

MA2015-10

**MARINE ACCIDENT
INVESTIGATION REPORT**

October 29, 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:	Container ship, WAN HAI 162
IMO number:	9132909
Gross tonnage	13,246 tons
Vessel type and name	Fishing vessel, SEINAN MARU No.7
Fishing vessel registration number:	OS2-1480
Gross tonnage:	9.7 tons
Vessel type and name:	Fishing vessel, SEINAN MARU No.8
Fishing vessel registration number:	OS2-1730
Gross tonnage:	9.7 tons
Accident type:	Collision
Date and time:	About 5:59am, February 25, 2013
Location:	Off the west coast of Kansai International Airport Approximately 2.7 nautical miles in approximately 274° from Kansai International Airport Offing Light Beacon A, Osaka Prefecture (Approximate position: 34°25.9' North, 135°08.3' East)

October 8, 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 container ship WAN HAI 162, with a master and twenty other crews onboard, sailing northeast toward the Osaka section of Hanshin Port under the pilotage of a pilot, and the fishing vessels SEINAN MARU No.7 and SEINAN MARU No.8, both with a master and one other crew onboard, tied together by wire ropes at bow and middle of the hull, starboard side of SEINAN MARU No.7 alongside of the port side of SEINAN MARU No.8, sailing north toward fishing grounds, collided each other at about 05:59 on February 25, 2013, off the coast to the west of Kansai International Airport.

The master of SEINAN MARU No.7 was killed and the vessel had a hole in the stern part of the vessel. Crew of SEINAN MARU No.8 was killed and the stern part of the vessel was torn apart.

The WAN HAI 162 suffered scratches on the fore part of the vessel, but no one was injured.

< Probable Causes >

It is probable that the accident occurred while both WAN HAI 162 was sailing northeast under the pilotage of a pilot and 'SEINAN MARU No.7 tied together with SEINAN MARU No.8 by wire ropes at bow and middle of the hull, starboard side of SEINAN MARU No.7 alongside of the port side of SEINAN MARU No.8' (hereinafter referred to as "Vessels S") was sailing north, both WAN HAI 162 and Vessels S sailed maintaining their courses and speeds until coming close to each other, at night off the west coast of Kansai International Airport.

It is probable that WAN HAI 162 maintained its course and speed until coming close to Vessels S because the pilot thought that changing course or speed would bring WAN HAI 162 close to the surrounding fishing vessels, and the pilot was unable to decide on the way to avoid a collision with Vessels S.

It is somewhat likely that Vessels S maintained its course and speed until coming close to WAN HAI 162 because, although the master of SEINAN MARU No.7 noticed WAN HAI 162 and steered SEINAN MARU No.7 to starboard and talked to SEINAN MARU No.8 over the radio, the master of SEINAN MARU No.8 did not notice the approach of WAN HAI 162 nor the radio communication from the master of SEINAN MARU No.7, the master of SEINAN MARU No.8 was concentrated on maintaining SEINAN MARU No.8's heading toward the north as instructed by the master of SEINAN MARU No.11, and was steering to port in order to maintain the north bearing by counteracting the effect of SEINAN MARU No.7 being steered to the starboard.

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

The container ship WAN HAI 162, with a master and twenty other crews onboard, sailing northeast toward the Osaka section of Hanshin Port under the pilotage of a pilot, and the fishing vessels SEINAN MARU No.7 and SEINAN MARU No.8, both with a master and one other crew onboard, tied together by wire ropes at bow and middle of the hull, starboard side of SEINAN MARU No.7 alongside of the port side of SEINAN MARU No.8, sailing north toward fishing grounds, collided each other at about 05:59 on February 25, 2013, off the coast to the west of Kansai International Airport.

The master of SEINAN MARU No.7 was killed and the vessel had a hole in the stern part of the vessel. Crew of SEINAN MARU No.8 was killed and the stern part of the vessel was torn apart.

The WAN HAI 162 suffered scratches on the fore part of the vessel, but no one was injured.

1.2 Outline of the Accident Investigation

1.2.1 Setup of the Investigation

On February 25, 2013, the Japan Transport Safety Board appointed an investigator-in-charge and two other maritime accident investigators to carry out the investigation on this accident.

1.2.2 Collection of Evidence

February 26, 27, and 28, 2013, October 7 and 8, 2014: On-site investigation and interviews

March 8, 2013, March 24, August 29, September 11, 17, 18, and 26, October 14, 15, 16, 29, and 30, November 21 and 25, 2014: Collection of questionnaire

March 10 and 15, May 17, November 8, 2013, September 19, October 1 and 2, November 5, December 15, 2014, March 24, 2015: Interviews

September 22, 2014 and May 9, 2015: Interviews and collection of questionnaire

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.

2 FACTUAL INFORMATION

2.1 Events Leading to the Accident

2.1.1 The navigational track of the WAN HAI 162 according to the Automatic Identification System

According to the ‘records of Automatic Identification System*¹ (AIS) data’ (hereinafter referred to as “AIS records”) of the WAN HAI 162 (hereinafter referred to as “Vessel A”) recorded by a private data company, Vessel A’s navigational track from 05:21:04 to 06:05:00 on February 25, 2013 were as indicated in Table 2.1-1.

The vessel position indicates the position of the GPS antenna installed above the bridge, and the courses over ground and headings are indicated in true bearings (this applies hereinafter), and the speed indicates speed over ground (this applies hereinafter). The AIS transmits the course over ground in values to the first decimal point (0.0° to 359.9°) and transmits the heading in whole number values (0° to 359°).

Table 2.1-1 AIS Records (Excerpt)

Time (hour:min:sec)	Vessel position		Course over Ground (°)	Heading (°)	Speed (Knots (kn))
	North latitude (°-'-")	East longitude (°-'-")			
05 : 21 : 04	34-18-21.3	135-00-03.6	042.7	043	15.6
05 : 25 : 04	34-19-06.7	135-00-56.7	043.7	043	15.6
05 : 35 : 04	34-21-02.1	135-03-05.8	042.6	043	16.0
05 : 45 : 04	34-23-02.3	135-05-16.3	041.2	043	16.3
05 : 54 : 57	34-25-03.1	135-07-24.6	041.6	043	16.1
05 : 55 : 56	34-25-14.8	135-07-36.8	041.6	043	16.1
05 : 57 : 05	34-25-28.7	135-07-51.9	041.7	043	16.2
05 : 57 : 57	34-25-39.3	135-08-03.4	041.4	043	16.2
05 : 58 : 40	34-25-48.1	135-08-12.8	041.5	043	16.1
05 : 58 : 46	34-25-49.3	135-08-14.1	041.6	043	16.1
05 : 58 : 51	34-25-50.3	135-08-15.1	041.3	044	16.1
05 : 58 : 57	34-25-51.5	135-08-16.3	039.1	047	16.1

*1 “AIS” (Automatic Identification System) is a device that can automatically transmit and receive information such as vessel identification codes, ship types, names, positions, and courses, and exchange information with other vessels or land based navigation aid.

05 : 59 : 03	34-25-52.8	135-08-17.5	038.0	051	15.9
05 : 59 : 07	34-25-53.7	135-08-18.2	039.5	055	15.8
05 : 59 : 10	34-25-54.2	135-08-18.9	040.9	058	15.7
05 : 59 : 12	34-25-54.5	135-08-19.3	042.3	060	15.7
05 : 59 : 14	34-25-54.9	135-08-19.7	044.1	061	15.6
05 : 59 : 16	34-25-55.3	135-08-20.2	046.6	064	15.4
05 : 59 : 18	34-25-55.6	135-08-20.7	049.4	065	15.2
05 : 59 : 24	34-25-56.4	135-08-22.3	055.5	069	14.9
05 : 59 : 29	34-25-57.1	135-08-23.5	058.3	072	14.7
05 : 59 : 34	34-25-57.6	135-08-24.8	062.3	075	14.6
05 : 59 : 59	34-25-59.7	135-08-31.5	078.3	083	13.9
06 : 00 : 05	34-25-59.9	135-08-33.2	081.2	081	13.8
06 : 05 : 00	34-26-07.4	135-09-29.7	145.6	172	4.9

2.1.2 Positional Information of SEINAN MARU No.7 and SEINAN MARU No.8 Obtained from Radar Images

According to recorded radar images (hereinafter referred to as “Radar Image 1”) and recorded radar images overlaid on electronic navigational charts (hereinafter referred to as “Radar Image 2”) obtained by the Osaka-Bay Ship’s Navigation Support Council*², the positions from about 05:38:04 to about 05:57:57 of ‘SEINAN MARU No.7 (hereinafter referred to as “Vessel B”) tied together with SEINAN MARU No.8 (hereinafter referred to as “Vessel C”) by wire ropes at bow and middle of the hull, starboard side of Vessel B alongside of the port side of Vessel C’ (Vessels S) were as indicated in Table 2.1-2.

*² “The Osaka-Bay Ship’s Navigation Support Council” is an organization which consists of associations and companies related to shipping, ports and harbors, and fisheries, aiming to contribute to a better traffic environment for vessels in Osaka Bay and it offers AIS and radar picture information of the whole area of the Osaka Bay and other information on its website.

Table 2.1-2 Position Information on Radar Image 1 and Radar Image 2

Time (hour:min:sec)	Vessel position	
	North latitude (°-'-")	East longitude (°-'-")
05 : 38 : 04	34-22-53.0	135-08-40.5
05 : 43 : 01	34-23-38.9	135-08-37.3
05 : 44 : 59	34-23-52.4	135-08-35.7
05 : 47 : 05	34-24-11.4	135-08-35.7
05 : 49 : 59	34-24-33.5	135-08-32.4
05 : 50 : 56	34-24-41.1	135-08-29.2
05 : 52 : 03	34-24-49.2	135-08-27.6
05 : 52 : 57	34-24-57.3	135-08-27.0
05 : 54 : 02	34-25-08.1	135-08-26.9
05 : 54 : 57	34-25-16.2	135-08-26.0
05 : 55 : 56	34-25-24.7	135-08-24.9
05 : 57 : 05	34-25-35.1	135-08-23.7
05 : 57 : 57	34-25-43.4	135-08-22.8

2.1.3 Audio and Other Data of Vessel A Recorded by Simplified Voyage Data Recorder

According to the Simplified Voyage Data Recorder^{*3} (hereinafter referred to as “SVDR”) of Vessel A, audio and other data inside the bridge from 05:56:45 to 06:02:05 were as indicated in Table 2.1-3.

Voices of the master of Vessel A (hereinafter referred to as “Master A”), the chief officer of Vessel A (hereinafter referred to as “Officer A”), the ordinary seaman of the Vessel A who was on watch (hereinafter referred to as “Ordinary Seaman A”), and the pilot onboard the Vessel A (hereinafter referred to as “Pilot A”), and sound of whistle and other sounds are indicated in the table below but the answerbacks to the orders are omitted from the table. Voices in Chinese and Taiwanese are translated into Japanese and shown in italics.

Table 2.1-3 Voice and Sound Record on SVDR (excerpt)

Time (hour:min:sec)	Speaker and others	Voices and sounds
05:56:45 - 05:56:50	Unknown	[Unclear voice]

^{*3} “Simplified Voyage Data Recorder” is a device stored inside a retrievable capsule which records navigational data such as vessel position, course, and speed, as well as VHF communications, and voices in the bridge.

05:57:36	Master A	<i>What is the speed of the fishing vessels?</i>
05:57:38	Officer A	<i>10 knots.</i>
05:57:45 - 05:57:50	Unknown	Ready to stop engine immediately. [Unclear Voice]
05:58:43	Sliding door	<Sound of sliding door>
05:58:44	Pilot A	Hard starboard.
05:59:04	Pilot A	Midships.
05:59:07	Sliding door	<Sound of sliding door>
05:59:10 - 05:59:16 (05:59:13)	Whistle Ordinary Seaman A	<Sound of one long blast> Midships, sir.
05:59:38 - 05:59:39	Master A	Pon, pon, pon, pon, two*.
05:59:45 - 05:59:55	Pilot A	OK, hard port. Steady. Reduce speed.
05:59:56	Master A	<i>What is the time?</i>
06:00:02 - 06:00:12	Ordinary Seaman A Pilot A Master A Pilot A	Hard port sir. Steady. So you report immediately. OK.
06:00:20 - 06:00:23	Pilot A	Kobe Coast Guard Radio* ⁴ , Kobe Coast Guard Radio, this is WAN HAI 162, WAN HAI 162, over. (<u>in Japanese</u>)
06:00:32 - 06:00:35	Kobe Coast Guard Radio	WAN HAI 162, this is Kobe Coast Guard Radio, channel 12, over. (<u>in Japanese</u>)
06:00:40 - 06:02:05	Pilot A Kobe Coast	[Reporting time and location of the accident]

*4 “Kobe Coast Guard Radio” refers to the info-communications management center of the 5th Regional Coast Guard Headquarters, Japan Coast Guard.

	Guard Radio	
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*According to the statement of Master A, this meant the two fishing vessels were drifting right beneath the port wing making a noise of machinery.

2.1.4 Events leading to the Accident According to the Statements of the Crews and Others

According to the statements of Master A, Officer A, Ordinary Seaman A, Pilot A, crew of Vessel B (hereinafter referred to as “Crew B”), the master of Vessel C (hereinafter referred to as “Master C”), and the master (hereinafter referred to as “Master D”) of the consort vessel SEINAN MARU No.11, events leading to the accident were as follows.

(1) Vessel A

Vessel A with Master A and twenty other crews onboard, left Port of Taipei, Taiwan at about 22:00 on February 21, 2013 for Osaka Nanko Warf in the Osaka section of Hanshin Port (hereinafter referred to as “Osaka Nanko”).

Pilot A boarded Vessel A at about 04:45 on February 25, 2013 at a pilot station*⁵ located to the south of Tomogashima, Wakayama City, Wakayama Prefecture and then handed a pilot information card*⁶ to Officer A, and received a pilot card*⁷ from Master A.

Master A took command of Vessel A, and assigned Officer A for lookout and operation of the main engine remote controller, and Ordinary Seaman A to manual steering, and after passing through the Tomogashima Channel, navigated on 043° (in true bearing, this applies hereinafter) toward Osaka Nanko at a speed of 16 knots piloted by Pilot A.

Pilot A saw lights of a large number of fishing vessels in the fore starboard direction, at about 05:30, sailing out from the fishing ports of Fuke and Tannowa in Misaki-cho, Osaka Prefecture and assumed they were groups of fishing vessels engaged in fishing of Japanese sand lance whose season opened two days before, and from about 05:40, Pilot A began to continuously monitor the movements of the groups of fishing vessels including Vessels S.

Officer A monitored the groups of fishing vessel using radar, and occasionally reported their movements to Master A.

At about 05:55, Pilot A saw 5 or 6 fishing vessels including Vessels S heading north in the starboard fore, thought that the vessel A would collide with them if these fishing vessels continued to keep their course and kept monitoring, then noticed that the two vessels in the front (hereinafter

*⁵ “Pilot Stations” are designated water areas where pilots meet with and board the vessels that requested the pilot.

*⁶ “Pilot Information Card” is a card that describes information about the conditions in the port, the waters scheduled to be navigated, and other matters and given to the master from the pilot.

*⁷ “Pilot Card” is a card that masters hand to pilots when they board a vessel to pilot. The card has information about the vessel’s loading conditions, propulsion, operational performance, etc. written on it.

referred to as “Vessel E” and “Vessel F”) reduced their speed, and later, noticed that two other vessels that came to approximately 1 nautical mile (hereinafter referred to as “Vessel G” and “Vessel H”) also reduced their speed.

Although there were no changes in the course of Vessels S, Pilot A thought that Vessel A would come close to Vessel G and Vessel H on the starboard fore if turned to starboard, and to the other surrounding fishing vessels if turned to port, and sailed maintaining Vessel A’s speed and direction.

Master A noticed that a white light and deck lights of Vessels S were moving straight ahead in front of Vessel A from about 05:56 to 05:57, and told Pilot A that Vessels S were crossing ahead, to pay attention, and to take action to avoid a collision, but there was no reply from Pilot A.

At about 05:57, as there were no changes in the bearing of the Vessels S, which was at approximately 1,000 meters, Pilot A operated the button on the whistle control panel to blow a whistle for the purpose of alerting Vessels S (see Chart 2.1).

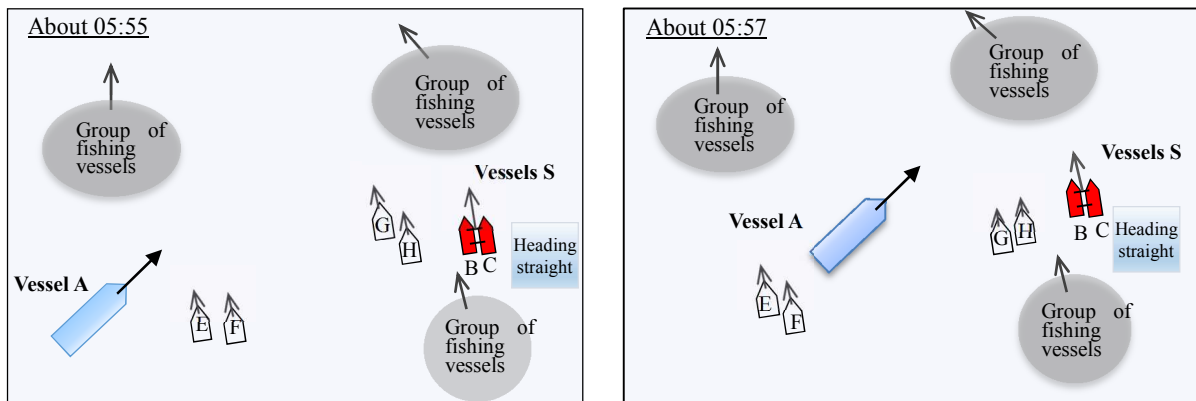


Chart 2.1: The situation prior to the accident according to Pilot A

While Pilot A was considering to take action to avoid a collision in response to the movements of Vessels S, the distance between Vessel A and Vessels S became approximately 200 meters, and Pilot A again operated the button on the whistle control panel, but there was no changes in the bearing of Vessels S, then Pilot A ordered Ordinary Seaman A hard starboard.

Master A opened the sliding door on the starboard side of the bridge, went out to the starboard wing, and continued monitoring Vessels S, and as the Vessels S were heading straight toward Vessel A’s bow and went into the blind area of the vessel A’s bow, then moved to the port wing.

The Pilot A, at about 05:59, as Vessel A turned around starboard and Vessels S went into the blind area of the Vessel A’s bow, and Vessels S did not come out around the port bow for a while, then ordered Ordinary Seaman A amidships and opened the sliding door on the port side of the

bridge and went out to the port wing to see the port fore.

Ordinary Seaman A felt an impact on his hands which were grabbing the steering wheel at the time between the order of hard starboard and returning the rudder to midships.

Pilot A saw an object floating near the amidships on the port side of Vessel A through the binoculars, and Master A saw two objects floating right below the port wing emitting mechanical sounds.

Master A told Pilot A to report the accident, and Pilot A reported the collision with Vessels S to the Japan Coast Guard and the Osaka Wan Pilots' Association.

(2) Vessels S

Vessels S normally operated in a group of three vessels with SEINAN MARU No. 11 (hereinafter referred to as "Vessel D") which is a fish shoal tracking/fish carrier, and Vessel D was to sail ahead of Vessels S to search for fish shoals, decide on the fishing sites, and instruct Vessel B and Vessel C which way to sail, and, Vessel C was responsible for course and speed of Vessels S, and Vessel B was to follow, lookout was carried out on both Vessel B and Vessel C and communications among the vessels were carried out by 27MHz radio (hereinafter referred to as "radio"). In order to start spreading fishing nets just by untying the wire ropes connecting Vessel B and Vessel C on arrival at a fishing site, Vessels S prepared the nets and tied the vessels' hulls by wire ropes before leaving port.

i) Vessel B

Vessel B, with The master of Vessel B (hereinafter referred to as "Master B") and Crew B on board, tied with Vessel C and forming Vessels S, left Fuke fishing port together with Vessel D for a fishing ground of Japanese sand lance (hereinafter referred to as "the fishing ground") located south off the coast of Kobe City, Hyogo Prefecture at about 05:10.

Vessel B, after leaving port, set its engine number of revolutions to the same speed as Vessel C and sailed toward the north. Crew B heard from Master B that Vessel A was approaching and saw Master B took starboard steer.

Crew B, at about 05:57, saw Vessel A in approximately 1,000 meters away from the window at the port aft of the wheelhouse and thought that the distance was enough to avoid collision with Vessel A by taking starboard turn.

Crew B heard Master B telling Vessel C over the radio to steer to the starboard as Vessel A was approaching, but there was no response from Vessel C. Crew B repeatedly heard Master B talking something to Vessel C over the radio afterwards, but was unable to hear the conversations disturbed by the sound of engine.

Crew B, after seeing Master B taking a hard starboard direction, saw that the bow of Vessel A looked to be coming straight toward the stern of Vessels S and told Master B that Vessel A was

approaching Vessels S at about 05:58 to 05:59.

When Vessel A came close to Vessels S, Crew B heard a radio message from Vessel C saying “We’re colliding” and heard Master B responding with “That’s what I’ve been telling you all along” While Vessel B was turning starboard the stern part of Vessel B and the bow of Vessel A collided and Vessel B capsized from port side.

ii) Vessel C

Vessel C, with Master C and a crew member (hereinafter referred to as “Crew C”) on board, tied together with Vessel B forming Vessels S, left Fuke fishing port at about 05:10 for the fishing ground.

After leaving port, the Vessel C was instructed over the radio by Vessel D to sail toward the north, and set the engine speed to approximately 2,000 rpm and sailed toward the north at a speed of approximately 8 to 9 knots.

Master C kept lookout ahead, monitoring the display of the GPS plotter, and steered to the starboard when the ship’s heading moved westward and steered to the port when the heading moved eastward in an appropriate manner to maintain north heading

Master C received a radio call telling him that Vessel A was approaching and when he looked astern, he realized that Vessel A was within approximately 100 to 200 meters in the port aft, and told Vessel B “We’re colliding” over the radio and steered hard starboard.

The stern part of Vessel C and the bow of Vessel A collided and Vessel C capsized from starboard.

The time of occurrence of the accident was at about 05:59 on February 25, 2013, approximately 2.7 nautical miles in approximately 274° from Kansai International Airport Offing Light Beacon A Osaka Prefecture.

(See: Figure 1: Estimated navigation routes (full figure); Figure 2: Estimated navigation routes (enlarged figure); Figure 3: Radar image 1 (1) and (2); Figure 4: Superimposed radar image; and Figure 5: Radar image 2 (1) to (5))

2.1.5 Information Relating to Search and Rescue

According to statements from Master A, Crew B, Master C, and Master D, and information from the Japan Coast Guard, search and rescue operation was as follows.

(1) Vessel A

Vessel A, after the collided with Vessels S, as Master A thought there was a risk of collision with many other fishing vessels that were heading to location of the accident and gave up going for

rescue, stopped the engine and anchored nearby.

(2) Vessel B

Master B was thrown out from the helm chair located in the center of the wheelhouse to the port side door and hit his left shoulder, but remained conscious and in the wheelhouse until Crew B escaped from the wheelhouse, but when the master of a consort vessel (hereinafter referred to as “Master J”) went into the sea for rescue, Master B was not in the wheelhouse.

Crew B, although hit against the port side wall of the wheelhouse by the impact of the collision, escaped from the door on the starboard side of the wheelhouse immediately after Vessel B capsized and climbed up to the bottom of capsized Vessel C and was rescued by Vessel D which came for help.

The Japan Coast Guard, at about 06:00 on the 25th, received a report of the accident from Pilot A and dispatched patrol boats and airplanes, and together with the consort vessels, Vessel B and Vessel C, searched for Master B.

Master B was found by a fishing vessel approximately 2.8 nautical miles southwest location of the accident and was confirmed dead on May 20th.

Master B and Crew B were not wearing lifejackets at the time of the accident.

(3) Vessel C

Master C escaped from the door on the port side of the wheelhouse immediately after Vessel C capsized, came up to the surface in a part of the bow where there was trapped air, and after spending about five to ten minutes to catch his breath, went into the water again and was rescued by Vessel D when he resurfaced.

Crew C was rescued from the wheelhouse of the capsized Vessel C by Master J but was confirmed dead at the hospital he was sent there.

Master C and Crew C were not wearing lifejackets at the time of the accident.

2.2 Injuries to Persons

According to statements from Master A, Crew B, and Master C and the post-mortem certificates of Master B and Crew C, information on injuries to people is as follows.

(1) Vessel A

There were no fatalities or injuries.

(2) Vessel B

The cause of death of Master B was drowning.

There was no injury to Crew B.

(3) Vessel C

The cause of death of Crew C was drowning.

There was no injury to Master C.

2.3 Damage to Vessels

(1) Vessel A

Vessel A had scratches on the stem and on the hull plate of port side fore. (see photo 2.3-1)

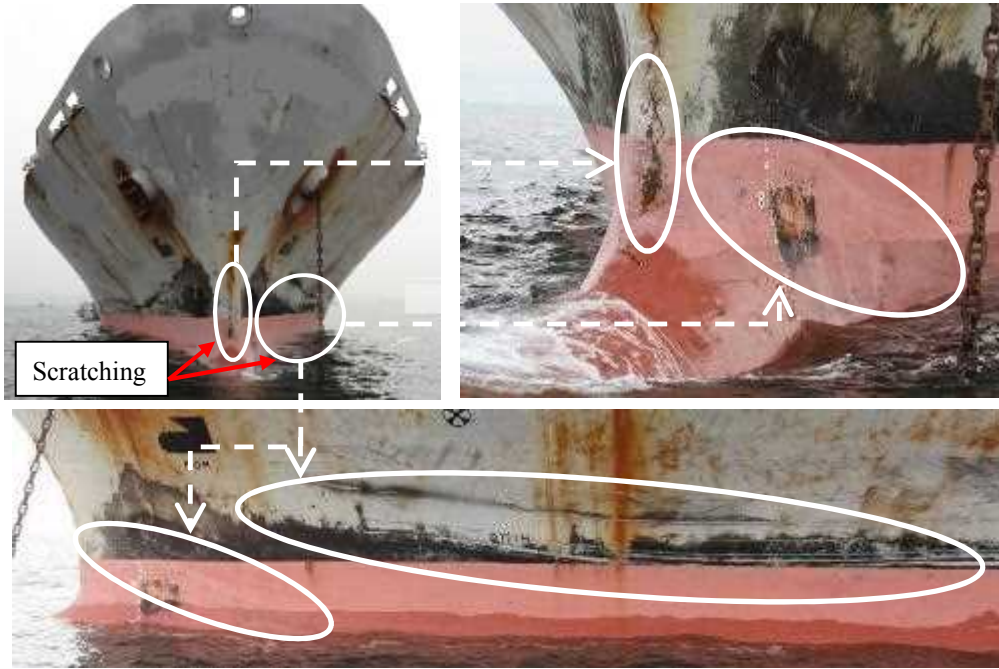


Photo 2.3-1 Damages on Vessel A

(2) Vessel B

Vessel B had holes on the bottom of the stern part, was bent on the shoe piece, and the wire ropes used to tie Vessel B to Vessel C were cut off. (see photo 2.3-2)



Photo 2.3-2 Damages on Vessel B

(3) Vessel C

The stern part of the Vessel C was torn apart from the hull. (see photo 2.3-3)



Photo 2.3-3 Damages on Vessel C

2.4 Crew information

(1) Gender, Age, and Certificate of Competency

i) Master A, male, 64 years old

Nationality: Taiwanese

Certificate of competency: Master (issued in Taiwan)

Date of Issue: August 27, 2010

(Valid until January 24, 2014)

ii) Officer A, male, 41 years old

Nationality: Taiwanese

Certificate of competency: Master (issued in Taiwan)

Date of Issue: May 17, 2010

(Valid until May 16 2015)

iii) Ordinary Seaman A, Male, 21 years old, Nationality: Taiwanese

Maritime license: None

iv) Pilot A, male, 27 years old

3rd Grade Osaka Wan Pilot Certificate

Date of Issue: June 24, 2011

Date of Expiry: June 23, 2014

v) Master B, male, 30 years old

First class boat's operator license/Personal watercraft operator with passenger service license

Date of Issue: October 7, 2002

Date of Revalidation: August 20, 2009

(Valid until August 19, 2014)

vi) Crew B, male, 30 years old

Maritime license: None

vii) Master C, male, 70 years old

First class boat's operator license/Personal watercraft operator with passenger service license

Date of Issue: August 10, 2001

Date of Revalidation: February 08, 2011

(Valid until August 9, 2016)

viii) Crew C, male, 30 years old

Maritime license: None

(2) Seagoing experience

According to statements by Master A, Officer A, Ordinary Seaman A, Pilot A, Crew B, Master C, and Master D, the seagoing experiences were as follows.

i) Master A

Master A joined WAN HAI LINES LTD. (hereinafter referred to as "Company A") in about 1979 and was promoted to shipmaster in about 1981. Master A joined for the first time as shipmaster of Vessel A on October 31, 2012 and had been serving since then and had visited Osaka Nanko about ten times a year.

Master A was in good health at the time of the accident.

ii) Officer A

Officer A joined Company A in about 2000, and first sailed on Vessel A as Officer in about September 2011 and resumed sailing as Chief Officer on Vessel A from January 25, 2013.

Officer A was in good health at the time of the accident.

iii) Ordinary Seaman A

Ordinary Seaman A joined Company A in about 2011, and had been onboard on Vessel A as an ordinary seaman.

Ordinary Seaman A was in good health at the time of the accident.

iv) Pilot A

After Pilot A graduated from university, he completed a 30-month course beginning on October 30, 2008 at a registered pilot training facility*⁸, and spent about one year from July 2011 gaining experience piloting approximately 230 vessels under the guidance of a 1st-grade pilot, and from July 2012 began solo piloting work as a 3rd-grade pilot, and had work experience as pilot on 67 vessels.

Pilot A was in good health at the time of the accident.

v) Master B

Master B had been master of Vessel B since about 2002.

Master B appeared to be in good health at the time of the accident.

vi) Crew B

Crew B had sailed on Vessel B since July 2012 and had 75 days of operating experience.

Crew B was in good health at the time of the accident.

vii) Master C

Master C had sailed on Vessel C since about 2002 and became master of the vessel from about 2006.

Master C was in good health at the time of the accident.

viii) Crew C

Crew C had sailed on Fuke Port fishing vessels since about 2010, and had sailed on Vessel C since February 23, 2013.

Crew C appeared to be in good health at the time of the accident.

*⁸ "A registered pilot training facility" is a pilot training facility that has been registered by the Minister of Land, Infrastructure and Transport.

2.5 Vessel Information

2.5.1 Particulars of Vessels

(1) Vessel A

IMO No.	9132909
Port of registry	Keelung (Taiwan)
Owner	Company A (Taiwan)
Management company	Company A
Class	Det Norske Veritas (Norway)
Gross tonnage	13,246 tons
L x B x D	159.52m x 25.00m x 12.80m
Hull material	Steel
Engine	One diesel engine
Output	8,561kW
Propulsion	One fixed pitch propeller
Date of construction	October 1996

(see Photo 2.5-1)



Photo 2.5-1 Vessel A

(2) Vessel B

Fishing vessel registration Number	OS2-1480
Base port	Misaki-cho, Osaka Prefecture
Owner	Owned by an individual
Gross tonnage	9.7 tons
L x B x D	17.80m x 3.60m x 1.43m
Hull material	FRP
Engine	One diesel engine
Output	Fishing Vessel Act horsepower 35
Propulsion	One fixed pitch propeller

Date of launch April 1 1983
(See Photo 2.5-1)

(3) Vessel C

Fishing vessel registration number OS2-1730
Base port Misaki-cho, Osaka Prefecture
Owner Owned by an individual
Gross tonnage 9.7 tons
L x B x D 17.80m x 3.58m x 1.01m
Hull material Fiberglass-reinforced plastic
Engine One diesel engine
Output Fishing Vessel Act horsepower 35
Propulsion One fixed pitch propeller
Date of launch May 18 1988
(See Photo 2.5-2)



Photo 2.5-2 Two vessels tied together (consort vessels of Vessel B and Vessel C)

2.5.2 Loading Conditions

(1) Vessel A

Loading capacity of Vessel A as for 20-foot container was 1,088 units and when leaving the Taipei Port, Vessel A loaded 384 units of 20-foot containers and 256 of 40-foot containers, and draft was approximately 6.8m at fore and approximately 8.0m at aft.

(2) Vessels S

Both Vessel B and Vessel C loaded fishing equipment.

2.5.3 Information Relating to Vessel Equipment.

(1) Vessel A

i) Bridge

The bridge had a wheel stand in the center, two radars in the port side, and a Main Engine Remote Control System in the starboard side of the wheel stand. The radars were able to display overlapping AIS information on their screens and were equipped with echo trail*⁹ function and Automatic Radar Plotting Aid (ARPA)*¹⁰ function.

Two VHF radiophone apparatus (hereinafter referred to as “VHF”), a pushbutton for a whistle (hereinafter referred to as “whistle button”), a repeater compass, a whistle control panel, and a daylight signaling lamp were installed in the fore part of the bridge. Whistle button, pushbutton for a maneuvering light*¹¹ (hereinafter referred to as “maneuvering light button”), a whistle alternating switch, which selects a whistle to be blown, either one on the bow mast or the one above bridge, were installed on the whistle control panel.

A bridge control console, AIS display device, and a chart table were installed in the aft part of the bridge.

Microphones for SVDR were installed in four places on the ceiling of the bridge.

There was one whistle button and one repeater compass on both the port and starboard wings. (See Chart 2.5-1 and Photo 2.5-3)

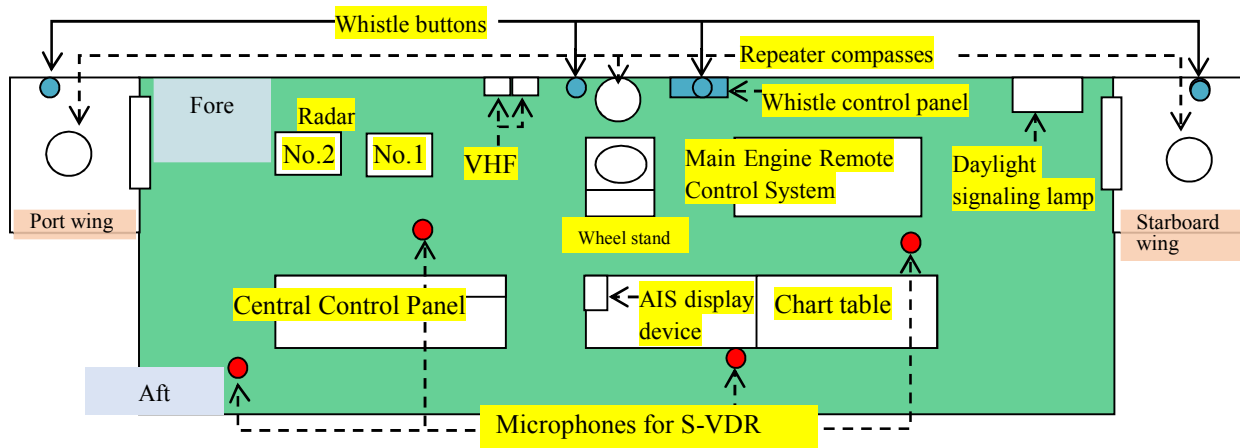


Chart 2.5-1 Layout of navigational equipment in the bridge

*⁹ “Echo trails” are persistent radar image trails that display the navigational paths of target objects.

*¹⁰ “Automatic Radar Plotting Aids (ARPA)” automatically computer-process the changes in positions of other vessels displayed by the radar, and show the course, speed, time of closest approach, predicted future position, etc. of other vessels, and also have a function that sounds an alarm when there is a predicted risk of collision when approaching other vessels.

*¹¹ “Maneuvering lights” are lights situated on the top of the radar mast that are used to signal to others when a vessel is changing course or moving astern, etc.



Photo 2.5-3 Whistle buttons and maneuvering light button

ii) Display of navigation lights.

According to the statements of Officer A, navigation lights were displayed at the time of the accident.

iii) Navigation bridge visibility

According to Blind Distance Table of Vessel A, there was an approximately 345m of blind area forward of the bow obstructed by four layers of containers loaded on the deck (see Photo 2.5-4).



Photo 2.5-4 Navigation bridge visibility

iv) Use of Radar

According to the statements of Master A, Officer A, and Pilot A, use of radars were as follows.

At the time of the accident, Master A and Pilot A were using the No. 1 radar, which was set

to six nautical miles and Officer A was using the No. 2 radar, which was set to three nautical miles.

CPA/TCPA alarm of the ARPA was set from 0.3 to 0.5 nautical miles, but since the alarm sounded continually in congested waters, the volume was set to minimum.

v) Conditions of hull, main engine and other equipment of the Vessel.

According to the statements of Master A and Officer A, at the time of the accident, there were no failures or malfunctions on the hull, main engine, and other equipment.

(2) Vessels S

According to the statements of Crew B and Master C, the conditions were as follows.

i) Wheelhouse

On both Vessel B and Vessel C, there was a steering stand in the center of the fore part of the wheelhouse, and a GPS plotter and a radio device which was set to a frequency for communications exclusively among Vessel B, Vessel C, and Vessel D on the starboard side, a radio device which was set to a frequency commonly used by fishing vessels operating in Osaka Bay. Both Vessel B and Vessel C were not equipped with a radar.

There were no failures or malfunctions on the hull, main engine, and other equipment of both Vessel B and Vessel C at the time of the accident.

ii) Display of navigation lights and other lights.

At the time of the accident, Vessel B and Vessel C displayed, in addition to navigation lights, a revolving yellow light on the rear mast behind the wheelhouse, and Vessel B displayed a deck light to illuminate the stern area to monitor the fishing net so it would not fall in the sea.

iii) Visibility on the portside from the wheelhouse of Vessel C

As Vessel B was alongside the port side of Vessel C, visibility for port aft from the helm chair was partly restricted by the wheelhouse of Vessel B, but this did not obstruct the lookout.

2.5.4 Information Relating to Maneuverability Characteristics

(1) Vessel A

i) Ship's speed and engine number of revolutions under normal cargo loading conditions

According to the Maneuverability characteristics table, ship's speed and engine speed were as follows.

	Ship's speed (kn)	Engine number of revolutions (rpm)
Navigation full ahead	18.5	127
Harbor full ahead	11.5	82
Half ahead	7.5	58

Slow ahead	5.9	48
Dead slow ahead	4.5	38

ii) Stopping time and stopping distance under normal loading conditions

The operational performance chart states the following.

Conditions of the engine when ordered astern	Time (min)	Distance (M)
Full ahead	6.8	1.17
Full ahead	4.3	0.58

iii) Results of turning test under normal ballast conditions (rudder angle of 35°)

According to the results of sea trial, the results of turning test were as follows.

(Fore draft: 2.8m, Aft draft: 5.9m)

Turning direction	Speed (kn)	Advance* ¹² (m)	Transfer* ¹³ (m)	Time (min)
Starboard turn	18.7	520	321	1.3
Port turn	19.1	538	295	1.3

(2) Vessels S

According to the statements of the master of the consort vessel of Vessels S, which also sails tied together with another vessel the same as Vessels S, operational performance was as follows.

- i) When the one vessel takes steering, while both vessels set engines to same rotational speed and the other vessel keeps the rudder amidships, the vessels will start turning immediately.
- ii) When the one vessel takes steering and the other vessel takes steering of the same degree to the opposite direction, while the both vessels set the engines to same rotational speed, both vessels will not change the course but will sail straight.

2.6 Information Relating to Whistle

2.6.1 Information Relating to the Blowing of the Whistle of Vessel A

- (1) According to the statements of Officer A, at the time of the accident, the whistle alternating switch was set to the bow mast whistle.

*¹² "Advance" refers to the distance of a vessel's center of gravity advances along its course after the direction of the vessel is turned 90°.

*¹³ "Transfer" refers to the sideways distance a vessel's center of gravity moves from its course after the direction of the vessel is turned 90°.

- (2) According to the statements of Officer A, Officer A blew one long blast of the whistle when Vessels S disappeared into the blind area forward of Vessel A's bow.
- (3) According to the statements of Crew B, Master C, and Master D, they did not hear the whistle before the accident.

2.6.2 Investigation on the Whistle Recorded by SVDR of Vessel A

Since Pilot A stated that he operated the whistle control panel button twice and Officer A stated to have blown one long blast of the whistle, SVDR only recorded sound of one blast of the whistle, an investigation on the sound of whistle and record by SVDR was carried out, and the results were as follows.

No change has been made to the performance or location of the whistle or SVDR (since the time of the accident).

(1) Date, time, and place of the investigation

- i) Date and time of investigation: About 00:30, October 8, 2014
- ii) Place of investigation: Osaka Nanko (moored)
- iii) Ship's heading: Approximately 078°

(2) Weather conditions at time of the investigation

Weather: Fine Wind direction: North-northeast Wind speed: 2.0m/s Temperature: 17°C
 Visibility: more than 10km

(3) Conditions and results of the investigation

Conditions	Whistle location	Port and starboard sliding doors	Comparative volume of recorded sounds
1	Bow mast	Close	Low ↓ High
2	Bow mast	Open	
3	Radar mast	Close	
4	Radar mast	Open	

Even with sliding doors on the both side of the bridge closed, the sound of whistle of bow mast was recorded by the SVDR.

2.6.3 Information Relating to the Whistle of Vessels S

According to the provisions of Article 33 Paragraph 1 of the Act for Preventing Collision at Sea, vessels over 12 meters in length must be equipped with whistles, but neither Vessel B nor Vessel C had whistles.

2.7 Information Relating to Weather and Sea Conditions

2.7.1 Observed Data

- (1) Data from the Kanku Island District Meteorological Observatory located approximately 3 nautical miles from the location of the accident were as follows.

At 05:40 Wind direction: North. Wind speed 4.5m/s. Temperature: 1.5°C. Precipitation: 0.0mm

At 06:00 Wind direction: North. Wind speed: 4.6m/s. Temperature: 1.4°C. Precipitation: 0.0mm

- (2) Tide

According to the tide table issued by the Japan Coast Guard, the tide of at 06:00 on the 25th, 1.3 nautical miles to the northwest of location of the accident site was to the north at approximately 0.4kn.

- (3) Seawater temperature

According to the web site of the Japan Coast Guard, the average seawater temperature near the accident site on the 25th was approximately 10°C.

- (4) Time of Sunrise

According to the nautical almanac issued by the Japan Coast Guard, the time of sunrise was about 06:34.

2.7.2 Observation by Crew

According to the statements of Master A and Master C, the weather was fine, wind was from north, the sea surface was calm, and the visibility was approximately six nautical miles.

2.8 Information Relating to Seawater Temperature and Survival Time

According to reference*¹⁴, the realistic upper limit for survival time in approximately 10°C seawater when dressed normally is about 15 hours.

2.9 Information relating to the Area of accident

- (1) According to the Sailing Directions for the Seto Inland Sea issued by the Japan Coast Guard, a large number of fishing vessels operate from early morning to noon in southern Osaka Bay regardless of the season.
- (2) According to the statements of Master C and Master D, the fishing season of Japanese sand lance opened on February 23, and at the time of the accident, 24 Japanese sand lance fishing vessels went fishing from Fuke fishing port, and among them, 14 vessels including Vessels S were tied

*¹⁴ “International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual” (Japanese translation, 3rd edition, editorial supervision by the Rescue Section of the Guard and Rescue Department of the Japan Coast Guard, edited by the Japan Coast Guard Association, published in 2013 by Kaibundo Publishing Co., Ltd.).

together in pairs.

- (3) According to radar image 1, at about 05:45, there were more than 20 vessels including Vessels S, traveling in west-northwest to north bearings within a three nautical mile radius from the starboard side of Vessel A to the fore direction (see Chart 2.9).

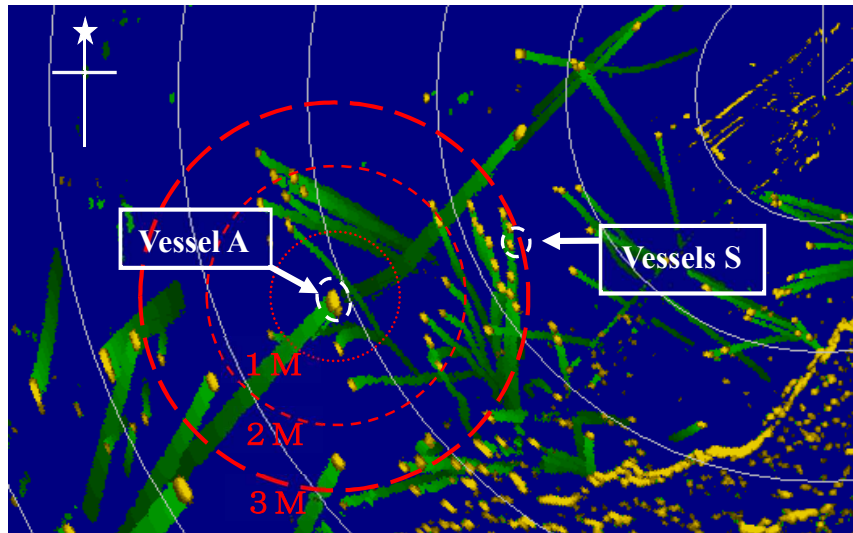


Figure 2.9 Radar image (about 05:45)

2.10 Information Relating to Safety Management System of Company A

According to Company A's safety management manual, the authorities and responsibilities of the master and the officer on watch while a pilot is onboard are stipulated in reference to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW) as below (excerpt).

(1) Master's authority

When there is imminent danger to human life or to the vessel, the master must decide how to avoid the danger and implement necessary measures.

(2) Master's responsibilities

The master is responsible for the safety of the crew, cargo, and vessel, and must not delegate to others their responsibility to ensure the safety of the voyage.

(3) The officer and others on watch duty when a pilot is onboard

The master and the officer on watch must accurately ascertain the position of the vessel and cooperate with the pilot, and the master and officer are not absolved of their duties and responsibilities when a pilot is onboard.

If the officer on watch has any doubts about the behavior or intentions of a pilot, they must ask the pilot for an explanation. If doubts still remain, the situation must be reported immediately to the master, and any measures deemed necessary must be implemented.

2.11 Information Relating to BRM*¹⁵ of Vessel A

2.11.1 Information Relating to Education and Training

According to the reply to the questionnaire by Company A and the Osaka Wan Pilots' Association, information relating to BRM was as follows.

(1) Master A and Officer A

Master A and Officer A participated BRM course and learned about the importance of cooperation of the master and officer on watch with pilot, when onboard, as a member of the bridge team for safe operation of the vessel.

(2) Pilot A

Pilot A participated in an in-house BRM course taught by an external instructor and, in addition, received BRM onboard training instructed by a 1st grade pilot from the Osaka Wan Pilots' Association during the onboard pilot training.

2.11.2 Information Sharing at the Time of the Accident

According to the statements of Master A, Officer A, and Pilot A, information sharing was as follows.

- (1) Master A did not confirm with Pilot A how to pass Vessels S.
- (2) Pilot A was under tension as Vessel A approached the groups of fishing vessels, including Vessels S, from about 05:56 to 05:57, unable to tell Master A about the movements of the groups of fishing vessels including Vessels S and how to pass, and did not remember whether Master A provided any advice.

2.12 Information Relating to Radio Communication between Vessel B, Vessel C, and Vessel D

According to the statements of Crew B, Master C, and Master D, radio communications were as follows.

- (1) Crew B heard Master B telling Vessel C over the radio to take starboard steer as Vessel A was approaching.
- (2) Master C did not hear the radio communication from Master B.
- (3) Master D did not remember about the radio communications between Vessel B and Vessel C.

2.13 Information Relating to Pilotage.

2.13.1 Forced Pilotage Area and Vessels Subject to Pilotage

According to the provisions of Article 35 of the Pilotage Act and the Article 5 of the Order for Enforcement of the Pilotage Act, the Osaka Bay pilotage area is designated as a compulsory pilotage area,

*¹⁵ "BRM" (Bridge Resource Management) refers to the effective management of all available resources at the bridge, such as crew, equipment, information in order to ensure the safe navigation of the vessel.

and master of vessel with a gross tonnage of 10,000 tons and over must have a pilot on board.

2.13.2 Information Relating to Pilot

(1) Licensing requirements

The May 2006 revision to the Pilotage Act newly introduced three-grade system of 1st, 2nd, and 3rd grade, in licensing education and training license and was enacted on April 1, 2007 with the condition of evaluation of the outcome within seven years. The new requirements include, in addition to the exiting requirements of completion of onboard training in pilotage areas, a training course at a registered pilot training facility and a training period for 3rd grade pilots was set to two years and six months including four months of onboard training on merchant ships.

Afterwards, as a result of the evaluation of the outcome, 1st to 3rd grade training course at the registered pilot training facility, mainly, was reviewed from February 2014 and the education and training system was amended to be more practical in nature, such as through extension of the training period for the trainees in 3rd grade pilot course who have less than one year of onboard experience as navigational officers from four months to 24 months. (see the supplemental reference “Summary of meeting on implementation of the pilot system including pilot training” (excerpts)).

(2) Training system.

According to the reply to the questionnaire by the Osaka Wan Pilots’ Association and the Regulations of the Association, the training system was as follows.

- i) The association have regulations on training, supervision, and re-education of the members in the association’s regulations.
- ii) The Osaka Wan Pilots’ Association’s regulations stipulate that 3rd grade pilots should complete about one year of 3rd grade pilot training before solo piloting work.
- iii) The president of the Osaka Wan Pilots’ Association may require member’s re-education courses, and Pilot A was scheduled to attend a training course for safe pilotage focused on BRM education and training in 2016, which is to be taken every five years after joining the association.

3 ANALYSIS

3.1 Situation of the Accident Occurrence

3.1.1 Analysis of the Course and Speed of Vessels S

It is probable that, extending a straight line between the positions on Table 2.1-2 of Vessels S at 05:54:57 and 05:57:57, the average bearing of Vessels S during that time was approximately 354.5°.

It is probable that the average speed of Vessels S was approximately 9.1 knots, since the distance

traveled during that time period was approximately 840m.

3.1.2 Course of the Events

Based on 2.1.1 to 2.1.4 and 3.1.1 the course of the event was as follows.

(1) Vessel A

- i) It is probable that Vessel A left Taipei Port, Taiwan at around 22:00 on February 21, 2013, bound for Osaka Nanko.
- ii) It is highly probable that Vessel A, after passing through the Tomogashima Channel, sailed at a heading of approximately 043° at approximately 16 knots from about 05:21:04 to 05:58:50 on 25th.
- iii) It is highly probable that Vessel A started to turn to starboard at about 05:58:51.
- iv) It is probable that while Vessel A was turning, the bow of Vessel A collided with Vessels S.

(2) Vessels S

- i) It is probable that Vessel B and Vessel C were tied together to form Vessels S, and left Fuke fishing port at about 05:10 and headed toward the fishing ground.
- ii) After leaving port, it is probable that Vessels S set their engines 2,000rpm and sailed north at approximately eight to nine knots.
- iii) It is probable that between about 05:54:57 and 05:57:57, Vessels S sailed at a Course over Ground of approximately 354.5° and at a speed of approximately 9.1 knots.
- iv) It is probable that, while Vessels S was turning to starboard, the stern of Vessels S collided with the bow of Vessel A.

3.1.3 Time, Date, and Location of Accident

It is probable that, based on 2.1.1, 2.1.3, and 2.1.4, the time and location were as follows.

(1) Time and date of accident

Based on i) to iii) below, the accident occurred at about 05:59 on February 25, 2013.

- i) Vessels S went into the blind area of Vessel A's bow after Pilot A ordered Ordinary Seaman A hard starboard at 05:58:44.
- ii) Ordinary Seaman A felt an impact at the time between 05:58:44 when Ordinary Seaman was ordered hard starboard by Pilot A and 05:59:13 when Ordinary Seaman A returned the wheel amidships.
- iii) Master A saw two fishing vessels drifting before 05:59:38 when Master A spoke of expressing the way two fishing vessels drifting right below the port wing.

(2) Accident location

Based on the location of Vessel A at about 05:59, the accident occurred approximately 2.7 nautical miles in approximately 274° from Kansai International Airport Offing Light Beacon A, Osaka Prefecture. Approximately 2.7 nautical miles in approximately 274° from Kansai International Airport Offing Light Beacon A, Osaka Prefecture

3.1.4 Damage to Vessels

According to 2.3, the damage was as follows.

- (1) Vessel A sustained scratching damage to external plating on the tip of the bow and on the port side of the bow.
- (2) As for Vessels S, Vessel B sustained a puncture hole beneath the stern and its shoe piece was broken off; the stern of Vessel C was severed from the hull; and the two wire ropes used to tie Vessel B and Vessel C were severed.

3.1.5 Collision Circumstances

Based on 2.1, 2.3, 3.1.3, and 3.1.4, it is probable that the bow of Vessel A and the stern of Vessels S collided at about 05:59, while Vessel A was turning to starboard at a bearing of approximately 043° to 061° at a speed of approximately 15.6 to 16.1 knots, and while Vessels S was turning hard to starboard from their northerly course.

3.1.6 Fatalities and Injuries

According to 2.1.5 and 2.2, fatalities and injuries were as follows.

- (1) There were no fatalities or injuries on Vessel A.
- (2) As for Vessels S, Master B and Crew C drowned, but Master C and Crew B were uninjured.

3.2 Causal Factors of the Accident

3.2.1 Crew Information

According to 2.4, information about the crew is as follows.

(1) Master A

Master A held a lawful and valid master's license issued by Taiwan.

It is probable that he was in good health.

(2) Pilot A

Pilot A held a lawful and valid maritime pilot's license.

It is probable that he was in good health.

(3) Master B

Master B held a lawful and valid permit of boat's operator.

It is somewhat likely that he was in good health.

(4) Master C

Master C held a lawful and valid permit of boat's operator.

It is probable that he was in good health

3.2.2 Condition of the Vessels

It is probable that, based on 2.5.3 and 2.6.3, the condition of the vessels was as follows.

(1) Vessel A

At the time of the accident, there were no failure or malfunction with the hull, engine, and equipment and the vessel was sailing exhibiting navigation lights.

(2) Vessels S

At the time of accident, besides the vessels not equipped with whistles, there were no failure or malfunction with hulls, engines, and other equipment, and they were sailing exhibiting navigation lights.

3.2.3 Analysis of weather and sea conditions

Based on 2.7, at the time of the accident, it is probable that the weather was fine, a 4.6m/s northerly wind was blowing, the sea surface was calm, and visibility was about six nautical miles. In addition, the tide was moving to the north at approximately 0.4 knots, the sea temperature was approximately 10°C, and sunrise on the day of the accident was at about 06:34.

3.2.4 Analysis of Sailing Routes

It is probable that, based on 2.1.1, 2.1.2, and 3.1.1 to 3.1.3, the routes sailed were as follows.

(1) Route sailed by Vessel A

The route sailed by Vessel A from about 05:25 until the accident is as indicated on Figure "Estimated navigation routes (full figure)."

(2) Route sailed by Vessels S

The route sailed by Vessels S from the time they left Fuke fishing port until the accident is the route indicated on Figure 1; "Estimated navigation routes (full figure)," and is based on positions determined from radar images from the time they left the port until their arrival at the point where the accident took place.

(3) The changes in direction of Vessels S from the point of view of Vessel A, and the course and speed of Vessels S

Between about 05:54:57 and 05:57:57, Vessel A maintained a constant course and speed, and

since from the point of view of Vessel A there was no clear alteration in the course or speed of Vessels S, Vessels S are presumed to have maintained a constant course (see Table 3.2).

(See Figure 2: Estimated navigation routes (enlarged figure))

Table 3.2: The direction and distance of Vessels S from the perspective of Vessel A

Time (hour:min:sec)	Positions of Vessel A		Positions of Vessels S		Direction of Vessels S from the point of view of Vessel A (°)	Distance between Vessel A and Vessels S (m)
	North latitude	East longitude	North latitude	East longitude		
	(°-'-")	(°-'-")	(°-'-")	(°-'-")		
05:54:57	34-25-03.1	135-07-24.6	34-25-16.2	135-08-26.0	Approx. 033	Approx. 1,560
05:55:56	34-25-14.8	135-07-36.8	34-25-24.7	135-08-24.9	Approx. 033	Approx. 1,200
05:57:05	34-25-28.7	135-07-51.9	34-25-35.1	135-08-23.7	Approx. 033	Approx. 830
05:57:57	34-25-39.3	135-08-03.4	34-25-43.4	135-08-22.8	Approx. 033	Approx. 470

3.2.5 Analysis of Vessel A's Sounding of Its Whistle

The following analysis is based on 2.1.3, 2.1.4, 2.5.3, 2.6.1, 2.6.2, and 3.2.2. It is probable that Vessel A did not sound its whistle between about 05:56:45 and 05:59:09, however, it was not possible to ascertain why it was not sounded.

- (1) It is probable that the whistle was in proper working order at the time of the accident, and the whistle location switch was set to the bow mast position.
- (2) Between about 05:58:43 and 05:59:07, the sound of sliding doors was recorded by the S-VDR. Since Master A is presumed to have opened the starboard side sliding door to monitor Vessels S from the starboard wing, and Pilot A is presumed to have opened the port side sliding door to check the port side of the bow area from the port wing, it is probable that the sliding doors on both sides of the bridge were shut until about 05:58:42.
- (3) Based on the results of an investigation into the whistle S-VDR recording conditions, it is probable that the whistle on Vessel A's bow and radar mast can both be recorded by the S-VDR even when both of the sliding doors on the bridge are shut.
- (4) Based on i) and ii) below, it is probable that the single long whistle sound recorded by the S-VDR between about 05:59:10 and 05:59:16 was the whistle sounded by Officer A.

- i) In a statement, Pilot A said he had pressed a button on the whistle control panel twice in order to try to sound the whistle at about 05:58:44, and Vessels S then disappeared into the blind area of the bow area of Vessel A.
 - ii) Officer A said in a statement that he sounded the whistle when Vessels S disappeared into the blind area of the bow area of Vessel A.
- (5) Although Pilot A said he tried to sound Vessel A's whistle by pressing a button on the whistle control panel twice, it was not recorded by the S-VDR, and it is probable that Crew B, Master C, and Master D did not hear the whistle prior to the accident.

3.2.6 Analysis of Vessel A's BRM

The following analysis is based on 2.1.3, 2.1.4(1), and 2.11.

- (1) Based on i) and ii) below, it is probable that, although Master A had attended BRM classes, and Pilot A had attended BRM classes and onboard training, at the time of the accident they did not implement BRM practices.
 - i) From about 05:56 to 05:57, Master A told Pilot A to exercise caution and take action to avoid a collision because Vessels S were cutting across the path of Vessel A, but no confirmation was made of what kind of action to avoid a collision should be taken by Vessels A.
 - ii) From about 05:56 to 05:57, although Vessel A was approaching fleets of fishing vessels, Pilot A did not inform Master A about the movements of the fleets (which included Vessels S in their fleet) or action to avoid a collision, as Pilot A was extremely nervous, and Pilot A could not remember if Master A had made any instructions to him at the time.
- (2) It is somewhat likely that early action could have been taken to avoid a collision with Vessels S if Master A and Pilot A had implemented BRM and had shared information regarding the movements of the fishing vessel fleets, which included Vessels S in their fleet, or taken action to avoid a collision.

3.2.7 Analysis of the Radio Communications of Vessels S

The following analysis was based on 2.1.4(2), 2.12, and 3.2.2(2).

- (1) Since Crew B heard Master B radioing Vessel C to tell those on board to turn to starboard because Vessel A was approaching, it is somewhat likely that Master B engaged in radio communication with Vessel C.
- (2) Since Master C continued to watch the waters to the fore while monitoring the GPS plotter screen, and was focusing on maintaining the north bearing, it is somewhat likely that Master C did not hear the radio communication from Master B.
- (3) It is somewhat likely that, if Master C had heard Master B's radio communication, he could

have noticed Vessel A earlier.

3.2.8 Analysis of the Operation of Vessels S

The following analysis was based on 2.1.2, 2.1.4(2), 2.5.4(2), 3.2.4, and 3.2.7.

- (1) Since Crew B heard from Master B before 05:57 that Vessel A was approaching and saw Master B steer to starboard, it is probable that Master B steered to starboard because he was aware that Vessel A was approaching.
- (2) Based on i) to iii) below, it is somewhat likely that from the time Master B steered to starboard up until about 05:57:57, Master C may have been steering to port to counteract the effect of Master B steering to starboard in order to maintain the north bearing of the vessels.
 - i) Although Master B was steering Vessels S to starboard from before 05:57, the course and speed of Vessels S were maintained until 05:57:57.
 - ii) With fishing vessels that are tied together in the same manner as Vessels S, if the rudder of either vessel is turned, and the combined rotational speed is the same, the vessels will start to change direction immediately even if the rudder on the other vessel is in the central position, but when the rudders of each vessel are pointed in opposing directions with the same rudder angle, the direction will not change and the vessels will continue sailing straight.
 - iii) Master C was steering to prevent the vessels from veering to the east and maintain the north bearing.
- (3) Since Vessels S was formed by tying the starboard side of Vessel B and the port side of Vessel C together with wire ropes, the handling of Vessel B and Vessel C would be impaired if the rudders were pointed in opposing directions.

3.2.9 Watchkeeping and Vessel Operation Conditions

According to 2.1.1 to 2.1.4, 2.5.3, 2.6.1, 2.6.2, 2.11.2, 3.1.2, and 3.2.4 to 3.2.8, the conditions were as follows.

- (1) Vessel A
 - i) From about 05:40, it is probable that Pilot A was continually monitoring the fishing vessel fleets, which included Vessels S in their fleet.
 - ii) It is probable that at about 05:55, Pilot A saw five or six fishing vessels to the fore starboard side and thinking there could be a collision if the vessels continued heading straight, he continued to monitor them and then noticed Vessel E, Vessel F, Vessel G, and Vessel H reducing speed.
 - iii) It is probable that Pilot A thought that although Vessels S had not changed direction, if Vessel A steered right or reduced speed it would draw near to Vessel G and Vessel H to the fore

starboard side, and if it steered left, it would draw near the other surrounding fishing vessels, and therefore Pilot A maintained Vessel A's speed and direction.

- iv) It is somewhat likely that, from about 05:56 to 05:57, Master A noticed Vessels S heading directly toward the bow of Vessel A, and told Pilot A to exercise caution and take action to avoid a collision because Vessels S were cutting across the path of Vessel A, but as Pilot A was extremely nervous, Pilot A did not hear any instructions made to him by Master A at the time.
- v) It is somewhat likely that, when Vessel A and Vessels S were approximately 1,000 meters apart and then 200 meters apart, Pilot A attempted to sound the whistle by pressing a button on the whistle control panel, but the whistle did not sound and the bearing of Vessels S did not alter.
- vi) It is somewhat likely that, if the whistle had sounded when Vessel A and Vessels S were heading toward a collision, Master C could have been made aware of the presence of Vessel A.
- vii) It is probable that Pilot A was considering taking action to avoid a collision in response to the movements of Vessels S, but the bearing of Vessels S did not change, so at about 05:58:44 Pilot A directed Ordinary Seaman A to turn hard to starboard and Vessel A began turning around to starboard at about 05:58:51.
- viii) It is probable that Pilot A thought that altering the bearing or speed would bring Vessel A near to the surrounding fishing vessels, and he was unable to come to a decision about action to avoid a collision, and so maintained Vessel A's course and speed until drawing near to Vessels S.

(2) Vessels S

i) Vessel B

- a. It is probable that Master B noticed Vessel A before 05:57 and steered to starboard.
- b. It is probable that, since Crew B saw Master B turning hard to starboard, Master B may have done so between about 05:58:00 and 05:59:00.
- c. It is probable that, although Master B noticed the approach of Vessel A, since Vessel B was not equipped with a whistle, Master B was unable to sound a whistle to alert Vessel A.

ii) Vessel C

- a. It is probable that, because Master C was keeping watch over the waters in the fore direction and monitoring the GPS plotter screen while focusing his attention on maintaining the north bearing as directed by Vessel D, he did not notice the approach of Vessel A.
- b. Since Master C did not notice the approach of Vessel A, it is somewhat likely that he turned the rudder of Vessel C in the opposite direction to that of Vessel B from the time that Master B steered to starboard up until 05:57:57, in order to maintain the north bearing by counteracting the effect of Vessel B being steered to starboard.
- c. It is probable that Master C turned hard to starboard after being informed of the approach of Vessel A by a radio message from Vessel D, and noticing that Vessel A was only 100 to

200 meters away.

3.2.10 Analysis of the Accident

The following analysis is based on 2.1.1 to 2.1.4, 3.1, and 3.2.4 to 3.2.9.

(1) Vessel A

- i) It is probable that, at about 05:55, while heading northeast toward Osaka Nanko in the waters to the west of Kansai International Airport, Pilot A saw five or six fishing vessels (including Vessels S) heading north, and thought that if those vessels continued traveling straight they may collide with Vessel A, and while monitoring their movements, he noticed that Vessel E, Vessel F, Vessel G, and Vessel H were reducing speed.
- ii) It is probable that Pilot A maintained the course and speed of Vessel A because, although there was no change in the bearing of Vessels S, he thought that if Vessel A turned to starboard or reduced speed, it would draw close to Vessel G and Vessel H in the starboard direction, and if Vessel A turned to port it would draw close to the surrounding fishing vessels.
- iii) It is somewhat likely that Master A noticed that between about 05:56 and 05:57, Vessels S were heading straight towards the bow of Vessel A, and told Pilot A to exercise caution because Vessels S were cutting across, and take action to avoid a collision, but Pilot A was extremely nervous and did not hear Master A's instructions.
- iv) It is probable that, although Pilot A pressed a button on the whistle control panel to try to sound the whistle to alert Vessels S when Vessel A was within approximately 1,000 meters, and again at a distance of approximately 200 meters, the whistle did not sound and no change was seen in the bearing of Vessels S.
- v) It is probable that Pilot A thought that changing course or reducing speed would bring Vessel A closer to the surrounding vessels, so he was unable to make a decision about how to avoid a collision with Vessels S, and he therefore maintained Vessel A's course and speed until drawing near to Vessels S.
- vi) It is probable that at about 05:58:44, Pilot A directed Ordinary Seaman A to steer hard to starboard, and although Vessel A began to turn around at about 05:58:51, the bow of Vessel A collided with the stern of Vessels S.

(2) Vessels S

- i) It is somewhat likely that Master B noticed Vessel A prior to 05:57 and after steering to starboard, he radioed Vessel C to tell those onboard to steer to starboard because Vessel A was approaching.
- ii) It is somewhat likely that, since Master C was keeping watch over the waters in the fore direction and monitoring the GPS plotter screen while focusing on maintaining the north bearing

as directed by Master D, he did not notice that Vessel A was approaching and did not notice the radio communication from Master B, and that from the time that Master B steered to starboard until about 05:57:57, he was steering to port in order to maintain the north bearing by counteracting the effect of Vessel B being steered to the starboard.

- iii) It is probable that Vessels S maintained its course and speed until drawing near to Vessel A because Master C was steering to port in order to maintain the north bearing by counteracting the effect of Vessel B being steered to the starboard.
- iv) It is probable that Master B began to steer hard to starboard at about 05:58 to 05:59 and although Master C also steered hard to starboard when Vessel A was within 100 to 200 meters, the stern of Vessels S collided with the bow of Vessel A.

3.3 Analysis Regarding Damage Mitigation

Based on 2.1.5, 2.8, and 3.2.3, it is probable that the seawater was approximately 10°C at the time of the accident, and that the reasonable upper limit of survival time in approximately 10°C seawater when dressed normally is about 15 hours, and that the fact that Crew B and Master C were able to escape from the wheelhouses immediately after their vessels capsized, and the fact that Master D noticed the accident and immediately went to rescue them helped Crew B and Master C to survive and avoid hypothermia.

4 CONCLUSIONS

4.1 Probable Causes

It is probable that the accident was occurred as, while, both Vessel A was sailing northeast under the pilotage of Pilot A and Vessels S was sailing north, both Vessel A and Vessels S sailed maintaining the their courses and speeds until coming close each other, at night off the west coast of Kansai International Airport.

It is probable that Vessel A maintained its course and speed until coming close to Vessels S because Pilot A thought that changing course or speed would bring Vessel A come close to the surrounding fishing vessels, and Pilot A was unable to decide on a way of avoiding a collision with Vessels S.

It is somewhat likely that Vessels S maintained its course and speed until coming close to Vessel A because, although Master B noticed of Vessel A and steered Vessel B to starboard and talked to Vessel C over the radio, Master C did not notice the approach of Vessel A and the radio communication from Master B, Master C was concentrated on maintaining Vessel C heading toward north as instructed by Master D, and was steering to port in order to maintain the north bearing by counteracting the effect of Vessel B being steered to the starboard.

4.2 Other Identified Safety Issues

- (1) It is somewhat likely that if Vessel A blew whistle when Vessel A were in risk of collision with Vessels S, Master C could be aware of Vessel A's presence in earlier stage.
- (2) It is somewhat likely that if Master A and Pilot A had implemented BRM, and had shared information relating to the movements of group of fishing vessels including Vessels S, and on how to avoid a collision, actions to avoid a collision with Vessels S could have been taken earlier.

5 SAFETY ACTIONS

The following measures need to be implemented for prevention of recurrence of similar accidents.

- (1) When navigating areas congested with fishing vessels or other vessels, and a collision with those vessels is possible, conning officers should at an early stage with plenty of time to spare, make appropriate judgements about the movements of other vessels to avoid collision, and speed reduction.
- (2) When there is a risk of collision with other vessel, conning officers should be aware of the fact that conning officers of the other vessels may not be aware of their vessel's presence, and should with absolute certainty alert other conning officers to their vessel's presence by for example sounding a whistle at an early juncture.
- (3) Pilots and shipmasters should implement BRM, share information about the movements of other vessels, and endeavor to navigate their vessel safely by cooperating with each other.
- (4) The masters of fishing vessels that are tied together in a similar manner to Vessels S should be aware of the fact that when the engine rpm of each vessel is matched and the rudders of each vessel are pointing in opposing directions, the handling of the vessels will be impaired, and in addition to carrying out an appropriate level of watchkeeping, they must also establish a means of communication in addition to radio communications such as direct communication between crew members that are not engaged in vessel navigation.

5.1 Measures Implemented After the Accident

5.1.1 Measures Implemented by the Osaka Wan Pilots' Association

In addition to informing its members about the accident, the Osaka Wan Pilots' Association also implemented the following measures.

- (1) Training for new pilots relating to navigation in Osaka Bay, etc.
 - i) Discussion regarding ship navigation in Osaka Bay.
 - ii) Discussion regarding the characteristics and action to avoid a collision taken by fishing vessels in Osaka Bay.
 - iii) Classes regarding congestion conditions in Osaka Bay during the Japanese sand lance fishing

season.

- iv) Discussion regarding methods of avoiding Japanese sand lance fishing vessels when they are sailing and when they are engaging in fishing operations.
 - v) Implementation of cruises on large vessels to view Japanese sand lance fishing vessels while sailing and while engaging in fishing operations.
- (2) The sending out to pilots of written notices prior to the start of the Japanese sand lance fishing season, building awareness of the importance of BRM, and thorough BRM education and training. In addition, the production of leaflets regarding Japanese sand lance fishing to be handed to the masters of vessels that request pilots.
- (3) Thoroughly reminding pilots to confirm after boarding a vessel the position and operating conditions of the whistle and daylight signaling lamp equipment, and ensure that they are usable at any time.
- (4) Establishment of a pilot work verification system for new pilots (implemented on May 1, 2014). 1st grade pilots (verified pilots) with at least five years' experience selected by the president of the association carry out twice-yearly verification of the safety and effectiveness of the navigation activities of 3rd grade pilots with less than three years' of solo piloting work experience, and where necessary provide guidance, make recommendations, or implement remedial measures.

5.1.2 Measures Taken by Company A

Company A circulated information on summary of the accident and following to all the vessels Company A operated.

- (1) The safety management manual should be strictly obeyed, and efforts should be implemented for safe operation of the vessels.
- (2) Importance of BRM should be affirmed and, when a pilot is onboard, information should be shared, and efforts should be implemented to cooperate with each other for safe operation of the vessels.
- (3) Whenever possible, choose navigation routes that do not pass through areas crowded with fishing vessels, and when this is not possible, sharp lookout should be kept, and actions to avoid collision should be made in ample time in accordance with the International Regulations for Preventing Collisions at Sea.

5.2 Required Accident Prevention Measures

It is desirable that conning officers and masters of sailing fishing vessel tied together with other vessel thoroughly implement the following measures.

5.2.1 Conning Officers

- (1) When navigating waters that are congested with fishing vessels and there is a predicted risk of collision, sufficiently early judgements must be made about the movements of other vessels and actions such as speed reduction must be taken to prevent collisions.
- (2) In situations where there is a risk of collision with other vessels, conning officers need to be aware of the fact that those onboard the others vessels may not be aware of the presence of their vessel and should alert them at an early juncture by sounding the whistle, etc.

5.2.2 Masters of Sailing Fishing Vessel tied together with other vessel

Masters must be aware of the fact that when the engine number of revolutions of each vessel is matched, and the rudders of each vessel are pointing in opposing directions the handling of the vessels will be impaired, and in addition to carrying out an appropriate level of watchkeeping, they must also establish a means of communication in addition to radio communications such as direct communication between crew members that are not engaged in vessel navigation.

Figure 1: Estimated navigation routes (full figure)

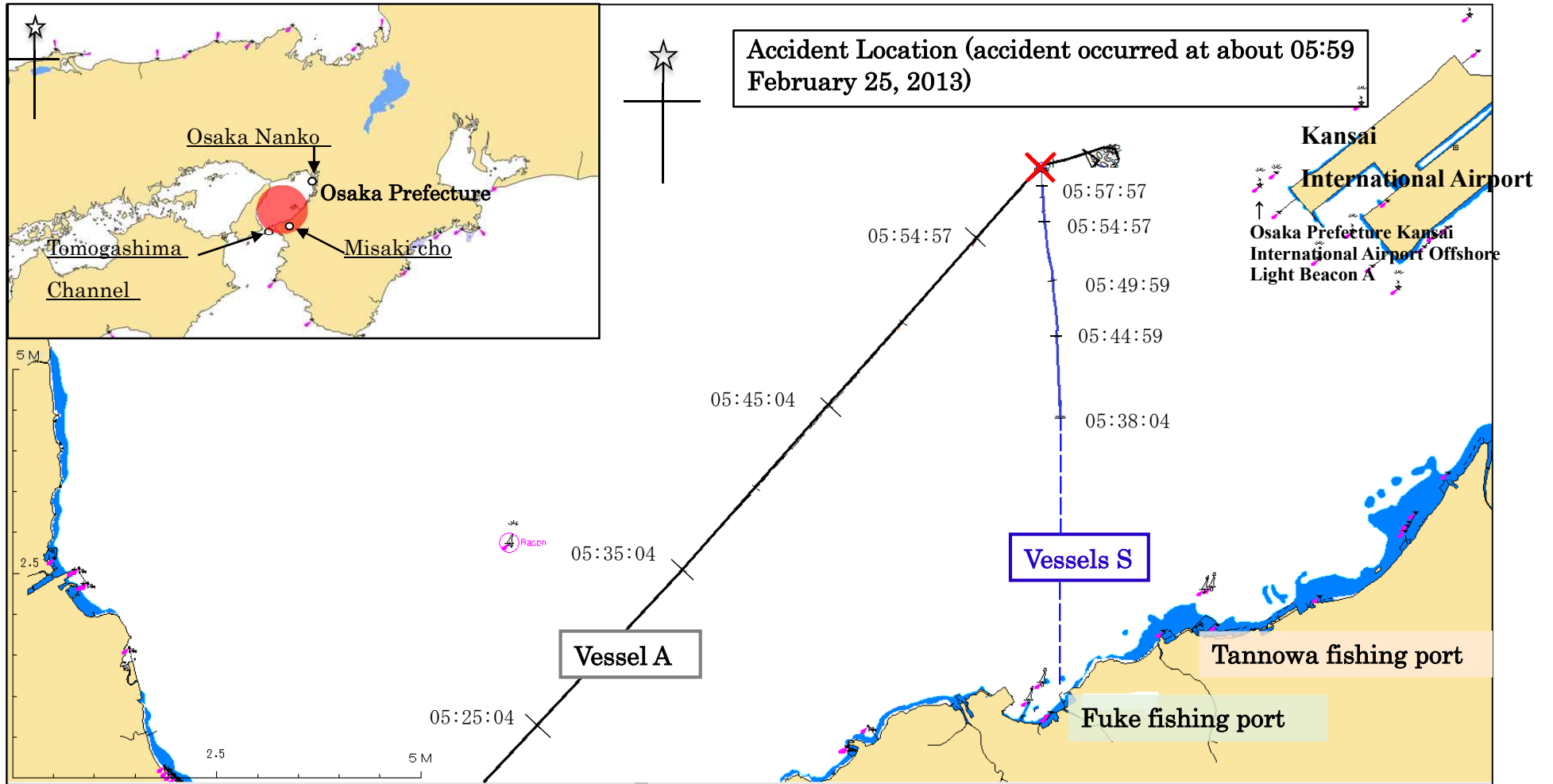


Figure 2: Estimated navigation routes (enlarged figure)

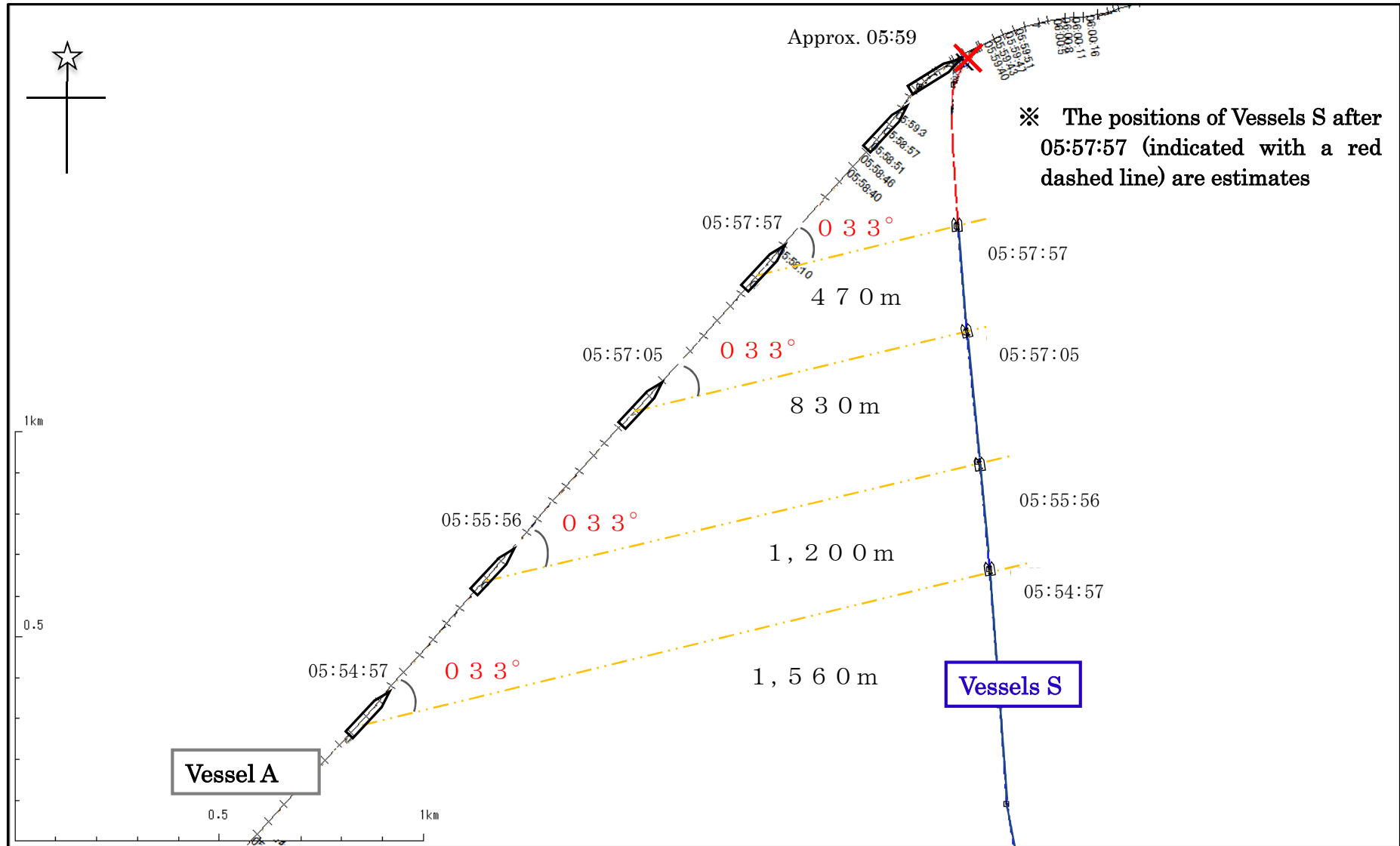
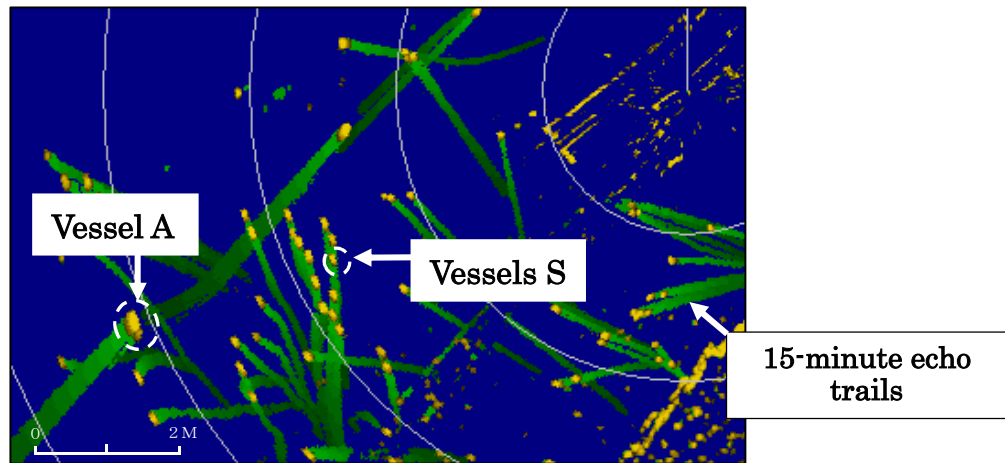


Figure 3 Radar Image 1

(1) About 05:45:00 (prior to the accident)



(2) About 06:00:00 (after the accident)

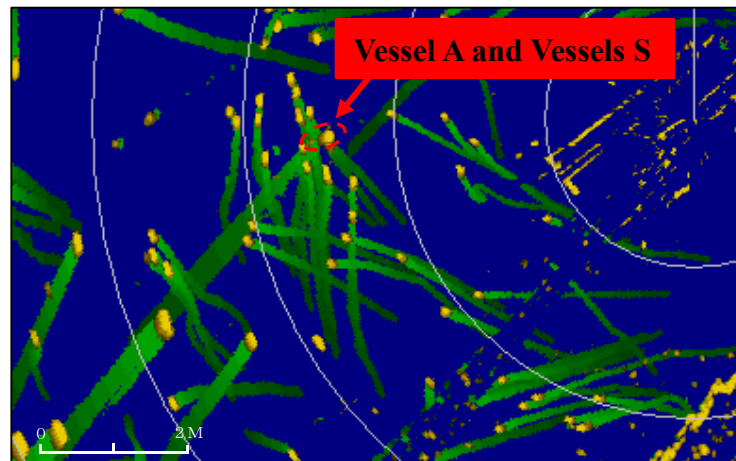


Figure 4: Superimposed radar image

(Superimposed images from about 05:45:00 and 06:00:00)

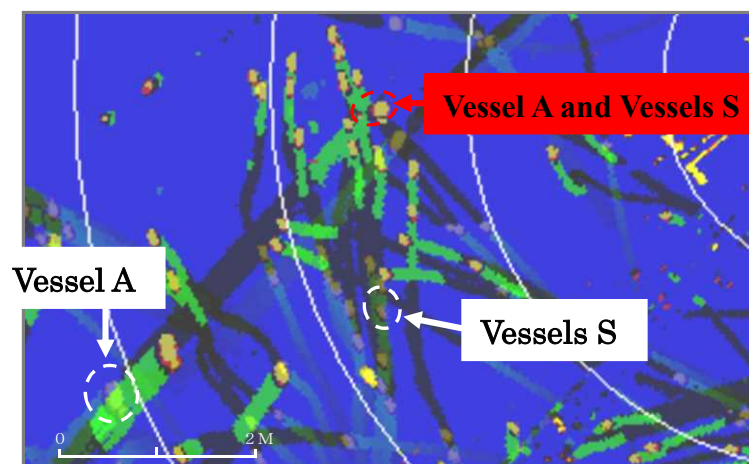
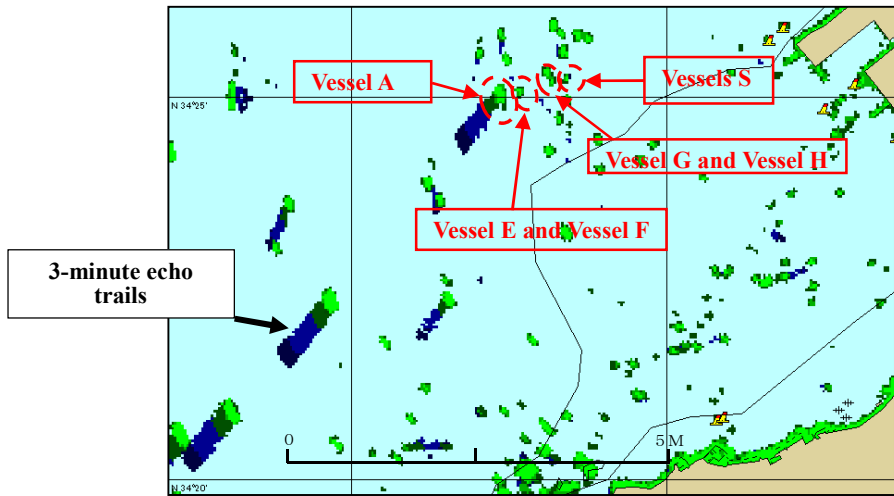
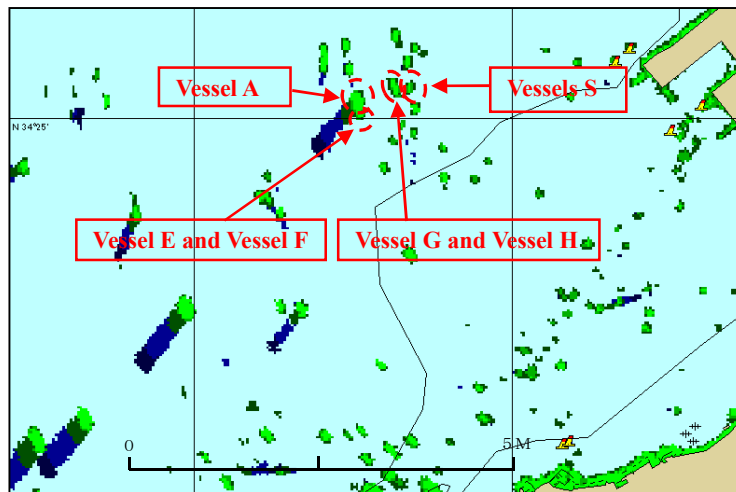


Figure 5 Radar Image 2

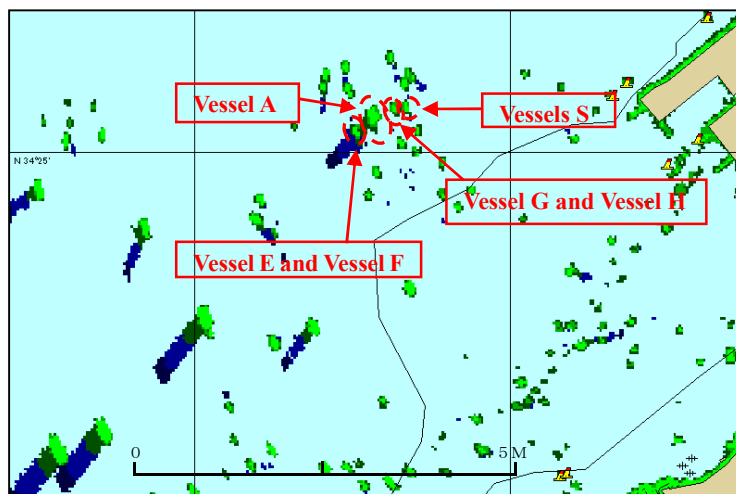
(1) About 05:54:57



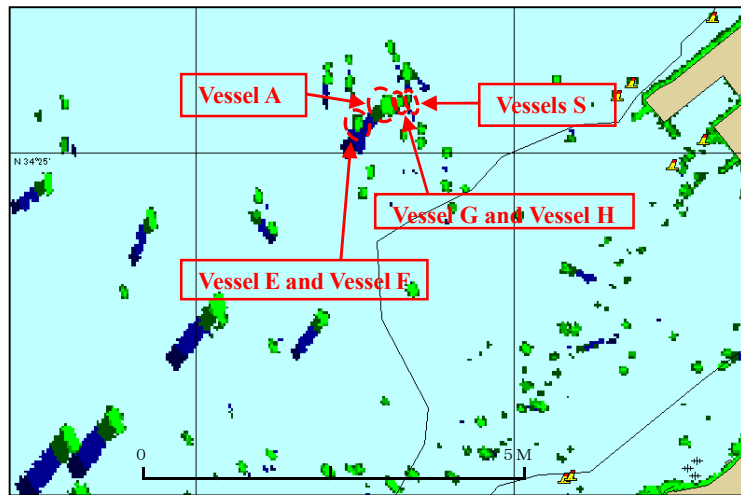
(2) About 05:55:56



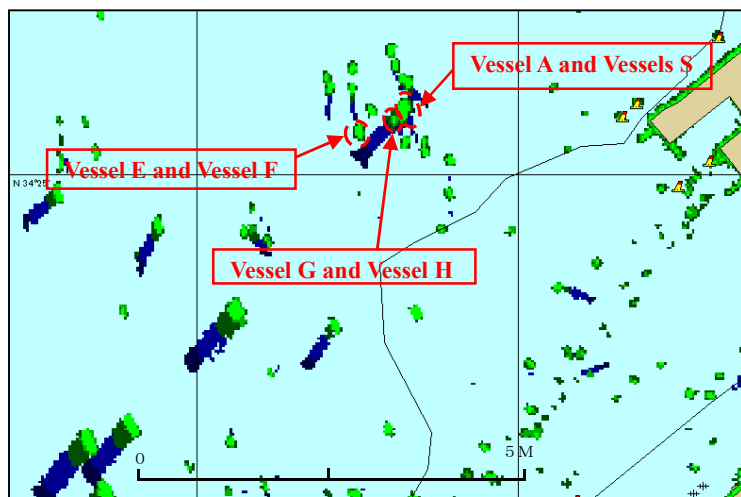
(3) About 05:57:05



(4) About 05:57:57



(5) About 05:58:59



“Summary of meeting (informal pilot review meeting) on the implementation of the pilot system including pilot training (June 10, 2013)” (excerpt)

(From the website of the Maritime Human Resource Institute, Japan)

Education and training issue

A wide range of issues have been raised with regard to the existing education and training system that has been provided up until now, particularly trainees for the 3rd grade pilot course who have little experience as deck officers and are not competent enough as accomplished pilots and require further long-term training at each pilot association, even after completion of their training.

To address these issues, necessary measures should be taken so that trainees can acquire enough knowledge and skills during the training course aiming at providing personnel with quality desired by the pilot industry at early stage.

- Contents of the training course

① In-house training

To reform the in-house training course for each grade, including new courses, promotion, and multiple training, appropriate for the education of advanced-skilled professionals, it is necessary to substantially amend the course program to include pragmatic and practical content focused on obtaining knowledge that is required in actual pilotage work.

② Onboard training on merchant ship

- a) As new graduates have little experience onboard and therefore have insufficient training on “the ordinary practice of seamen” which is required for navigation duties, a considerable amount of time and effort are needed.

To address this issue, with the cooperation of shipping companies, onboard training onboard ocean going merchant ships as deck officers for more than one year (within two calendar years) is to be required for those trainees who have less than one year experience as a deck officer.

- b) Onboard training is supposed to be the same as training of shipping companies for newly hired deck officers and is left to the companies and ship masters, however, considering it is also a part of pilot training, it is required, as far as possible, to submit assignment reports indicating goals and tasks to be accomplished, to encourage obtaining license of second grade navigational officer (deck), and requires necessary trainings while at shore.

③ Ship handling training on simulator

• Although ship handling simulators have received a measure of recognition as for birthing/leaving training, they are said to be insufficient for navigation training. To address this issue, to achieve training in realistic situations where actions of other vessels are not predictable, introduce trainings on multi-cubicle type simulators with which each trainee operates a ship at once in a sea area using multiple simulators.

④ Other trainings

• In terms of onboard pilotage training, include simulator trainings reflecting navigational situations, which are likely to be encountered in each pilotage area in the onboard training, aiming at the further enhancement of the effectiveness of the training.

- Structure of training scheme

① Trainers

• As for trainers for the new training scheme, which was modified to include more practical content, it is appropriate that the majority of the course is taught by pilots.

• As for other trainings on related matters, it is appropriate to use external teachers who are actually engaged in each related matter.

3 rd Grade Pilots (New)		Current	Following the revision (main concepts)					
Practical onboard training on merchant ships, etc.	4 months		Common	Practical onboard training on merchant ships, etc.*	24 months	Practical onboard training on merchant ships, etc.*	24 months	• Training onboard as a navigator, etc.
In-deck training	95 months			In-deck training	55 months	In-deck training	6 months	• Specialization in practical pilot work
Ship operation simulator training	6 months		Pilotage area specific	Ship operation simulator training	35 months	Ship operation simulator training	5 months	• Smaller class sizes, use of multiple simulators to enhance efficiency
Onboard training on tugboats	05 months			In-deck training	05 months	Onboard training on tugboats	1 month	• Introduce new related business training based on training results
Practical pilot training	10 months		Ship operation simulator training	15 months	Practical pilot training	9 months	• Increase the actual quantity of training through class size reduction • Enhance training effectiveness through pilotage area-specific education	
Total	30 months		Onboard training on tugboats	1 month				Practical pilot training
			Practical pilot training	9 months	Total	45 months		

* Not required for those with at least one year's experience as a navigator or shipmaster (1000GT or over only. Excludes smooth water areas.).

* If moving from onboard training at a licensed maritime officer training facility to practical onboard training on merchant ships, six months will be added.