onarutokyo Bridge with a heading of

338°, a course of 339.6°, and a speed of 10.5 kn.

[2] It is highly probable that Vessel A, during the period between 00:06:53 and 00:09:53 on the 28th, was sailing approximately 0.5–1.1 M south-southeast of the Onarutokyo Bridge with a heading of 329–331°, a course of 322.1–326.0°, and a speed of 10.4–11.1 kn. It is also probable that during this period, since the course of Vessel A was 4–9° west of her heading, Vessel A was under the influence of the south tide current and was sailing with a course heading more toward the west than the center of the Onarutokyo Bridge.

[3] It is highly probable that Vessel A, during the period between 00:9:53 and 00:10:29, changed her heading from 331° to 318°.

[4] It is highly probable that Vessel A changed her heading from 318° to 336° during the period between 00:10:29 and 00:10:50.

[5] It is highly probable that Vessel A, during the period between 00:10:50 and 00:11:00, was sailing with a heading of 336–345°, a course of 273.7–304.7°, and a speed of 2.6–7.7 kn.

[6] It is probable that at around 00:11, the bow of Vessel A and the port center part of the hull of Vessel B collided with each other almost at a right angle.

(2) Vessel B

[1] It is probable that Vessel B, when the lamp light of the Naruto Tobi Shima Lighthouse was visible on the east of the west side piers of the Onarutokyo Bridge, turned to starboard and changed her course to approximately 160° toward the narrowest part of the Naruto Strait so that her course was almost at a right angle to the Onarutokyo Bridge.

[2] It is probable that Vessel B passed between the central light and the leftmost light of the Onarutokyo Bridge at a speed of approximately 12.5 kn.

[3] It is probable that although Vessel B stopped the engine and turned the rudder to hard starboard when Vessel A was at approximately 5–10° and approximately 100–150 m off the portside bow, the port center part of the hull of Vessel B and the bow of Vessel A collided with each other.

3.1.2 Date & Time and Location of the Accident

Judging from 2.1, the details were as follows.

According to the statement from Second Officer A and judging from the AIS Record of Vessel A showing that the speed of Vessel A changed from 7.7 kn to 2.6 kn during the period between 00:10:50 and 00:11:00 on the 28th, it is probable that the date and time when the

accident occurred were about 00:11, March 28, 2010, and that the position of the occurrence was in the vicinity of 084° and 280 m from the Naruto Tobi Shima Lighthouse.

3.2 Causal Factors of the Accident

3.2.1 Conditions of Crew and Vessels

(1) Crew

Judging from 2.4, the details were as follows.

[1] Master A and Second Officer A were both in possession of legal and valid endorsements attesting the recognition of certificate under STCW regulation I/10. It is probable that Second Officer A was in good physical health when the accident happened.

[2] Master B was in possession of a legal and valid seamen's competency certificate. Master B had experienced navigation in the vicinity of the site of the accident over 60 times, and it is probable that Master B was in good physical health when the accident happened.

[3] Second Officer B was in possession of a legal and valid seamen's competency certificate. It is probable that Second Officer B was in good physical health when the accident happened.

(2) Vessels

From 2.5.3, it is probable that at the time of the accident, there was no malfunction or failure in the hulls, engines or other equipment of Vessel A and Vessel B.

3.2.2 Lookout and Maneuvering Conditions

From 2.1 and 3.1.1, it is probable that the lookout and maneuvering conditions were as follows.

(1) Vessel A

[1] Second Officer A, while Vessel A was sailing approximately 3 M south of the Onarutokyo Bridge, using a radar fitted with ARPA device, recognized radar images of Vessel B and one other vessel approximately 5 M off the bow sailing southeast from the north of the Onarutokyo Bridge.

[2] When Second Officer A sighted the port light of Vessel B at approximately 15–20° and approximately 1 M off the starboard bow, Vessel B emitted a flashing light once toward Vessel A and Master A ordered Second Officer A to emit a flashing light once. Second Officer A emitted a flashing light once toward Vessel B and at

the same time, Master A ordered Quartermaster A to turn the rudder to starboard 20°, and then ordered “steady”.

[3] Vessel A, between 00:06:53 and 00:09:53, was sailing approximately 0.5–1.1 M south-southeast of the Onarutokyo Bridge with the heading of 329–331°. Therefore, the steering described in [2] above had no effect on turning to starboard. During this time, Vessel A was under the influence of the south tide current and was sailing on a course heading more toward the west than toward the center of the Onarutokyo Bridge.

[4] Although it is probable that Vessel A was sailing on a course heading more toward the west than toward the center of the Onarutokyo Bridge compared to the method of passage specified in the Sailing Directions, approaching Vessel B at a collision course, and continued sailing without changing her course until approximately 1 minute before the collision with Vessel B, it was not possible to determine the reason for this as no information could be obtained from Master A.

[5] Master A, since Vessel B emitted a flashing light twice, and again emitted that same flashing light signal when the distance to Vessel B was approximately 0.4 M, ordered Quartermaster A to turn the rudder to port 20°. However, although it is somewhat likely that Master A saw a flashing light emitted from a searchlight when Vessel B was passing through the Onarutokyo Bridge, since there is no information on this signal made by Vessel B, it is not possible to determine what Master A saw.

[6] Master A, as Vessel B off the bow started turning to starboard when the rudder angle was approximately 15°, ordered that the rudder be turned to starboard 20° and the engine shifted to neutral and then to full astern.

(2) Vessel B

[1] While Vessel B was sailing approximately 1.2 M northwest of the Onarutokyo Bridge, Master B, approximately 2 M off the starboard bow, sighted the navigation light of Vessel A sailing north-northwest.

[2] Master B assigned Second Officer B to manual steering and conned the vessel himself in the vicinity of the windows on the starboard side of the bridge front. When the light of the Naruto Tobi Shima Lighthouse was visible on the east of the west side piers of the Onarutokyo Bridge, Master B had the vessel turn to starboard and changed her course to approximately 160° so that the course was almost at a right angle to the Onarutokyo Bridge.

[3] Second Officer B, before Vessel B passed under the Onarutokyo Bridge, emitted a

flashing light once toward Vessel A in order to urge her to turn to starboard.

[4] Master B thought Vessel A would turn to starboard and pass Vessel B port to port because vessels sailing north-northwest toward the Onarutokyo Bridge usually turned to starboard to keep out of the way of Vessel B after Vessel B passed under the bridge.

[5] Master B, while Vessel B was sailing approximately 200–300m south of the Onarutokyo Bridge, when he sighted the masthead light and the starboard light of Vessel A in the direction of approximately 10–20° off the portside bow, emitted a flashing light once toward Vessel A in order to urge her to turn to starboard.

[6] Master B, while Vessel B was sailing approximately 500 m south of the Onarutokyo Bridge, saw the risk of collision with Vessel A when he sighted Vessel A with the masthead light and the starboard light upon approaching the immediate vicinity of Vessel B on the portside bow. Master B emitted a flashing light three times toward Vessel A in order to attract attention and stopped the engine. Second Officer B put the rudder to starboard.

3.2.3 Maneuvering Signals and Warning Signals

Judging from 2.1.2, 2.5.4, 2.5.5 and 3.2.2, the details were as follows.

- (1) Master A, when Vessel B emitted a flashing light once toward Vessel A, ordered Second Officer A to emit a flashing light once toward Vessel B and to put the rudder to starboard 20°. Therefore, it is probable that these maneuvering signals of Vessel A were employed in order to show the intention or motion of turning the course to starboard. However, as detailed in 3.2.2(1) [3] above, the steering had no effect in producing a starboard turn.
- (2) Although it is probable that before passing under the Onarutokyo Bridge, Second Officer B emitted a flashing light once toward Vessel A in order to urge her to turn to starboard, it is somewhat likely that if Second Officer B had given Vessel A signals to attract attention, Second Officer B could have attracted Vessel A's attention to Vessel B.
- (3) It is probable that when Master B saw the risk of collision with Vessel A, although he emitted a flashing light three times in order to attract attention since he was pressed for time, as a flashing light is supposed to be given more than 5 times as a warning signal, Vessel A did not understand that Master B was sending a warning signal to Vessel A.

3.2.4 Weather and Sea Conditions

Based on the information in 2.6, it is probable that in the region where the accident took place at the time of the accident, the weather was calm, visibility was good, and tidal current directly beneath the Onarutokyo Bridge was approximately 6.8 kn in the southern direction.

3.3 Analysis of the Accident Occurrence

Judging from 2.1, 2.5.6 and 3.2.2, the details were as follows.

(1) Vessel A

[1] It is probable that Vessel A, while sailing in the south of the Naruto Strait toward the strait, between 00:08:12 and 00:09:53 on the 28th, approximately 0.5–0.7 M south-southeast of the Onarutokyo Bridge, as she was under the influence of south tidal current, was sailing with a course heading more toward the west than the center of the Onarutokyo Bridge, and was therefore not in accordance with the method specified in the Sailing Directions.

[2] Although it is probable that Vessel A was sailing with a course heading more toward the west than the center of the Onarutokyo Bridge, approaching Vessel B on a collision course, and continued sailing without changing her course until approximately 1 minute before the collision with Vessel B, since no information could be obtained from Master A, it is not possible to determine the reason for this.

[3] It is probable that Vessel A, although listening to VHF channel 16, was not in communication with Vessel B prior to the accident.

[4] It is probable that Master A, approximately 1 minute before the collision, ordered Quartermaster A to put the rudder to port 20°, and when Vessel B on the bow started turning to starboard, ordered that the rudder be put to starboard 20°, the engine shifted to neutral and then to full astern.

[5] It is probable that at around 00:11, the bow of Vessel A and the port center part of the hull of Vessel B collided with each other almost at a right angle.

(2) Vessel B

[1] It is probable that Master B, while Vessel B was sailing south-southeast after passing the Onarutokyo Bridge in the Naruto Strait, thought Vessel A would turn to starboard and pass Vessel B port to port, and therefore navigated the vessel without changing her course and speed, since vessels sailing north-northwest toward the Onarutokyo Bridge usually turned to starboard to keep out of the way of Vessel B after Vessel B passed under the bridge.

[2] It is probable that Second Officer B, before passing under the Onarutokyo Bridge, emitted a flashing light once toward Vessel A in order to urge her to turn to starboard.

[3] It is probable that Vessel B, although listening to VHF channel 16, was not in communication with Vessel A prior to the accident.

[4] It is probable that although Master B stopped the engine and put the rudder to hard starboard when he sighted Vessel A at a short distance from the portside bow, the port center part of the hull of Vessel B and the bow of Vessel A collided with each other.

3.4 Analysis of Rescue Effort and Damage Mitigation Measures

Judging from 2.1 and 2.8, the details were as follows.

It is somewhat likely that all the crew members of Vessel B would have been rescued had they worn lifejackets, since Vessel A started rescue operations immediately after the occurrence of the accident.

4 CONCLUSIONS

4.1 Probable Causes

It is probable that the accident occurred because, at night, in the south of the Naruto Strait, while Vessel A was sailing north-northwest toward the strait and Vessel B was sailing south-southeast in the south of the Naruto Strait after passing underneath the Onarutokyo Bridge, even though the two vessels were approaching each other on a collision course, they continued sailing without changing their course and speed until they collided with each other.

It is probable that the reason Vessel B continued sailing without changing her course and speed was because Master B thought Vessel A would turn to starboard and pass Vessel B port to port, since vessels sailing north-northwest toward the Onarutokyo Bridge usually turned to starboard to keep out of the way of Vessel B after Vessel B passed under the bridge.

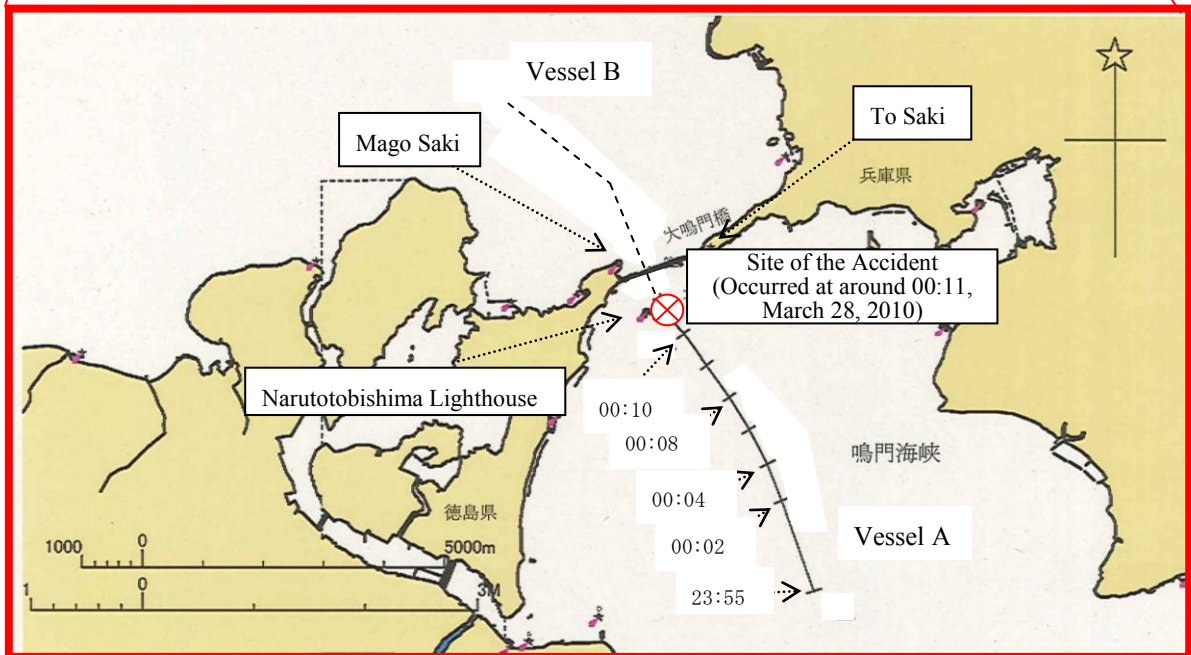
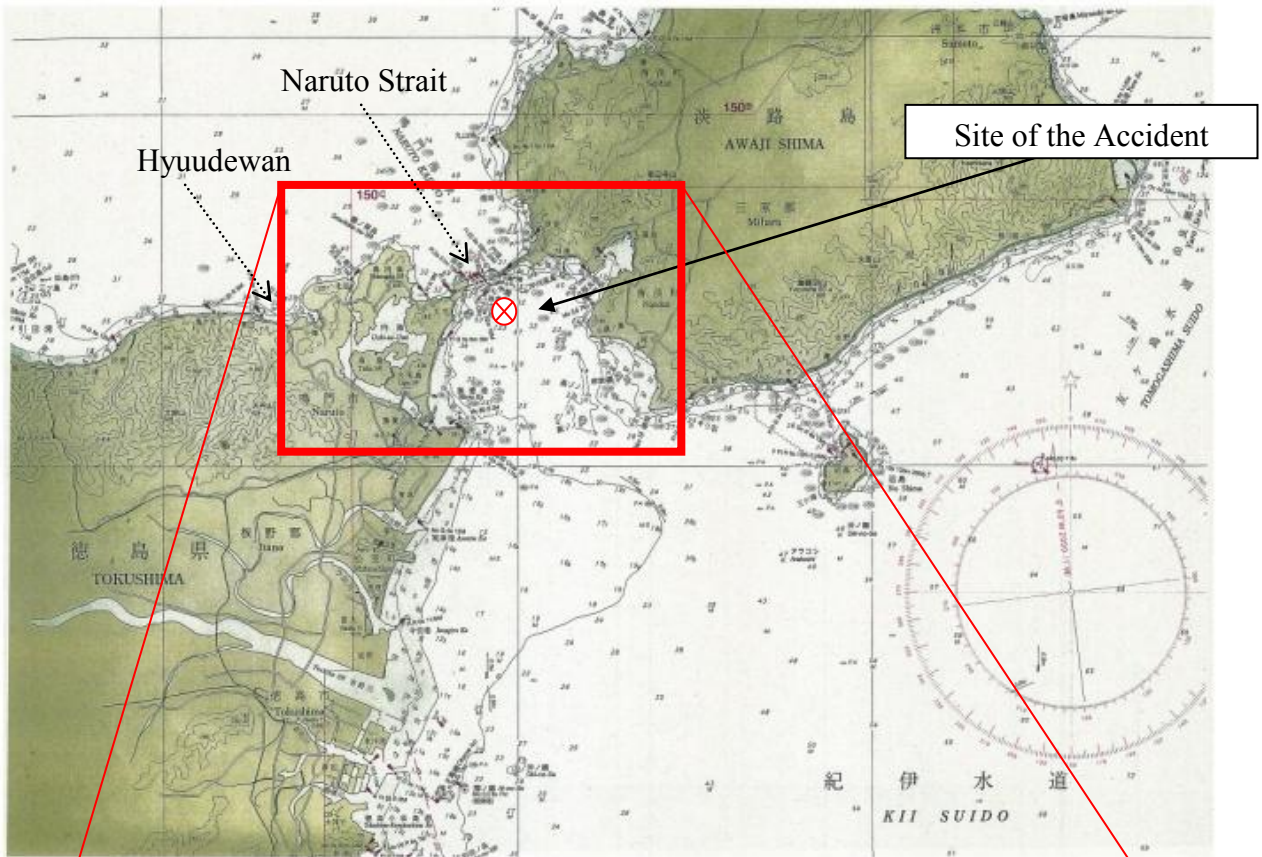
4.2 Other Safety Information that Came to Light

- (1) It is probable that unlike the navigation method specified in the Sailing Directions, Vessel A, under the influence of the south tide current, was sailing on a course heading more toward the west (portside) than toward the center of the Onarutokyo Bridge. It is

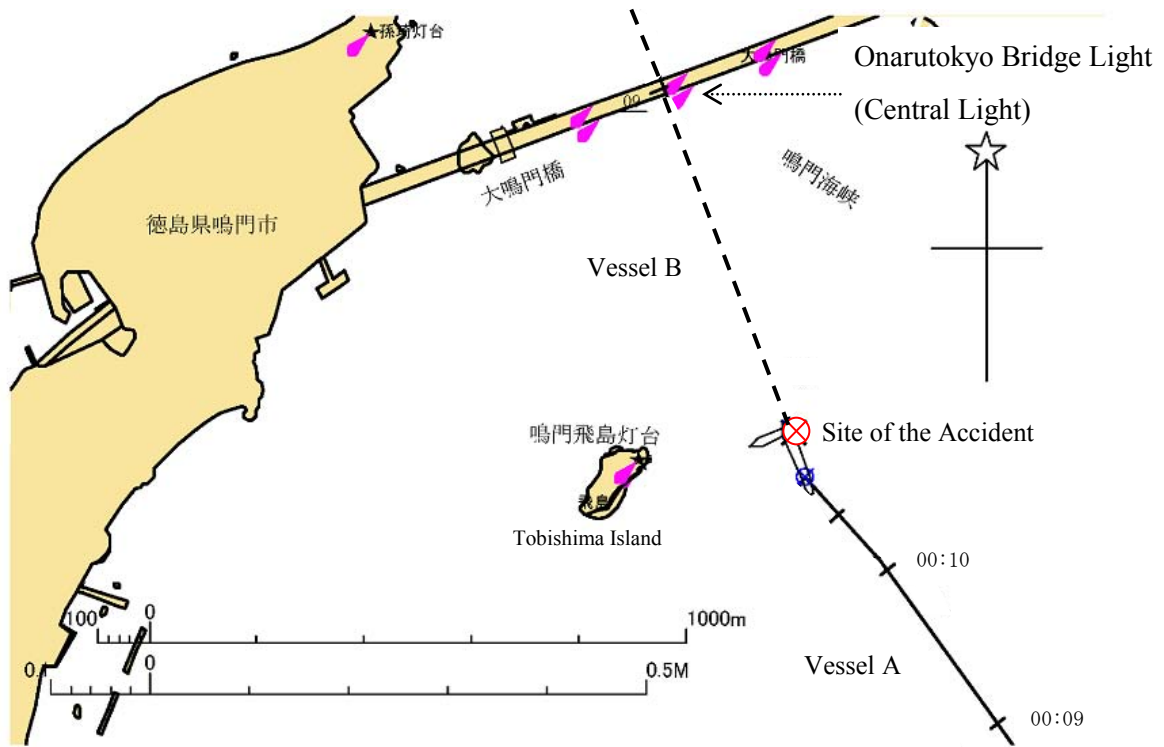
probable that had Vessel A sailed the starboard edge of the narrow sea area in the Naruto Strait (more toward the east than the center of the Onarutokyo Bridge) using the navigation method specified in the Sailing Directions to the extent that it was safe and practical, the accident could have been avoided.

- (2) Before passing under the Onarutokyo Bridge, Vessel B emitted a flashing light toward Vessel A once in order to urge her to give way to Vessel B. However, this signal is used when a vessel is turning her course to starboard, and it is somewhat likely that Vessel B could have attracted the attention of Vessel A to Vessel B if Vessel B had given out signals to attract attention.

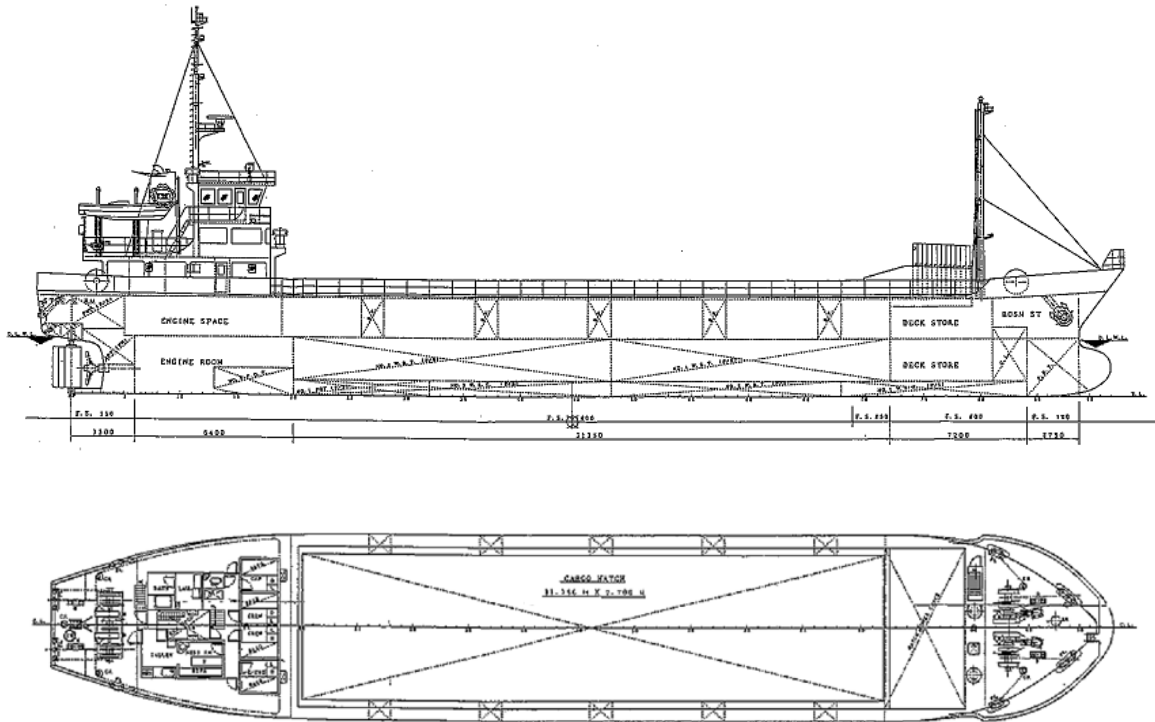
Attached figure 1 Estimated Route



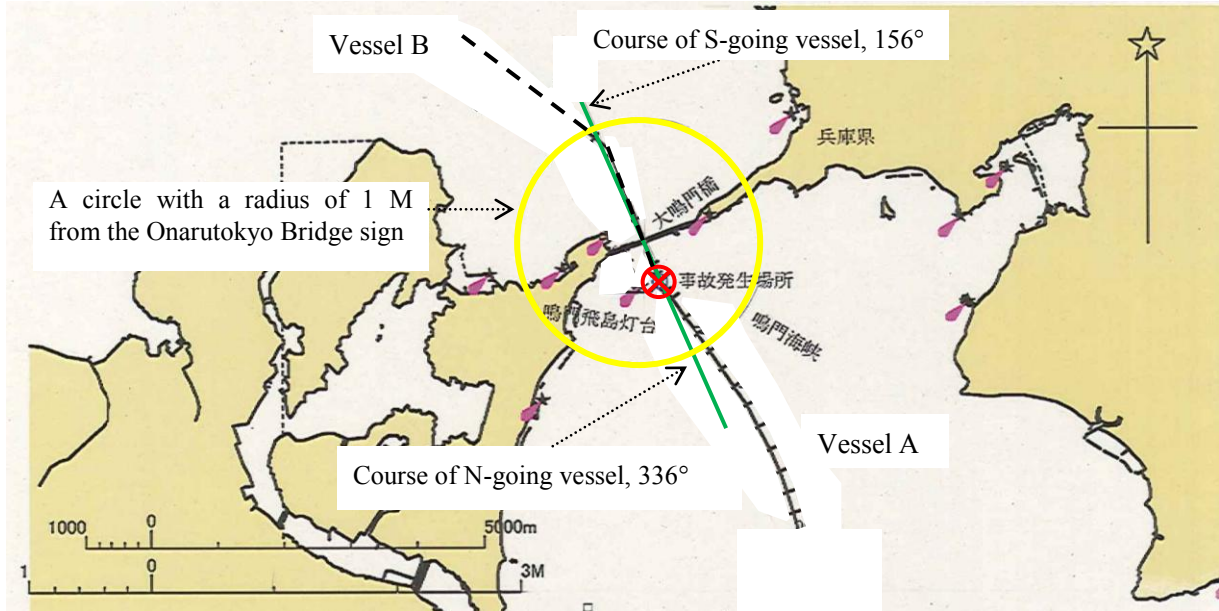
Attached Figure 2 Estimated Route (Enlarged)



Attached Figure 3 General Arrangement Plan of Vessel B



Attached Figure 4 Estimated Routes of Two Vessels and the Method of Passage specified in the Sailing Directions



Attached Table 1 AIS Record of Vessel A

Time (H:M:S)	Vessel Position		Course over the ground (°) (True bearing)	Heading (°) (True bearing)	Speed over the ground (kn)
	Degrees North (Latitude) (°-'-")	Degrees East (Longitude) (°-'-")			
23:54:52	34-11-20.9	134-40-42.1	339.6	338	10.5
23:57:01	34-11-42.3	134-40-32.8	342.1	338	10.7
00:00:02	34-12-12.9	134-40-20.5	342.1	335	10.8
00:00:53	34-12-22.0	134-40-17.0	341.2	336	11.4
00:01:53	34-12-33.0	134-40-11.6	333.7	330	11.8
00:03:02	34-12-45.5	134-40-04.1	333.0	330	12.2
00:04:02	34-12-56.0	134-39-57.2	329.6	329	11.6
00:04:53	34-13-03.9	134-39-50.9	325.7	329	10.9
00:06:02	34-13-14.1	134-39-42.7	326.6	331	10.5
00:06:53	34-13-21.5	134-39-36.8	326.0	330	10.5
00:08:12	34-13-32.4	134-39-27.1	323.4	330	10.4
00:09:01	34-13-39.6	134-39-20.6	323.5	329	11.1
00:09:53	34-13-47.6	134-39-13.8	322.1	331	11.1
00:10:29	34-13-52.2	134-39-09.7	324.3	318	8.3
00:10:50	34-13-53.6	134-39-07.1	304.7	336	7.7
00:11:00	34-13-53.4	134-39-06.6	273.7	345	2.6
00:11:16	34-13-53.1	134-39-06.3	210.9	358	1.5
00:11:35	34-13-52.5	134-39-07.0	138.6	001	2.5
00:12:01	34-13-51.4	134-39-08.4	134.8	354	3.7

(Note) Vessel position (latitude and longitude) refers to the position of the GPS antenna of Vessel A.

Picture 1 Condition of Vessel A



Picture 2 Damage Condition of Vessel A



Dents and scratches