Annual Report 2017

Japan Transport Safety Board

JTSB Mission

We contribute to

- preventing the occurrence of accidents and
- mitigating the damage caused by them,

thus improving transport safety while raising public awareness, and thereby protecting the people's lives by

- accomplishing appropriate accident investigations which thoroughly unveil the causes of accidents and damages incidental to them, and
- urging the implementation of necessary policies and measures through the issuance of safety recommendations and opinions or provision of safety information.

JTSB Principles

1 Conduct of appropriate accident investigations

We conduct scientific and objective accident investigations separated from apportioning blame and liability, while deeply exploring into the background of the accidents, including the organizational factors, and produce reports with speed. At the same time, we ensure that the reports are clear and easy to understand and we make efforts to deliver information for better understanding.

2 Timely and appropriate feedback

In order to contribute to the prevention of accidents and mitigation of the damage caused by them, we send messages timely and proactively in the forms of recommendations, opinions or factual information notices nationally and internationally. At the same time, we make efforts towards disclosing information in view of ensuring the transparency of accident investigations.

3 Consideration for victims

We think of the feelings of victims and their families, or the bereaved appropriately, and provide them with information regarding the accident investigations in a timely and appropriate manner, and respond to their voices sincerely as well.

4 Strengthening the foundation of our organization

We take every opportunity to develop the skills of our staff, including their comprehensive understanding of investigation methods, and create an environment where we can exchange opinions freely and work as a team to invigorate our organization as a whole.

A Message from the Chairman

The Japan Transport Safety Board (JTSB) is a government organization tasked with investigating the causes of accidents and serious incidents in the transport sector. The sector is closely connected to all of our lives in the modes of aviation, railways and marine. Based on the outcome of these investigations, our goal is to improve transport safety and protect people's lives by safety recommendations to prevent accidents or to reduce damage when an accident occurs.

In 2016, many accidents and serious incidents still occurred throughout Japan. For example, there were the "Serious incident involving an aircraft of Korean Air at Haneda airport" in May in aviation mode, the "Kyusyu Shinkansen derailment due to the Kumamoto earthquake" in April in railways mode and the "Capsizing accident of a fishing vessel, Daifuku Maru" in December in marine mode. We are proceeding with these investigations.

In addition, the JTSB is striving to enhance and upgrade its system of investigation to ensure accurate and prompt investigation of accidents and serious incidents. We are also working hard to prevent a recurrence of such accidents or serious incidents by releasing information on the findings obtained in our investigations.

As well as the above, we publish investigation reports at the end of investigations. The 938 investigation reports published in 2016 included: the report in November on the "Accident involving an aircraft of Asiana Airlines (collision with ground facilities) at Hiroshima airport" in April 2015 in aviation mode; the report in July on the "Serious incident (fall of a utility pole on tracks) on JR Tohoku Line (Yamanote Line)" in April 2015 in railways mode; and the report in July on the "Capsizing accident of a fishing vessel, Genpuku Maru No.1" in December 2014 in marine mode. Among these, safety recommendations to take measures to enhance safety were issued in the investigation report of the Asiana Airlines accident based on the Chicago convention.

"JTSB Annual Report 2017" gives brief descriptions of accidents that occurred and became subject to investigation in 2016, and an outline of investigation reports published in 2016, with additional statistics and other data. I expect the Annual Report will provide useful lessons for improving safety in your various activities.

I hope I can count on your continued understanding and support in connection with JTSB activities in future.

Kazuhiro Nakahashi
Chairman
Japan Transport Safety Board
June 2017

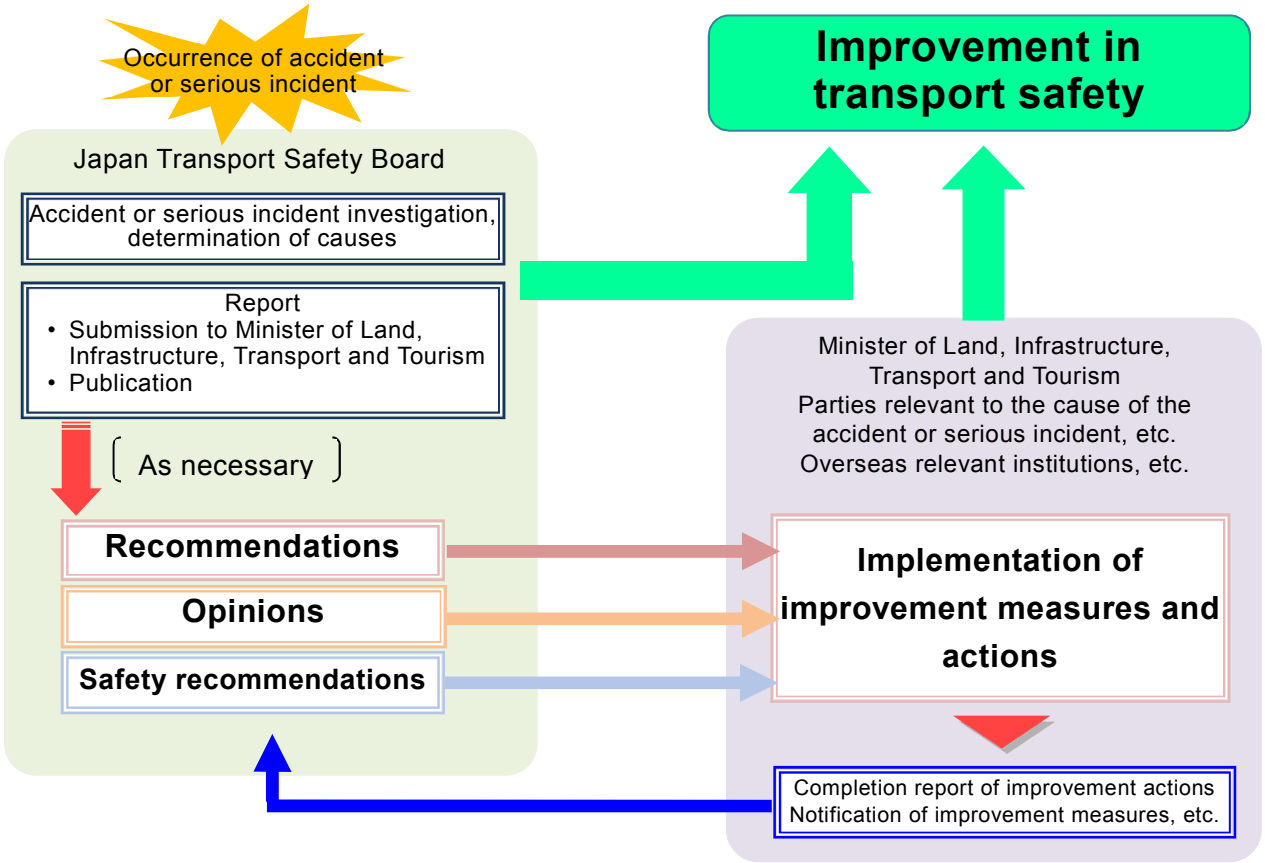
Japan Transport Safety Board
Annual Report 2017

Contents

Chapter 1 Summary of Recommendations and Opinions Issued in 2016

In order to fulfill the objectives of the law specified in Article 1 of the Act for Establishment of the Japan Transport Safety Board (hereinafter referred to as "Establishment Act"), the Japan Transport Safety Board has been established as an external bureau of the Ministry of Land, Infrastructure, Transport and Tourism based on the regulations of Paragraph 2, Article 3 of the National Government Organization Act (Article 3 of the Establishment Act). Its duty is to accurately conduct investigations identifying the causes of aircraft, railway, and marine accidents and serious incidents, as well as the causes of damage occurring due to those accidents and serious incidents, while also requesting required measures and actions to be taken by the Minister of Land, Infrastructure, Transport and Tourism or parties relevant to the causes of accidents or serious incidents, based on the results of its investigations (Article 4 of the Establishment Act).

Specifically, the Japan Transport Safety Board has the ability to give recommendations to the Minister of Land, Infrastructure, Transport and Tourism or parties relevant to the causes of accidents or serious incidents, regarding measures that should be taken for the prevention of accidents or serious incidents, or for reducing their damage, based on the results of its accident investigations. The Minister of Land, Infrastructure, Transport and Tourism must provide notifications to the Japan Transport Safety Board on measures that have been taken based on its recommendations, and if parties relevant to the causes of accidents or serious incidents do not take measures in response to recommendations that have been given, the Japan Transport Safety Board has the ability to publicly disclose that fact (Articles 26 and 27 of the Establishment Act).



In addition to actions based on individual accident investigation results, if it is recognized to be necessary at an interim stage of investigations or from investigation results of multiple past accidents, the Japan Transport Safety Board has the ability to state its opinions to the Minister of Land, Infrastructure, Transport and Tourism or the directors of related government institutions regarding measures that should be taken to prevent accidents or serious incidents and to reduce their damage (Article 28 of the Establishment Act).

In the cases of aircraft and marine accidents and serious incidents, the Japan Transport Safety Board may provide recommendations (safety recommendations) on measures that should be taken quickly in order to improve safety, to related overseas institutions or parties as necessary in any stage of accident investigations, based on international treaties.

The recommendations and safety recommendations issued by the Japan Transport Safety Board in 2016 are summarized as follows.

There were no opinions issued.

1 Recommendations

Aircraft Accident involving a Viking Air DHC-6-400 (Small Aeroplane), registered JA201D, operated by First Flying Co., Ltd.

(Recommendations on December 15, 2016)

Summary of the Accident

On Friday, August 28, 2015, at around 08:55 Japan Standard Time (JST: UTC + 9 hours. All times are indicated in JST on a 24-hour clock) a Viking DHC-6-400 registered JA201D and operated by First Flying Co., Ltd. departed from the side of the runway during landing at Aguni Airport for the purpose of passenger transport, collided with the airport perimeter fence and lateral groove and damaged aircraft.

There were 14 people on board the Aircraft, consisting of a PIC, a crewmember and 12 passengers (including one company employee). Of these, a crewmember and ten passengers suffered minor injuries.

The aircraft suffered substantial damage, but there was no outbreak of fire.

Probable Causes

It is highly probable that this accident occurred because, when the aircraft landed, the First Officer, as the PF in charge of flying, could not properly control the aircraft as it started to deflect after touchdown, as a result of which the aircraft departed from the side of the runway and collided with a fence on the airport perimeter.

It is probable that the aircraft started to deflect after touchdown because the PF forgot to perform the checklist, while the PIC, as the PM in charge of duties other than flying, did not properly monitor the situation or did not perform the necessary pointed out, as a result of which the aircraft touched down with the nose wheel deflected to the right.

It is somewhat likely that the PF could not properly control the aircraft as it started to deflect after touchdown, because his knowledge concerning the aircraft system of the aircraft was

inadequate, as a result of which he did not fully understand situations that cause deflection to start. It is somewhat likely, moreover, that the insufficient response by the PIC when an unforeseen situation arose contributed to this.

It is probable that the knowledge of the PF was inadequate and he did not fully understand situations that cause deflection to start, because the company had not properly confirmed the effectiveness of ground school training that should be undertaken prior to route training and training related to establishing knowledge.

Safety Recommendations to the First Flying Co., Ltd.

Ascertain the current situation of ground training and flight training correctly, and then improve its system for training to enable the stipulated training to be carried out properly.

2 Safety Recommendations

(1) Aircraft Accident involving an Airbus A320-200 (Large Aeroplane), registered HL7762, operated by Asiana Airlines, Inc.

(Safety Recommendations on November 24, 2016)

Summary of the Accident

On Tuesday, April 14, 2015, an Airbus A320-200, registered HL7762, operated by Asiana Airlines, Inc., as the scheduled Flight 162 of the company, approached lower than the prescribed approach path during approach to Hiroshima airport. The aircraft collided with the Aeronautical Radio Navigation Aids located in front of the runway 28 at 20:05 JST and KST, and it touched down in front of the threshold of the runway. Subsequently, it moved forward on the runway, and then deviated to the south side of the runway and came to a stop inside the runway strip of the airport.

There were 81 people on board, consisting of the Pilot-in-Command (PIC), six other crew members, a boarding mechanic and 73 passengers. Among them, 26 passengers and two crew members, 28 people in total, were slightly injured.

The aircraft was substantially damaged, but there was no fire breakout.

Probable Causes

It is certain that when landing on runway 28 at Hiroshima airport, the aircraft undershot and the PIC commenced executing a go-around; however, it collided with the Aeronautical Radio Navigation Aids located in front of runway 28 threshold, just before turning to climb.

Regarding the fact that the aircraft undershot, it is probable that there might be following aspects in causes: The PIC continued approaching without executing a goaround while the position of the aircraft could not be identified by visual references which should have been in view and identified continuously at or below the approach height threshold (Decision Altitude: DA); and as well, the first officer, as pilot-monitoring who should have monitored meteorological conditions and flight operations, did not make a call-out of go-around immediately when he could not see the runway at DA.

Regarding the fact that the PIC continued approaching without executing a goaround while the position of the aircraft could not be identified by visual references which should have been in view and identified continuously at or below DA, he did not comply with the regulations and Standard Operating Procedures (SOP), and it is probable that there was a background factor that the education and trainings for compliance of rules in the company was insufficient. In addition, regarding the fact that the first officer did not make an assertion of go-around, it is probable that the Crew Resource Management (CRM) did not function appropriately.

Safety Recommendations to the Ministry of Land Infrastructure and Transport, Republic of Korea

In order to contribute to prevention of recurrence of similar accidents based on the results of this accident investigation, Japan Transport Safety Board makes the safety recommendations that Ministry of Land Infrastructure and Transport, Republic of Korea should supervise Asiana Airlines, Inc. in the following items:

(1) The Company should reemphasize and reinforce the significance of compliance by flight crew members, while reviewing company procedures and ensuring comprehensive training.

(2) The Company should surely implement the education and training that flight crew members should refer primarily to visual references, using flight instruments as supplementary tools appropriately, when approaching below DA.

(2) Collision Accident involving the Cargo Ship FUKUKAWA and the Fishing Vessel TSUNOMINE MARU

(Safety Recommendations on March 31, 2016)

Summary of the Accident

While the cargo ship FUKUKAWA, on which the Master and nine other people crew were on board, was in its way in the north-east direction toward Hanshin Port Osaka District in the Sea of Genkai, and while the fishing vessel TSUNOMIME-MARU, on which the Skipper alone was on board, was in its way in the south-southeast direction toward Hakata Port, Fukuoka City, Fukuoka Prefecture, both collided in north off coast of Genkai Shima Island, Fukuoka City, at around 02:04 on June 15, 2013.

TSUNOMINE MARU, the Skipper died, caused damage to the bow section and capsized.

FUKUKAWA produced an abrasions on the port bow section, but there were no death and casualties.

Probable Causes

It is probable that this accident occurred, at night, when it became a restricted visibility state due to fog in the north offshore of the Genkai Shima Island, while FUKUKAWA was navigating in north-eastward and TSUNOMINE MARU was navigating in south-southeastward, because both ships maintained the course and speed in the same degree, they had collided together.

The reason for FUKUKAWA continued navigation maintaining the course and speed was that the third officer, while recognizing that TSUNOMINE MARU was coming towards FUKUKAWA, expected to be able to avoid TSUNOMINE MARU even by turning the direction after TSUNOMINE MARU approached nearer.

Safety Recommendations to the TIAN CHEN INT'L SHIPPING MANAGEMENT CO., LIMITED

The Japan Transport Safety Board, based on the results of the accident investigation, against the TIAN CHEN INT'L SHIPPING MANAGEMENT CO., LIMITED, recommend the following actions to be taken.

(1) To the masters and crew members, captain and crew, when it became a restricted visibility condition, it shall be thoroughly instructed to comply with the Safety Management Manual.

(2) To the masters and crew members it shall be thoroughly instructed to comply with the Urgent Procedure Book.

(3) To the masters, if a collision occurred, it shall be thoroughly instructed to carry-out notification to the search and rescue agencies of the coastal state and the TIAN CHEN INT'L SHIPPING MANAGEMENT CO., LIMITED, and return to the accident place, appropriately carry-out the search and rescue.

(4) As to the above (1) through (3), for the master and crew members of a ship owned or managed, education shall be strengthened by using the case of this accident, and it shall be thoroughly familiarized.

(3) Sinking Accident of Cargo Ship MING GUANG

(Safety Recommendations on August 25, 2016)

Summary of the Accident

When the cargo ship MING GUANG manned with a master and 9 crewmembers was sailing south-southwest to Kwangyang, Republic of Korea, the vessel's interior could have been flooded from taking on seawater and she foundered to the northwest of Ajigasawa Port, Ajigasawa Town, Aomori Prefecture, around 06:05 on December 26, 2014.

All ten of the crewmembers were rescued but three died.

Probable Causes

It is probable that the accident occurred because, while MING GUANG was sailing at night against waves from her starboard bow west of Tsugaru Strait, the Vessel foundered due to the fact that water from striking waves flooded the CO2 room, ballast tanks, and other compartments on the starboard side through holes in the hatch covers, ventilation fans, and air vent pipes of the upper deck and gaps in the manhole covers and access openings, etc." (hereinafter referred to as the "holes, etc., on the upper deck"), thereby causing a starboard list and putting the Vessel into a situation in which her upper deck's starboard edge became submerged, and that this resulted in the Vessel's turning on her side when a greater amount of water flooded into the hull's interior through hatch covers, access openings, etc., and the Vessel lost stability and turned over due to the effect of the wind and waves, which in turn allowed additional water to flood in.

It is probable that the flooding of the CO2 room, ballast tanks, and other compartments on the MING GUANG's starboard side from striking waves through holes, etc., on the upper deck occurred because the weathertightness of hatch covers, access openings, and other facilities of the upper deck was not maintained.

It is probable that the weathertightness of the hatch covers, access openings, and other facilities of the upper deck was not maintained because MING GUANG's crewmembers did not periodically check holes, etc., on the upper deck to maintain her weathertightness.

Safety Recommendations to the HK SAFE BLESSING SHIPPING and the Kingdom of Cambodia

It is probable that this accident occurred because MING GUANG was flooded through holes in the hatch covers, ventilation fans, and air vent pipes of the upper deck and gaps in the manhole covers and access openings, etc." (hereinafter referred to as the "holes, etc., on the upper deck") while she sailed through waves coming from her starboard bow.

It is probable that MING GUANG's flooding through holes, etc., on the upper deck occurred because the vessel's weathertightness was not being maintained, as crewmembers did not periodically check holes, etc., on the upper deck to maintain her weathertightness.

It is probable that HK SAFE BLESSING SHIPPING Ltd. did not appropriately engage in safety management of MING GUANG, such as by properly manning the Vessel and providing education for her crewmembers, and that MING GUANG sailed in a condition that exceeded her load line that was set based on the International Convention on Load Lines of 1966.

It is somewhat likely that if the Chief Officer had put on an immersion suit before abandoning the Vessel and if the Second Officer and the surviving Able Seaman had been able to prevent the inflow of seawater into the immersion suits they were wearing, the Chief Officer and the Second Officer would have survived and the surviving Able Seaman would not have suffered hypothermia.

In view of the result of this accident investigation, the Japan Transport Safety Board recommends that HK SAFE BLESSING SHIPPING, as the management company, and the Kingdom of Cambodia, as the flag state of the MING GUANG, should take the following measures to prevent recurrence of similar accidents and reducing damage.

HK SAFE BLESSING SHIPPING should engage in thoroughgoing vessel safety management that includes manning the vessels it manages with crewmembers who possess legally valid certificates of competence and appropriately providing education to crewmembers, and should instruct crewmembers to engage in the following practices:

(1) Crewmembers shall maintain weathertightness by periodically checking the integrity and closed condition of weathertight closing devices, etc., on the upper deck.

(2) Masters shall maintain sufficient freeboard in compliance with the International Convention on Load Lines of 1966.

(3) Crewmembers shall understand that seawater can enter immersion suits that are being worn, and shall wear immersion suits appropriately by periodically inspecting their storage conditions and practice putting them on.

Authorities of the Kingdom of Cambodia should direct management companies and recognized organizations to ensure that vessels in its registry are manned with personnel who possess the legally valid certificates of competence that are specified in Minimum Safe Manning Certificates and that safety management such as above items (1) to (3) are thoroughly practiced aboard them.

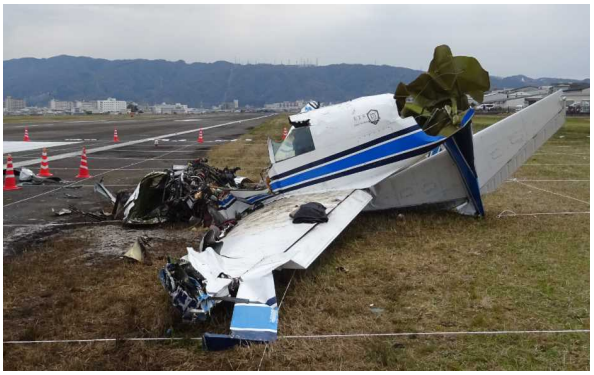
Chapter 2 Summary of major investigation activities in 2016

1 Statistics of accident investigation activities

In the case of occurrence of aircraft, railway, or marine accidents, the JTSB designates an investigator-in-charge and accident investigators who begin investigations to determine their causes. Since we can never know when or where accidents may occur, the personnel of the Board, including accident investigators, are making continuous efforts to be able to conduct investigation activities immediately when accidents should occur.

Various accidents occurred in 2016.

In terms of aviation, there were 13 aircraft accidents. These included an accident at New Chitose Airport in February, when smoke appeared inside a Boeing 737-800 aircraft operated by Japan Airlines Co., Ltd. while it was taxiing prior to takeoff, as a result of which the emergency evacuation slide was used on the taxiway and some passengers were injured while being evacuated. Another case was an accident at Yao Airport in March, when a privately-owned Mooney M20C crashed after landing and going around. We investigated the causes of 44 accidents in all, including 31 ongoing investigations from the previous year. Beside these, there were 10 aircraft serious incidents involving aircraft, including an incident in December when an Airbus A320-214 aircraft operated by Peach Aviation Co., Ltd. attempted to land on a closed runway at Tokyo International Airport. We investigated the causes of 22 serious incidents in all, including 12 ongoing investigations from the previous year.



Of the above, we have published investigation reports on 28 aircraft accidents and seven serious incidents following completion of the respective investigations.

Of the published investigation reports, we issued recommendations to First Flying Co., Ltd. regarding the “Aircraft Accident involving a Viking DHC-6-400 operated by First Flying Co., Ltd.” and safety recommendations to the Ministry of Land Infrastructure and Transport of the Republic of Korea regarding the “Aircraft Accident involving an Airbus A320-200 operated by Asiana Airlines, Inc.”

(For more details, see Chapter 1 “Summary of Recommendations and Opinions Issued in 2016”, p.4.)

In terms of railways, there were 23 railway accidents in all. These included a derailment between Kumamoto Station and Kumamoto Railway Carriage Depot on the Kyushu Shinkansen of Kyushu Railway Company in April, and a derailment between the Suwa-Jinja-Mae and Kokaido-Mae tram stops on the Sakuramachi branch line of Nagasaki Electric Tramway Co., Ltd. in June. We investigated the causes of 36 accidents in all, including 13 ongoing investigations from the previous year. As for railway

serious incidents, there were two cases including a serious incident in which a moving train entered a section of track on Keisei Electric Railway Main Line that was closed for maintenance work in July. We investigated the causes of four incidents in all, including two ongoing investigations from the previous year.

Of the above, we have published investigation reports on 17 railway accidents and two serious incidents following completion of the respective investigations.

In terms of marine, a total of 738 marine accidents were investigated. These included a collision accident between the container ship SINOKOR INCHEON and the fishing vessel TOSHI MARU in February, and an explosion accident involving the chemical tanker EIWA MARU 3 in September. We investigated the causes of 1,354 accidents in all, including 617 ongoing investigations from the previous year (excluding cases that proved non-applicable as a result of the initial investigation). Besides these, 117 marine incidents were investigated. We investigated the causes of 178 incidents in all, including 62 ongoing investigations from the previous year (excluding cases that proved non-applicable as a result of the initial investigation).

Of the above, we have published investigation reports on 778 marine accidents and 106 marine incidents following completion of the respective investigations.

Of the published investigation reports, we issued safety recommendations to TIAN CHEN INT'L SHIPPING MANAGEMENT CO., LIMITED (shipping management company) regarding the "Collision Accident involving the Cargo Ship FUKUKAWA and the Fishing Vessel TSUNOMINE MARU". We also issued safety recommendations to HK SAFE BLESSING SHIPPING LTD. (shipping management company) and the relevant authority in the Kingdom of Cambodia regarding the "Sinking Accident of Cargo Ship MING GUANG".

(For more details, see Chapter 1 "Summary of Recommendations and Opinions Issued in 2016" pp.5-7.)

Accident investigators conduct investigations and invite comments from parties relevant to the cause of the accident; accordingly, they make draft recommendations or opinions regarding the measures to be taken to prevent the recurrence of accidents and to mitigate damage caused by accidents. Therefore, they shall endeavor to improve their level of skill and knowledge by participating in national and international training; moreover, they share accident information among international society by attending international conferences.

In the future, we will continue to carry out thorough investigations into the causes of aircraft, railway, and marine accidents, and will publish our investigation reports as soon as possible. Based on the results of our investigations, who will also make recommendations and state our opinions as necessary to related government institutions and parties relevant to the causes of accidents to prevent the recurrence of accidents.

Chapter 3 Aircraft accident and serious incident investigations

1 Aircraft accidents and serious incidents to be investigated

<Aircraft accidents to be investigated>

◎Paragraph 1, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of aircraft accident)

The term "Aircraft Accident" as used in this Act shall mean the accident listed in each of the items in paragraph 1 of Article 76 of the Civil Aeronautics Act.

◎Paragraph 1, Article 76 of the Civil Aeronautics Act (Obligation to report)

1 Crash, collision or fire of aircraft;
2 Injury or death of any person, or destruction of any object caused by aircraft;
3 Death (except those specified in Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism) or disappearance of any person on board the aircraft;
4 Contact with other aircraft; and
5 Other accidents relating to aircraft specified in Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism.

◎Article 165-3 of the Ordinance for Enforcement of the Civil Aeronautics Act

(Accidents related to aircraft prescribed in the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism under item 5 of the paragraph1 of the Article 76 of the Act)

The cases (excluding cases where the repair of a subject aircraft does not correspond to the major repair work) where navigating aircraft is damaged (except the sole damage of engine, cowling, engine accessory, propeller, wing tip, antenna, tire, brake or fairing).

<Aircraft serious incidents to be investigated>

◎Item 2, Paragraph 2, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of aircraft serious incident)

A situation where a pilot in command of an aircraft during flight recognized a risk of collision or contact with any other aircraft, or any other situations prescribed by the Ordinances of Ministry of Land, Infrastructure, Transport and Tourism under Article 76-2 of the Civil Aeronautics Act.

◎Article 76-2 of the Civil Aeronautics Act

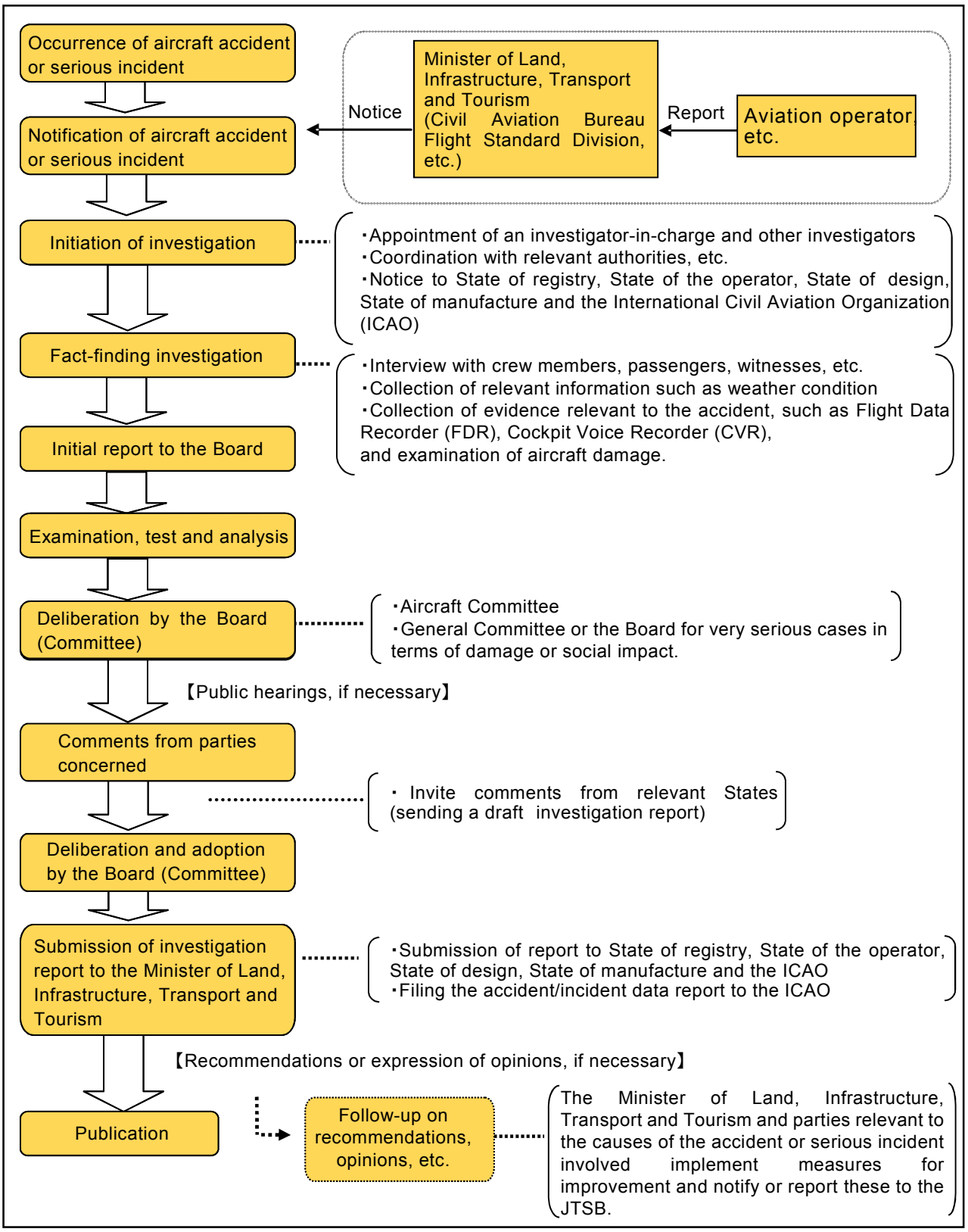
・When the pilot in command has recognized during flight that there was a danger of collision or contact with any other aircraft.

・When the pilot in command has recognized during flight that there is a danger of causing any of accidents listed in each item of paragraph 1, article 76 of the Civil Aeronautics Act, specified by Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism.

◎**Article 166-4 of the Ordinance for Enforcement of the Civil Aeronautics Act** (The case prescribed in the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism under Article 76-2 of the Civil Aeronautics Act)

1 Take-off from a closed runway or a runway being used by other aircraft or aborted take-off
2 Landing on a closed runway or a runway being used by other aircraft or attempt of landing
3 Overrun, undershoot and deviation from a runway (limited to when an aircraft is disabled to perform taxiing)
4 Case where emergency evacuation was conducted with the use for emergency evacuation slide
5 Case where aircraft crew executed an emergency operation during navigation in order to avoid crash into water or contact on the ground
6 Damage of engine (limited to such a case where fragments penetrated the casing of subject engine
7 Continued halt or loss of power or thrust (except when the engine(s) are stopped with an attempt of assuming the engine(s) of a motor glider) of engines (in the case of multiple engines, 2 or more engines) in flight
8 Case where any of aircraft propeller, rotary wing, landing gear, rudder, elevator, aileron or flap is damaged and thus flight of the subject aircraft could be continued
9 Multiple malfunctions in one or more systems equipped on aircraft impeding the safe flight of aircraft
10 Occurrence of fire or smoke inside an aircraft and occurrence of fire within an engine fire-prevention area
11 Abnormal decompression inside an aircraft
12 Shortage of fuel requiring urgent measures
13 Case where aircraft operation is impeded by an encounter with air disturbance or other abnormal weather conditions, failure in aircraft equipment, or a flight at a speed exceeding the airspeed limit, limited payload factor limit operating altitude limit
14 Case where aircraft crew became unable to perform services normally due to injury or disease
15 Case where a slung load, any other load carried external to an aircraft or an object being towed by an aircraft was released unintentionally or intentionally as an emergency measure
16 Case where parts dropped from aircraft collided with one or more persons
17 Case equivalent to those listed in the preceding items

2 Procedure of aircraft accident/incident investigation



3 Statistics of investigations of aircraft accidents and serious incidents

The JTSB carried out investigations of aircraft accidents and serious incidents in 2016 as follows:

31 accident investigations had been carried over from 2015, and 13 accident investigations were newly launched in 2016. 28 investigation reports were published in 2016, and thereby 16 accident investigations were carried over to 2017.

12 serious incident investigations had been carried over from 2015, and 10 serious incident investigations were newly launched in 2016. Seven investigation reports were published in 2016, and thereby 15 serious incident investigations were carried over to 2017.

Among the 35 investigation reports published in 2016, one was issued with recommendations, and one was issued with safety recommendations.

Investigations of aircraft accidents and serious incidents in 2016

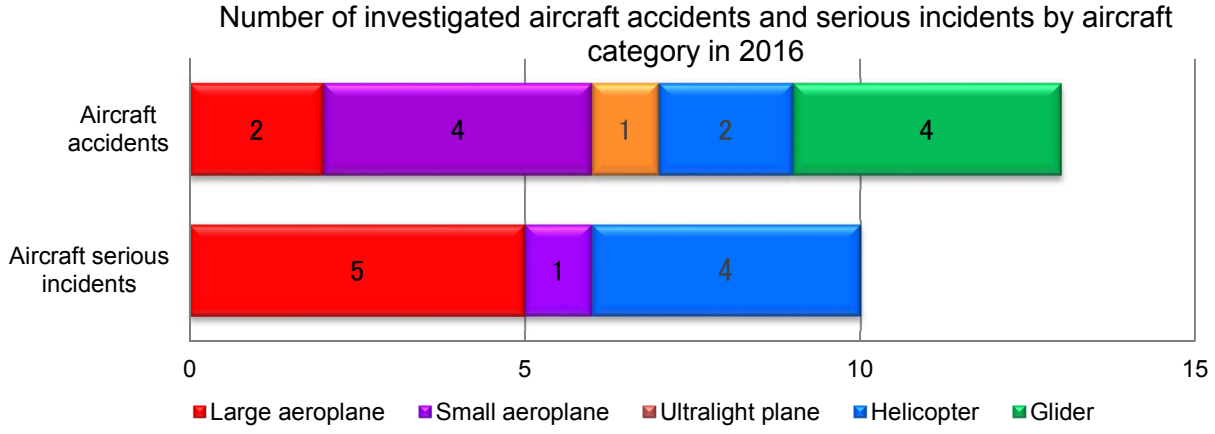
(Cases)

Category	Carried over from 2015	Launched in 2016	Total	Published investigation reports	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2017	(Interim report)
Aircraft accident	31	13	44	28	(1)	(1)	(0)	16	(0)
Aircraft serious incident	12	10	22	7	(0)	(0)	(0)	15	(0)

4 Statistics of investigations launched in 2016

The aircraft accidents and serious incidents that were newly investigated in 2016 consisted of 13 aircraft accidents, down by 14 from 27 for the previous year, and 10 aircraft serious incidents, up one from nine for the previous year.

By aircraft category, the aircraft accidents included two cases involving large aeroplanes, four cases involving small aeroplanes, one case involving ultralight plane, two cases involving helicopters, and four cases involving gliders. The aircraft serious incidents included five cases involving large aeroplane, one case involving small aeroplane, and four cases involving helicopters.



* Large aeroplane refers to an aircraft of a maximum take-off mass of over 5,700 kg.
* Small aeroplane refers to an aircraft of a maximum take-off mass of under 5,700 kg except for Ultralight plane.

In the 13 aircraft accidents, the number of casualties was 13, consisting of eight deaths and five injured persons.

Statistics of number of casualties (aircraft accident)

(Persons)

2016							
Aircraft category	Dead		Missing		Injured		Total
	Crew	Passengers and others	Crew	Passengers and others	Crew	Passengers and others	
Large aeroplane	0	0	0	0	1	3	4
Small aeroplane	1	3	0	0	0	1	5
Ultralight plane	0	0	0	0	0	0	0
Helicopter	0	0	0	0	0	0	0
Glider	3	1	0	0	0	0	4
Total	4	4	0	0	1	4	13
	8		0		5		

5 Summaries of aircraft accidents and serious incidents which occurred in 2016

The aircraft accidents and serious incidents which occurred in 2016 are summarized as follows: The summaries are based on information available at the start of the investigations and therefore are subject to change depending on the course of investigations and deliberations.

(Aircraft accidents)

1	Date and location of accident	Operator	Aircraft registration number and aircraft type
	February 23, 2016 On New Chitose Airport taxiway, Hokkaido	Japan Airlines Co., Ltd.	JA322J Boeing 737-800
	Summary	While the aircraft was taxiing prior to takeoff at New Chitose Airport, smoke appeared inside the cabin, as a result of which the emergency evacuation slide was used to evacuate the passengers on the taxiway. Of the three injured passengers, one was seriously injured and two suffered minor injuries.	
2	Date and location of accident	Operator	Aircraft registration number and aircraft type
	March 17, 2016 Sakae Town, Inba District, Chiba Prefecture	Privately owned	JA50KM PZL-Bielsko SZD-50-3 Puchacz (glider)
	Summary	The aircraft took off from Otone glider field, but crashed into a house near the location referred to above during flight. Two passengers died.	
3	Date and location of accident	Operator	Aircraft registration number and aircraft type
	March 23, 2016 Yanagita Town, Utsunomiya City, Tochigi Prefecture	Privately owned	JR1747 Ultralight Aircraft Challenger II-R447L (ultralight plane)
	Summary	The aircraft took off from Utsunomiya temporary airfield in Tochigi Prefecture for a leisure flight, but came into contact with trees and crashed while making its approach for landing after flying on a circular route. A total of two persons consisting of the pilot and the passenger were on board the aircraft, but neither of them was injured.	

4	Date and location of accident	Operator	Aircraft registration number and aircraft type
	March 26, 2016 Yao Airport, Osaka Prefecture	Privately owned	JA3788 Mooney M20C
	Summary	The aircraft took off Kobe Airport, bounced while the aircraft landed at Yao Airport and attempted go-around, but crashed into the above-mentioned place. The aircraft was destroyed and a fire broke out. A captain and three passengers were on board and all of them were fatally injured.	
5	Date and location of accident	Operator	Aircraft registration number and aircraft type
	April 10, 2016 Aso City Kumamoto Prefecture	Privately owned	JA2437 S.N. Centrair C 101B (glider)
	Summary	The aircraft crashed on the cross country course (lawn) by failure of forced landing in the Aso Tourism Ranch, with a winch has failed while climbing by winch launch for a familiarization flight from runway 26 of Aso Tourism Ranch landing field. The fuselage was destroyed. The Captain was not injured.	
6	Date and location of accident	Operator	Aircraft registration number and aircraft type
	May 5, 2016 Miharu Town, Tamura District, Fukushima Prefecture	Privately owned	JA21BB Glasflugel 304CZ-17 (glider)
	Summary	The aircraft took off from the Kakuda glider field in Miyagi Prefecture, but crashed near the location referred to above. One passenger died.	
7	Date and location of accident	Operator	Aircraft registration number and aircraft type
	May 6, 2016 Temporary airfield (Miho Airstrip), Shizuoka City, Shizuoka Prefecture	Privately owned	JA4023 Socata TB10
	Summary	On landing at the temporary airfield in Shizuoka City, Shizuoka Prefecture, the aircraft was unable to stop on the runway and overran it, causing damage to the aircraft. No one was injured.	
8	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 6, 2016 Kumamoto Airport, Kumamoto Prefecture	Privately owned	JA3628 Fuji Heavy Industries FA-200-180
	Summary	The aircraft took off from a temporary airfield inside Aso Dude Ranch in Yamada, Aso City, Kumamoto Prefecture for a leisure flight, but crashed onto the farm while flying on a circular route. The aircraft was destroyed and the pilot was severely injured.	
9	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 8, 2016 Hirasawa, Hadano City, Kanagawa Prefecture	Aero Asahi Corporation	JA6917 Kawasaki BK117C-2
	Summary	The aircraft took off from a temporary airfield in Isehara City, Kanagawa Prefecture, but touched down too strongly when landing at a temporary airfield in Hadano City, Kanagawa Prefecture, and the tail boom aft of the aircraft was broken off. No one was injured.	
10	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 9, 2016 Seawater pool in Shichigahama Town, Miyagi District, Miyagi Prefecture	Japan Coast Guard	JA968A Agusta AW139
	Summary	The aircraft took off from Sendai Airport, but when landing on the beach in the location referred to above for rescue activities, the bottom of the fuselage was damaged. No one was injured.	

11	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 25, 2016 On Runway B, Sendai Airport, Miyagi Prefecture	Civil Aviation College	JA5807 Hawker Beechcraft G58
	Summary	The aircraft took off from Sendai Airport, but when landing on Runway B during takeoff and landing practice at the Airport, it made a belly landing and stopped on the runway. No one was injured.	
12	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 10, 2016 Kokai, Oizumi Town, Oura District, Gumma Prefecture (Tonegawa river bed)	Privately owned	JA22WP Rolladen-Schneider LS4-b (glider)
	Summary	The aircraft took off from the Menuma glider field, but crashed in the location referred to above (on the north side of the glider field) during flight. One passenger died.	
13	Date and location of accident	Operator	Aircraft registration number and aircraft type
	November 10, 21016 While ascending after takeoff from Kagoshima Airport, Kagoshima Prefecture	Japan Airlines Co., Ltd.	JA658J Boeing 767-300
	Summary	The aircraft took off from Kagoshima Airport, but started to shake while ascending, and one member of cabin crew was injured.	

(Aircraft serious incidents)

1	Date and location of accident	Operator	Aircraft registration number and aircraft type
	March 1, 2016 At a height of approx. 100m above the vicinity of Mihama Town, Mikata District, Fukui Prefecture	Aero Asahi Corporation	JA9678 Aerospatiale AS332L1
	Summary	The aircraft took off from a temporary airfield in Mihama Town, Mikata District, Fukui Prefecture carrying a suspended cargo, but part of the cargo fell onto mountainous terrain inside the town during the flight (contents: electric insulators, weight approx. 800kg).	
2	Date and location of accident	Operator	Aircraft registration number and aircraft type
	March 21, 2016 On the runway at Kagoshima Airport, Kagoshima Prefecture	Privately owned	JA01YK Cirrus SR22T
	Summary	On landing at Kagoshima Airport, the nose gear broke and the aircraft stopped on the runway.	
3	Date and location of accident	Operator	Aircraft registration number and aircraft type
	April 17, 2016 At an altitude of approx. 12,000m near Matsue City, Shimane Prefecture	Ibex Airlines Co., Ltd.	JA06RJ Bombardier CL-600-2C10
	Summary	While the aircraft was turning back to Fukuoka Airport owing to bad weather at the destination, a malfunction occurred in the air bleed system (the system for sending air into the interior of the aircraft from the engine) near the location referred to above, and since the instrument display showed a drop in pressurization inside the cabin, the aircraft declared an emergency and landed at the Airport.	
4	Date and location of accident	Operator	Aircraft registration number and aircraft type
	May 27, 2016 On Runway C at Tokyo International Airport, Tokyo	Korean Air Lines	HL7534 Boeing 777-300

	Summary	While the aircraft was about to take off from Runway C at Tokyo International Airport, a malfunction occurred in the 1st (left-side) engine, causing the takeoff to be aborted and the aircraft to stop on the runway, whereupon the emergency evacuation slide was used to evacuate the passengers.	
5	Date and location of accident	Operator	Aircraft registration number and aircraft type
	May 27, 2016 At an altitude of approx. 5,000m approx. 50km southwest of Tokyo International Airport, Tokyo	All Nippon Airways Co., Ltd.	JA85AN Boeing 737-800
	Summary	The aircraft took off from Tokyo International Airport, but because the the cabin pressurization indicated a fall near the location referred to above during the climb, it turned back and landed at the said Airport.	
6	Date and location of accident	Operator	Aircraft registration number and aircraft type
	July 9, 2016 At an altitude of approx. 11,000m approx. 130km south-southeast of Chubu Centrair International Airport, Aichi Prefecture	Jetstar Japan Co., Ltd.	JA04JJ Airbus A320-232
	Summary	The aircraft took off from Fukuoka Airport, and although the speedometer indicators at the Pilot-in Command's and First Officer's seats were temporarily unstable near the location referred to above during the flight, they subsequently recovered, so that the aircraft continued to fly and landed at Narita International Airport.	
7	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 5, 2016 At a height of approx. 200m above the vicinity of Totsukawa Village, Yoshino District, Nara Prefecture	Aero Asahi Corporation	JA9678 Aerospatiale AS332L1
	Summary	The aircraft took off from a temporary airfield in Oto Town, Gojo City, Nara Prefecture carrying a suspended cargo, but part of the cargo fell onto mountainous terrain in the location referred to above during the flight (contents: one iron plate, weight approx. 800kg).	
8	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 7, 2016 At a height of approx. 150m above the vicinity of Hara, Sanjo City in Niigata Prefecture	Tohoku Air Service	JA6620 Kawasaki BK117B-2
	Summary	The aircraft took off from a temporary airfield in Sanjo City, Niigata Prefecture carrying a suspended cargo, but part of the cargo fell onto mountainous terrain inside the city during the flight (contents: approx. 250L of ready-mixed concrete, weight approx. 500kg).	
9	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 27, 2016 At a height of approx. 200m above the vicinity of Sakae Village, Shimo-Minochi District in Nagano Prefecture	Akagi Helicopter Co., Ltd.	JA9374 Fuji-Bell 204B-2
	Summary	The aircraft took off from a temporary airfield in Sakae Village, Shimo-Minochi District, Nagano Prefecture carrying a suspended cargo, but part of the cargo fell onto mountainous terrain inside the village during the flight (contents: office equipment, tools, etc., weight approx. 250kg).	
10	Date and location of accident	Operator	Aircraft registration number and aircraft type
	December 22, 2016 At a height of approx. 140m while approaching Tokyo International Airport, Tokyo	Peach Aviation Co., Ltd.	JA811P Airbus A320-214
	Summary	The aircraft took off from Taipei (Taoyuan), but when landing at Tokyo International	

		Airport, attempted to land on a closed runway instead of the runway instructed by the air traffic controller. The aircraft subsequently performed a go-around and landed at the Airport.

6 Publication of investigation reports

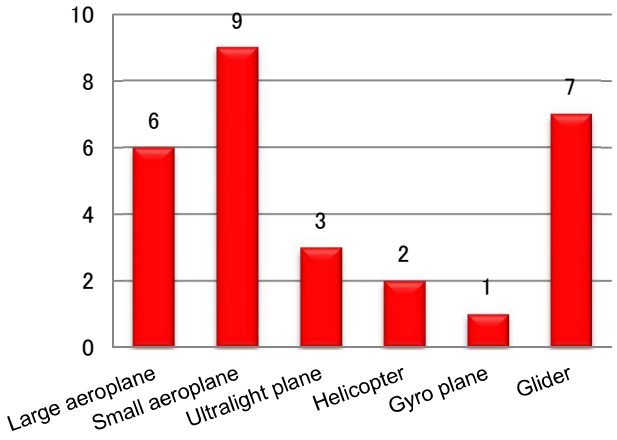
The number of investigation reports of aircraft accidents and serious incidents published in 2016 was 35, consisting of 28 aircraft accidents and seven aircraft serious incidents.

Breaking them down by aircraft category, the aircraft accidents involved six large aeroplanes, nine small aeroplanes, three ultralight planes, two helicopters, one gyro plane and seven gliders. The aircraft serious incidents involved four large aeroplanes, two small aeroplanes, and three helicopters.

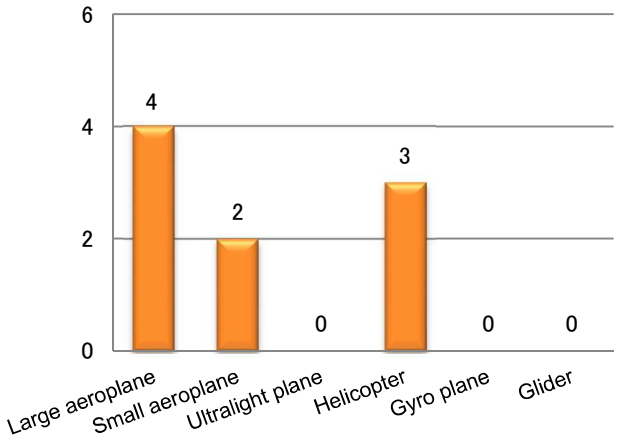
Note: In aircraft accidents and serious incidents, two or more aircraft are sometimes involved in a single case.

In the 28 accidents, the number of casualties was 70, consisting of five death, and 65 injured persons.

Number of published aircraft accident reports (28 cases) by aircraft category in 2016



Number of published aircraft serious incident reports (seven cases) by aircraft category in 2016



The investigation reports for aircraft accidents and serious incidents published in 2016 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/airrep.html

7 Actions taken in response to recommendations in 2016

Actions taken in response to recommendations were reported with regard to three aircraft accidents and one aircraft serious incident in 2016. Summaries of these reports are as follows.

① Aircraft serious incident involving a Eurocopter EC135T2, registration JA135E, operated by Hiratagakuen (Academic Corporation)

(Safety Recommendations on September 27, 2013)

Following its investigation of a serious incident at Kumejima temporary airfield on March 28, 2009, the Japan Transport Safety Board published an investigation report and issued safety recommendations to the European Aviation Safety Agency (EASA) on September 27, 2013. The Board received the following notice concerning actions taken in response to the recommendations.

○ Summary of the Serious Incident

A Eurocopter EC135T2, registration JA135E, operated by academic corporate body HIRATAGAKUEN, took off from Kumejima Helipad at 10:07 local time on March 28, 2009 for emergency patient transportation. When the helicopter was flying over the sea en route to Shuri Helipad on the main island of Okinawa, its left engine stopped around 10:20 at about 800 ft (about 240 m) about 6 nm (about 11 km) northwest of the Kerama Islands. It changed the destination to Naha Airport and landed there at 10:46.

There were six persons on board, consisting of the pilot in command (PIC) and a mechanic, a doctor and a nurse as medical personnel, and an emergency patient and an attendant, but no one was injured.

The inside of the left engine of the helicopter was destroyed, but there was no outbreak of fire.

○ Probable Causes

It is very likely that in this serious incident, the clogged injectors located relatively lower part of the left engine combustion chamber caused uneven fuel injection and combustion limited in the upper part, lead to a heat concentration to the Upper Structure resulting in engine interior damage.

Sea salt accumulation on fungicide with increased viscosity by heat probably clogged the fuel nozzles. Improper use of fungicide is probable. The JTSB could not determine the route of the sea salt penetration.

○ Safety Recommendations to European Safety Agency (EASA)

It is recommended that the European Safety Agency directs Eurocopter and Turbomeca to cooperatively study the helicopter operational environment and the effects of fungicide to inform helicopter customers of the proper dosing instructions and precautions.

○ Actions taken in response to the safety recommendations

Actions to be taken by the European Aviation Safety Agency (EASA)

After coordinating with Turbomeca, Airbus Helicopters Deutschland GmbH (AHD, formerly Eurocopter) reported back to EASA regarding the following process used for introducing new fuel specifications and additives.

－Engine limitations regarding fuels and fuel additives are detailed in the Engine Installation Manual.

－AHD assesses the applicable limitations (e.g. pressure limits, temperature limits, or specific mixing concentrations for additives), and takes these limitations into account when approving

aircraft standards, considering the helicopter operational environment. The outcome of this process is an update of the Rotorcraft Flight Manual (RFM) containing dosing instructions and approved additives.

* The original text of the notification from the European Aviation Safety Agency (EASA) can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/airkankoku/anzenkankoku8re_160202.pdf

② Aircraft serious incident involving a Boeing 737-700, registered JA16AN, operated by Air Nippon Co., Ltd.

(Recommendations and Safety Recommendations on September 25, 2014)

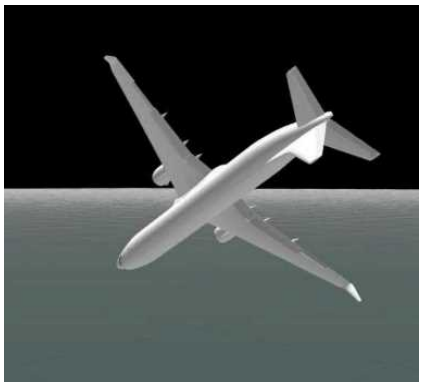
Following its investigation of an aircraft serious incident at an altitude of 41,000 ft about 69 nm east of Kushimoto on September 6, 2011, the Japan Transport Safety Board published an investigation report and also issued recommendations to All Nippon Airways Co., Ltd. as a party relevant to the cause of the serious incident and safety recommendations to the US Federal Aviation Administration (FAA) on September 25, 2014. The Board received the following notice on actions to be taken in response to the report, with regard to measures (implementation plans) based on the recommendations.

○ Summary of the Incident

On September 6 (Tuesday) 2011, a Boeing 737-700, registered JA16AN, operated by Air Nippon Co., Ltd., nosedived after having an unusual attitude (upset) at around 22:49 Japan Standard Time (JST: UTC+9hr, unless otherwise stated all times are indicated in JST) at an altitude of 41,000 ft about 69 nm east of Kushimoto while flying from Naha Airport to Tokyo International Airport as the scheduled flight 140 of the All Nippon Airways Co., Ltd.

There were 117 people on board the aircraft, consisting of the captain, the first officer, three cabin attendants and 112 passengers. Of these people, two cabin attendants sustained slight injuries.

There was no damage to the aircraft.



○ Probable Causes

It is highly probable that this serious incident occurred in the following circumstances: During the flight, the first officer erroneously operated the rudder trim control while having an intention of operating the switch for the door lock control in order to let the captain reenter the cockpit. The aircraft attitude became unusual beyond a threshold for maintaining the aircraft attitude under the autopilot control. The first officer's recognition of the unusual situation was delayed and his subsequent recovery operations were partially inappropriate or insufficient; therefore, the aircraft attitude became even more unusual, causing the aircraft to lose its lifting force and went into nosedive. This led to a situation which is equivalent to "a case where aircraft operation is impeded."

It is probable that the followings contributed to the first officer's erroneous operation of the rudder trim control while having an intention of operating the door lock control; he had

not been fully corrected his memories of operation about the door lock control of the Boeing 737-500 on which he was previously on duty; the door lock control of the Boeing 737-500 series aircraft was similar to the rudder trim control of the Boeing 737-700 series aircraft in their placement, shape, size and operability. It is somewhat likely that his memories of operation about the switch for the door lock control of the Boeing 737-500 aircraft had not been fully corrected because he failed to be fully accustomed with the change in the location of the switch for the door lock control. It is somewhat likely that this resulted from lack of effectiveness in the current system for determining the differences training contents and its check method, under which the Air Nippon Co., Ltd. and other airlines considered and adopted specific training programs to train pilots about how to operate the flight deck switches when their locations changed and the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism reviewed and approved them. It is probable that the first officer's failure to properly manage tasks contributed to his erroneous operation of the rudder trim control.

It is somewhat likely that the similarities between the switches for the door lock control and the rudder trim control in their operability contributed to the delay in his recognition of the erroneous operation. Moreover, he was excessively dependent on autopilot flight and he failed to be fully aware of monitoring the flight condition.

It is somewhat likely that the first officer's recovery operations were partially inappropriate or insufficient because he was startled and confused on the occurrence of an unexpected unusual situation in which the stick shaker was activated during the upset recovery maneuver. It is somewhat likely that the followings contributed to his startle and confusion: he had not received upset recovery training accompanied with a stall warning and in unexpected situations, thereby he lacked the experience of performing duties in such situations before the serious incident, and he had not received upset recovery training at a high altitude.

○ Recommendations to All Nippon Airways

(1) Thorough implementation of basic compliance matters for cases when the aircraft is operated by a single pilot and training to this end

Thoroughly implement the preventive measures, described in the OM information published by the Company and in The Flight ANA Group, for all flight crew members as specific and permanent basic compliance matters and continuously train them to this end.

(2) Implementation of high altitude upset recovery training accompanied with stall warning and other events

Implement "upset recovery training" at a high altitude upon considering defined flight envelope validated region of flight simulators. If necessary, also introduce a system to examine whether the recovery process is made outside the validated region. Moreover, scenarios in which a stall warning and others will be simultaneously activated or in which an upset cannot be expected by trainees should be prepared for such training.

○ Actions based on the recommendations (completion report)

(1) Thorough implementation of basic compliance matters for cases when an aircraft is operated continuously by a single flight crew member, and training to this end

Education consisting of regular training (academic subjects) shall be held once every three years starting from fiscal year 2015 on the basic compliance matters for cases when an aircraft is operated continuously by a single flight crew member.

Completion report

It was confirmed that 2,024 recipients of regular training had completed training in matters stipulated for basic compliance, including "As far as possible, choosing times when the workload is low before leaving one's seat", "As far as possible, not handling multiple operations simultaneously while away from one's seat", and "Visually confirming and surely operating switches when entering the cockpit and unlocking".

(2) Implementation of high altitude upset recovery training accompanied by stall warnings

Training materials will be created to provide knowledge on stalling and education on methods of stall recovery, since fatal accidents due to upsets are often accompanied by stalling. Due to be completed by all flight crew members in regular training in fiscal year 2015.

Completion report

It was confirmed that 2,024 recipients of regular training had completed training in matters such as "There are multiple causes that lead to an upset situation", "Quick initial action based on correct awareness of the situation is important", and "Operations needed for recovery differ according to the situation in question".

(3) Progress in "Items to continue to be investigated in the future" under "Implementation Plans for Actions to be Taken"

We have investigated initiatives concerning "The introduction of systems to judge whether recovery processes are made outside of the defined flight envelope validated regions of simulators" and "The development of scenarios in which an upset cannot be expected by trainees" as part of the development of upset recovery training worldwide, through international conferences and the like. On the former, in particular, we have also started a review aimed at introducing such systems. On the latter, scenarios are being studied around the world, but we have not yet reached the point at which valid scenarios have been established and broadly shared. It will take time to introduce these scenarios, but we are applying ideas such as having instructors create an environment for upset situations in the simulator while the trainees have their eyes turned down, practice handing over, etc.

* The completion report can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/airkankoku/kankoku5-2re_160628.pdf

③ Aircraft serious incident involving a Bombardier CL-600-2B19 (Large Aeroplane), registered JA206J, operated by J-AIR Corporation

(Recommendations on February 26, 2015)

Following its investigation of an aircraft serious incident on the taxiway at Osaka International Airport on May 6, 2013, the Japan Transport Safety Board published an investigation report and also issued recommendations to IHI Corporation and J-AIR Corporation as parties relevant to the cause of the serious incident on February 26, 2015. The Board received the following notice from IHI Corporation on actions to be taken in response to the report.

○ Summary of the Serious Incident

On Monday, May 6, 2013, a Bombardier CL-600-2B19, registered JA206J, operated by J-AIR Corporation, took off from Oita Airport as the scheduled flight 2362 of Japan Airlines Corporation, a code-sharing partner, and landed on runway 32R at Osaka International Airport. While the aircraft was taxiing on the taxiway after landing, a caution message was displayed for a right engine fire detection system failure at around 12:15 Japan Standard Time (JST: UTC+9hr), and subsequently a warning message was displayed for a right engine fire. While the crew responded to the engine fire warning message, the aircraft continued to taxi and entered the parking spot. During maintenance work after the flight, evidence of fire was found within the engine fire zone.

A total of 55 persons were on board the aircraft, including the captain, two crew members, and 52 passengers. There were no injuries.

○ Probable Causes

It is highly probable that the cause of this serious incident was that the coupling nut connecting the right engine fuel manifold (fuel supply piping) and fuel injector (fuel injection nozzle) No. 14 was loose, fuel leaked from this area and was ignited by the heat of the engine, which resulted in fire in the designated fire zone.

Although it is somewhat likely that the reason why the coupling nut was loose was the insufficient tightening force of the coupling nut, resulting in gradually loosening caused by factors such as engine vibration, the Japan Transport Safety Board couldn't determine the cause of the loosening.

○ Recommendations to IHI Corporation

When conducting engine overhauls, reconfirm that the system ensures that important work for safety is surely carried out, including the tightening of the coupling nuts connecting the injector and manifold.

○ Recommendations to J-AIR Corporation

Enhance education and training involving important system functions for safety and reconsider the contents of training in response to an outbreak of fires.

○ Actions taken in response to the recommendations

1. Content of recommendations

> When conducting engine overhauls, re-examine to confirm that important work for safety is surely executed by the system, including the tightening of coupling nuts connecting the injector and manifold.

2. Content of re-examination

(1) Examinations in response to this event (method of tightening coupling nuts)

Loose torque was discovered on the coupling nuts of four engines, including the engine that caused the serious incident. In the procedure for tightening the coupling nuts, a worker performs the tightening work and an inspector then checks the work visually or by manual confirmation.

However, in the inspection processes after the nuts were tightened by workers, the inspector confirmed that they had been tightened but did not confirm the tightened torque values. Moreover, no record or other evidence was kept that could categorically eliminate the possibility of insufficient tightening strength due to worker error or other causes.

Improvements must be made, such as having work performed reliably using regulation torque values, and keeping records so that response measures can be taken quickly should any abnormality occur. To this end, examinations were carried out, not only on the engine in question but also deployed horizontally to other engines as well. This was done with a view to confirming whether records or other evidence can indicate that the work of tightening the coupling nuts, which is considered important for safety, has been reliably performed according to the manual, or whether appropriate preventive measures, such as structures that can prevent loosening, have been applied.

(2) Horizontal deployment to work items that are important for safety

In the engine manual, the manufacturer has referred to design-related knowledge, users' experiences and other factors in calling for particular attention by marking the word "CAUTION" on work that could cause damage to components if its procedures are not executed correctly. Re-examination was carried out to check (1) whether all work marked with "CAUTION" in the manual is examined to ensure that work that is important for safety is carried out reliably, (2) whether the work can be reliably performed according to the manual, (3) whether records or other evidence indicating that the work has been reliably performed can be shown, and (4) whether appropriate preventive measures are carried out in subsequent steps, etc.

3. Results of examination

(1) Examination in response to this event (method of tightening coupling nuts)

1) The torque wrench serial numbers and torque set values used for the Build Record regarding CF34-3 and CF34-8C/8E engines were to be recorded, and the operation was started. It was also confirmed that the coupling nuts for V2500 and CF34-10E engines have a wire-hanging structure, and that preventive measures against looseness are in place. [Action taken in November 2013]

2) Triple torque tightening was set as an item included in regular training (lectures) and training was carried out once again. [Action taken in March 2014]

(2) Horizontal deployment to work items that are important for safety (specific measures in response to the recommendations)

1) To call particular attention to work marked with "CAUTION", notices were again issued to ensure that items marked with "CAUTION" are checked before beginning the work, and an item to this end was added to the content of regular training. [Action taken in May 2015]

Excerpt from Implementation Plan

Regulations on processes for implementation and approval, including the establishment of a Committee, shall be drawn up to confirm whether work marked with "CAUTION" can be reliably performed according to the manual, whether records or other evidence indicating that it has been reliably performed can be shown, and whether appropriate preventive measures are carried out in subsequent steps, etc. To ensure the application of these measures even if "CAUTION" notices are added or revised, these regulations shall be notified to all members of the authorized maintenance organization. Based on these regulations, all work marked with "CAUTION" shall be re-examined and improvement measures implemented.

Matters in this completion report

2) As explained below, a "CAUTION" Process Screening Committee devised a system to ensure that work that is important for safety is reliably performed.

(a) A "CAUTION" Process Screening Committee was set up to study and confirm the following points concerning work marked with "CAUTION".

a. Whether work that is important for safety can be reliably performed according to the manual
b. Whether records or other evidence that the work has been reliably performed can be shown, or whether appropriate preventive measures are carried out in subsequent steps, etc.

(b) In its screening process, the "CAUTION" Process Screening Committee identified work in which the following three situations could occur as being particularly important for safety. These three situations are defined as serious incidents pertaining to engines in Article 166–4 of the Ordinance for Enforcement of the Civil Aeronautics Act (cases prescribed in Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism under Article 76–2 of the Civil Aeronautics Act).

a. Damage to an engine (limited to cases where fragments penetrate the casing of said engine)
b. Occurrence of fire or smoke inside an aircraft and occurrence of fire within an engine fire prevention area
c. Cases where parts dropped from an aircraft collide with one or more persons

(c) Work processes marked with "CAUTION" were divided into the following six basic categories, and methods of confirming and recording these were examined.

Category 1 In quantitative work corresponding to (b) a-c above, records of the work and quantities shall be kept, and quantities shall be confirmed by an inspector.

Category 2 In qualitative work corresponding to (b) a-c above, work records shall be kept and the actual item shall be confirmed by an inspector.

Category 3 In work corresponding to (b) a-c above where prevention measures have already been initiated and in general calls for attention, records shall be kept.

Category 4 In quantitative work not corresponding to (b) a-c above, work records shall be kept.

Category 5 In qualitative work not corresponding to (b) a-c above, work records shall be kept.

Category 6 In work not corresponding to (b) a-c above where prevention measures have already been initiated and in general calls for attention, records shall be kept.

(d) After screening by the "CAUTION" Process Screening Committee, the content of the record sheet was revised as a necessary improvement measure, and it was confirmed that the system enabled contracted engine maintenance work that is important for safety to be carried out reliably.

(e) In order to apply this reliably to cases in which "CAUTION" is added or revised in an engine manual, a statement concerning the "CAUTION" Process Screening Committee was added to the air safety management regulations and notified to all management staff and employees.

[Action taken in March 2016]

8 Provision of factual information in 2016

The JTSB provided factual information on one case (one aircraft accident) to relevant administrative organs in 2016. The contents are as follows.

① Serious incident involving a Boeing 777-300, registration HL7534, operated by Korean Air Lines

(Information provided on June 18, 2016)

The Japan Transport Safety Board provided the following information on the serious incident that occurred on May 27, 2016, to Civil Aviation Bureau, the Ministry of Land, Infrastructure, Transport and Tourism.

(Summary of the serious incident)

At around 12:38 Japan Standard Time (JST: UTC+9hr) on May 27, 2016, while a Boeing 777-300, registered HL7534, operated by Korean Air Lines was making a takeoff run on Runway C at Tokyo International Airport, a malfunction occurred in the left-side engine, causing the takeoff to be aborted and the aircraft to stop on the runway, whereupon the emergency evacuation slide was used to evacuate the passengers. (Nine persons with minor injuries)

(Information provided)

As a result of the investigation so far, the following facts have been discovered regarding the left-side engine of the aircraft.

(1) Part of the turbine disc was broken and had penetrated the engine casing.

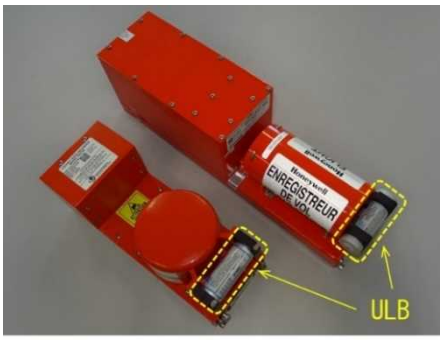
(2) The engine manufacturer (Pratt & Whitney, USA) issued a notice to users of this engine type, dated June 18 (JST), recommending them to carry out maintenance of the removed engine's turbine disc in line with the manual.

* The information provided can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/iken-teikyo/HL753420160527.pdf

Column

Underwater detection training carried out in Japan

Aircraft Accident Investigator

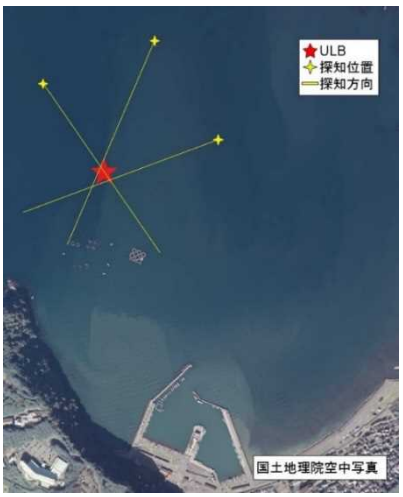


When the maximum takeoff weight of an aircraft exceeds a certain value for that type of aircraft, it must be equipped with a flight recorder (commonly known as a "black box"). The value in question differs according to the date when the initial airworthiness certificate was issued, among other factors. The flight recorder records aircraft-related data (such as location, speed, altitude and attitude) that are very useful when investigating and analyzing accidents, as well as voice data inside the cockpit. If an aircraft should crash and sink in the ocean or in a large river or lake, the flight recorder can be recovered once the crash location is identified, and can be of great assistance when investigating the cause of the accident.

A problem, however, is how to find and recover a flight recorder underwater. If the accident site is a lake or sea area in Japan, the general location of a crashed plane can be known from tracking records by air traffic control radar, etc., but the specific location underwater cannot be pinpointed with accuracy. Flight recorders are therefore equipped with Underwater Locator Beacons (ULB), which continue to emit ultrasound waves for about 30 days (at present) if submerged underwater. Detecting this signal makes it easier to discover and recover the flight recorder.

Fortunately, no accident of this kind has occurred in Japan in recent years, and no Japanese investigator has had actual experience of this sort. Instead, several investigators from the Japan Transport Safety Board have taken part in underwater detection training implemented by overseas aircraft accident investigation bodies. Given that Japan is surrounded by sea, however, we need to raise the technical level of underwater detection by JTSB investigators in readiness for any eventuality. To address this need, we have decided to conduct our own underwater detection training in Tomiura Bay, Chiba Prefecture, under instruction from investigators who have participated in overseas training, starting in fiscal year 2016. Thanks to this, all of our aircraft accident investigators will now be able to acquire skills in underwater detection.

To detect the ULB signal, a dedicated detector is required. When a ULB detector receives a ULB signal, it converts the ultrasound signal into audible sound (referred to below as "received sound"). Since the receiver antenna has directionality, the reception level is high if the receiver is facing toward the transmitted signal but becomes lower if it is facing in the wrong direction. The reception level also decreases as the distance from the ULB increases; as the level decreases, so the received sound also decreases, becomes mixed with noise and is harder to distinguish. It is therefore important to know how to recognize the received sound, so that it can be distinguished even at low volume levels.



The ULB signal converted by the detector sounds like the NTT time signal (marking seconds). Once the received sound can be heard, we record our own position on a GPS receiver while also measuring the bearing of the transmitter. By doing this in three or more locations and working out the point of intersection between them, we can specify the location of the flight recorder, etc. However, vessels tend to drift in currents while taking measurements, meaning that measurements and recordings have to be made quickly and accurately. It is important that we carry out training continuously, so that aircraft accident investigators can learn the necessary knowledge and skill to this end, and carry out underwater detection efficiently whenever necessary. This is also important in order to maintain or improve the underwater detection skills of aircraft accident investigators.

9 Summaries of major aircraft accident and serious incident investigation reports (case studies)

Crash after collision with power transmission lines during leaving from hovering

Shin Nihon Helicopter Co., Ltd. Aerospatiale AS332L1, JA6741

Summary: On Friday March 6, 2015, an Aerospatiale AS332L1, registered JA6741, operated by Shin Nihon Helicopter Co., Ltd., transported loads with external sling device. Afterward, when leaving and climbing from hovering at the loading site of forward base for fuel supply in Kii-Nagashima temporary helipad around 10:51 Japan Standard Time (JST: UTC +9 hours, all times are indicated in JST on a 24-hour clock), it collided with power transmission lines and crashed into the inclined surface of mountains.

A captain and an on-board mechanic were on board and both of them were fatally injured.

The Helicopter was destroyed and a fire broke out.

Findings

Sequence of the Helicopter's Flight

The Helicopter took off from the Helipad, traveled twice between the forward base and Yamato-dani, and left from hovering in order to go to the Helipad from the forward base for fuel supply, without keeping sufficient distance to the power transmission lines above the ground; therefore, it is highly probable that it collided with the power transmission lines located about 185 m from Pylon No. 64 in the direction towards Pylon No. 65, and crashed.

Selection of Leaving Route

It is somewhat likely that the captain tried to pass over Pylon No.64 which is closest to the forward base. However, there was the sun in the direction towards the Pylon No.64, which was too dazzling for the pilot to directly look ahead; therefore, it is somewhat likely that he turned about 40° to the left and went in the direction of the power transmission lines.

Flight Control in the Accident

If the Helicopter increased the output at the time unloading loads, climbed at a stroke, directed the nose to the traveling direction, and accelerated to shift to the climbing attitude, it is somewhat likely that the attitude of the Helicopter had largely changed, and that it was difficult to accurately grasp the relationship of positions between the Helicopter and the power transmission lines to which the distance was hard to perceive.

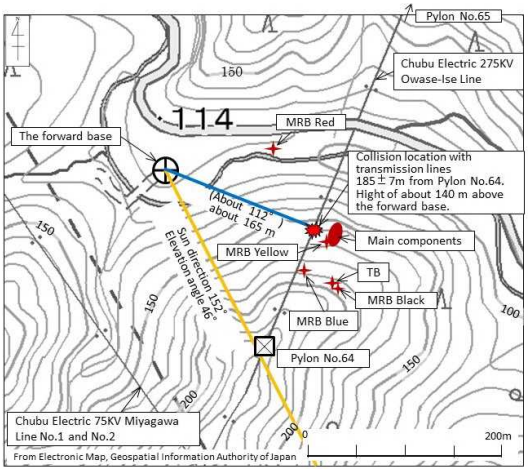
Factors of Preventing the Captain from Paying Sufficient Attention to Lines

The obstacle markings and the obstacle lights were not installed in the power transmission lines with which the Helicopter collided; however, it is highly probable that the captain had confirmed and grasped this in the preliminary survey flight; therefore, it is probable that if the captain had paid sufficient attentions to the power transmission lines, the collision with the lines could have been avoided even when they were not installed. It is somewhat likely that the following factors had influences on the fact that the captain could not pay sufficient attentions to the power transmission lines.

○ He could not afford to take it into consideration because he considered the quantity of fuel supply, and so on.

○ His concentration was deteriorate after he completed difficult loads transportation.

Condition of main components



Situation near the accident site

Probable Causes: In this accident, it is highly probable that the Helicopter did not fly with sufficient distance to power transmission lines stretched in the air when it left and climbed from hovering at the loading site of the forward base, causing the collision with the power transmission lines, which damaged the fuselage and made it crash.

Regarding the fact that the Helicopter did not fly with sufficient distance to the power transmission lines, it is somewhat likely that the captain did not visually confirm the lines soon until the collision, or he could not distinguish the distance to the lines and got closer to the lines than expected.

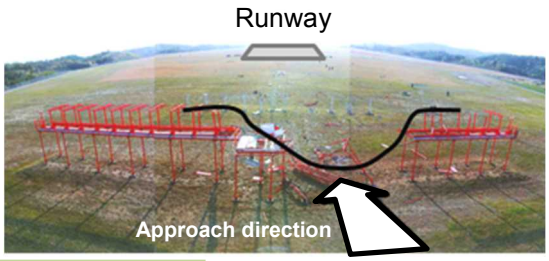
For details, please refer to the accident investigation report. (Published on April 28, 2016)
http://www.mlit.go.jp/jtsb/eng-air_report/JA6741-AA2016.pdf

Collision with the aeronautical Radio Navigation aids caused by undershooting
Asiana Airlines, Inc. Airbus A320-200, HL7762

Summary: On Tuesday, April 14, 2015, an Airbus A320-200, registered HL7762, operated by Asiana Airlines, Inc., as the scheduled Flight 162 of the company, approached lower than the prescribed approach path during approach to Hiroshima airport. The aircraft collided with the Aeronautical Radio Navigation Aids located in front of the runway 28 at 20:05 JST and KST, and it touched down in front of the threshold of the runway. Subsequently, it moved forward on the runway, and then deviated to the south side of the runway and came to a stop inside the runway strip of the airport.

There were 81 people on board, consisting of the Pilot-in-Command (PIC), six other crew members, a boarding mechanic and 73 passengers. Among them, 26 passengers and two crew members, 28 people in total, were slightly injured.

The aircraft was substantially damaged, but there was no fire breakout.



Findings

History of the Flight

- The aircraft commenced the approach to RNAV RWY28 from the final approach fix (FAF).
- After commencing the final approach, mist appeared near the end of the RWY28 approach and RVR (runway visual range) started to deteriorate rapidly.
- The PIC switched from autopilot to manual at about 1,000ft.
- At the decision altitude, the PIC announced "Continue approach".
- The FO said "Runway not in sight".
- The PIC instructed the FO to check the radio altitude.
- Because the runway could not be seen, the PIC performed go-around, but collided with a localizer frame stand.

Continuation of approach

- It is probable that the PIC turned off the AP and FD at 1,000ft, but did not understand that AP/FD must be used in RNAV approach up to the minimum descent altitude (DA) (433ft in this case).
- The PIC and FO said that the runway looked "a bit ambiguous due to cloud", and it is probable that it was difficult for them to continuously sight visual references in order to land safely.

Approach at less than the DA

- It is somewhat likely that the PIC was mainly referring to instruments and particularly to Bird when approaching at less than DA.

Probable Causes: It is certain that when landing on runway 28 at Hiroshima airport, the aircraft undershot and the PIC commenced executing a go-around; however, it collided with the Aeronautical Radio Navigation Aids located in front of runway 28 threshold, just before turning to climb.

Regarding the fact that the aircraft undershot, it is probable that there might be following aspects in causes: The PIC continued approaching without executing a go around while the position of the aircraft could not be identified by visual references which should have been in view and identified continuously at or below the approach height threshold (Decision Altitude: DA); and as well, the first officer, as pilot-monitoring who should have monitored meteorological conditions and flight operations, did not make a call-out of go-around immediately when he could not see the runway at DA.

Regarding the fact that the PIC continued approaching without executing a go- around while the position of the aircraft could not be identified by visual references which should have been in view and identified continuously at or below DA, he did not comply with the regulations and Standard Operating Procedures (SOP), and it is probable that there was a background factor that the education and trainings for compliance of rules in the company was insufficient. In addition, regarding the fact that the first officer did not make an assertion of go-around, it is probable that the Crew Resource Management (CRM) did not function appropriately.

For details, please refer to the accident investigation report. (Published on November 24, 2016)
http://www.mlit.go.jp/jtsb/eng-air_report/HL7762.pdf

Aircraft damage due to runway side excursion during landing

First Flying Co., Ltd. Viking DHC-6-400, JA201D

Summary: On Friday, August 28, 2015, at around 08:55 Japan Standard Time (JST: UTC + 9 hours. All times are indicated in JST on a 24-hour clock) a Viking DHC-6-400 registered JA201D and operated by First Flying Co., Ltd. departed from the side of the runway during landing at Aguni Airport for the purpose of passenger transport, collided with the airport perimeter fence and lateral groove and damaged aircraft.

There were 14 people on board the Aircraft, consisting of a PIC, a crewmember and 12 passengers (including one company employee). Of these, a crewmember and ten passengers suffered minor injuries.

The aircraft suffered substantial damage, but there was no outbreak of fire.

Findings

Situation Upon Approach

It is highly probable that the Aircraft made its approach without the procedure for confirming that the nose wheel is centered and the checklist being performed before landing.

Situation from Touchdown to Depart from the Side of the Runway

It is highly probable that the Aircraft touched down near the runway centerline with the nose wheel slightly deflected to the right, then rolled with the nose gradually turning to the right, and started deviating to the right when it was near the halfway position on the runway.

Situation of the Collision

It is probable that the Aircraft entered the grass area while skidding with its nose pointing slightly further to the right than the direction of travel due to the activation of the right hard brake that started just before the deviation from the runway, after which maximum brakes were applied to both main wheels but could not stop the Aircraft, which first collided with the lateral groove, then collided with the Perimeter Fence and came to a halt.

Landing Procedures of the PF

It is somewhat likely that the PF could not fully understand the situation when the nose started deflecting to the right after touchdown, because he did not have sufficient knowledge concerning the aircraft system of the Aircraft, and was unable to properly perform deceleration using reverse thrusts and brakes as he was distracted by the deflection.

Situation when the Aircraft stopped

Judgments and Actions Taken by the PIC

It is somewhat likely that the inadequate response of the PIC in the event of an unforeseen situation contributed to the fact that he could not properly control the aircraft when it started deflecting and it collided with the Perimeter Fence.

System of training in the Company

It is somewhat likely that one cause of this accident was that the FO undertook PF duties without adequate knowledge of the aircraft system, because the Company did not properly confirm the effectiveness of ground school training and training on the establishment of knowledge given to the FO. It is also somewhat likely that the insufficient awareness by the PIC of readiness for unforeseen situations and his inadequate response in the event of such situations, because the instructor training given to the PIC was not properly carried out, contributed to the occurrence of this accident.

Probable Causes: It is highly probable that this accident occurred because, when the aircraft landed, the First Officer, as the PF in charge of flying, could not properly control the aircraft as it started to deflect after touchdown, as a result of which the aircraft departed from the side of the runway and collided with a fence on the airport perimeter.

It is probable that the aircraft started to deflect after touchdown because the PF forgot to perform the checklist, while the PIC, as the PM in charge of duties other than flying, did not properly monitor the situation or did not perform the necessary pointed out, as a result of which the aircraft touched down with the nose wheel deflected to the right.

It is somewhat likely that the PF could not properly control the aircraft as it started to deflect after touchdown, because his knowledge concerning the aircraft system of the aircraft was inadequate, as a result of which he did not fully understand situations that cause deflection to start. It is somewhat likely, moreover, that the insufficient response by the PIC when an unforeseen situation arose contributed to this.

It is probable that the knowledge of the PF was inadequate and he did not fully understand situations that cause deflection to start, because the company had not properly confirmed the effectiveness of ground school training that should be undertaken prior to route training and training related to establishing knowledge.

For details, please refer to the accident investigation report. (Published on December 15, 2016)
http://www.mlit.go.jp/jtsb/eng-air_report/JA201D.pdf

Emergency operation to avoid crash into water surface

Peach Aviation Co., Ltd. Airbus A320-214, JA802P

Summary: On Monday, April 28, 2014, an Airbus A320-214, registered JA802P, operated by Peach Aviation Co., Ltd., as the scheduled Flight 252 of the company, departed New-Ishigaki Airport and approached Runway 18 of Naha Airport, guided by precision approach radar. At about 11:47 Japan Standard Time (JST, UTC + 9 hr: unless otherwise stated all times are indicated in JST) during this approach, at the position of about 4 nm north of the airport, the captain made a go-around as an emergency operation in order to avoid crash into water surface because the aircraft was losing its altitude. On this occasion, the Enhanced Ground Proximity Warning System issued some warnings. After that, the aircraft landed on the airport at 12:10.

There were 59 persons on board, consisting of the captain, five other crewmembers and 53 passengers, but nobody was injured.

There was no damage to the aircraft.

Findings

History of the flight leading up to the serious incident

When commencing the final approach

- The FO had a heavy workload with completing the checklist and communication with the final air traffic controller.
- The PIC operated the VS knob of the aircraft without making a callout.

→The altitude of the aircraft started to fall.

- The PIC was concentrating on radar guidance, and was not paying attention to the altitude of the aircraft.
- FO was prioritizing the checklist, believed the aircraft to be maintaining an altitude of 1,000ft by AP, and did not check the altimeter.

→The altitude of the aircraft continued to fall.

- After finishing the checklist, the FO noticed that the altitude of the aircraft was falling, and alerted the PIC.
- On realizing that the aircraft was descending, the PIC pressed the VS knob and commenced maneuvers to stop the descent.
- At the same time as the VS knob was operated, a warning was issued by the EGPWS (Enhanced Ground Proximity Warning System).
- At around the same time, the air traffic controller issued an instruction to “Maintain 1,000”.

→It is highly probable that the PIC initiated an approach go-around as an emergency maneuver to avoid colliding with the water surface.

Operation of the VS knob by the PIC

- It is somewhat likely that the PIC intended to stay true to the PAR approach, his first in a while and first in this type of aircraft, and overestimated his impression of the behavior of the aircraft after the glide path convergence.
- It is somewhat likely that, as a result, the PIC did not make a callout, preset the VS knob on the FCU panel to a sink rate of -900fpm, and following this, or some time after this, pulled the VS knob without intending to start the descent.

Flight monitoring

- Since it is probable that the PIC and FO had entrusted the maintenance of altitude to the AP, thus diminishing their alertness to the fact that they were flying at the low altitude of 1,000ft, and that they were not anticipating at all that the aircraft would descend unintentionally, it is probable that they did not pay attention to the FMA mode or basic instruments such as the altimeter and vertical speed indicator.

Probable Causes: It is highly probable that the serious incident occurred because the Captain executed an emergency operation in order to avoid crash into water as the aircraft, making an approach for runway 18 by precision approach radar-guidance at Naha Airport, began descent and continued.

It is probable that the aircraft began descent due to the captain's unintentional operation. It is also probable that the aircraft continued descending because the captain and the first officer were less aware of monitoring the altitude as they relied on autopilot system over maintaining of altitude and did not properly prioritize their tasks.

In addition, it is probable that insufficient risk management at the Naha Ground Controlled Approach Facility, relating to identification of that aircraft before meeting glide-path might descend and deviate below the Radar Safety Zone, consequently contributed to its continued descent of the Aircraft.

For details, please refer to the serious incident investigation report. (Published on July 28, 2016)
http://www.mlit.go.jp/jtsb/eng-air_report/JA802P.pdf

Attempted landing on runway occupied by vehicle

Japan Airlines Co., Ltd. Boeing 767-300, JA8299

Summary: On Sunday, April 5, 2015, a Boeing 767-300; registered JA8299 and operated by Japan Airlines Co., Ltd. took off from Tokyo International Airport continued its approach to Runway 29 at Tokushima Aerodrome after receiving a landing clearance at 10:53, found a vehicle on the runway at about 10:58 after passing the runway threshold, and executed a go-around.

There were 67 people on board the aircraft, consisting of a Pilot in command, seven other crewmembers and 59 passengers. No one was injured.

Findings

Situation of ATC operations
An electric maintenance worker requested permission to enter the runway in order to replace bulbs in the distance marker lights, and the supervisor, judging that there was enough time until the aircraft landed, granted this.

The supervisor, thinking that he could cope by memory alone as there were few takeoffs and landings scheduled, did not use the reminder (*).

* A sign used to show broadly that the runway was closed.

Situation of the reminder in use

○As the day in question was a Sunday and the work load was small, the supervisor was performing tower work and ground work alone.
○The supervisor was preoccupied with a request from a departure aircraft to use the runway in the opposite direction to arrival aircraft.

It is probable that the supervisor, who was combining the duties of the tower and the ground as a result of reducing the personnel number to one, was preoccupied with selecting a runway for the departure aircraft, and thus forgot about the presence of the work vehicle on the runway.

Work on the runway
Because it was a Sunday, the bulb replacement work, monitoring of the vicinity and handling of the transceiver were all carried out by the electric maintenance worker alone.

It is probable that, because he was working alone, this was one reason why he did not notice the presence of the aircraft until just before it landed.

He did not contact the Tower when moving among work locations on the runway, when adding work locations, or when completing the work.

It is probable that the fact that he did not contact the tower was one reason why the supervisor forgot about the presence of the work vehicle on the runway.

Probable Causes: It is highly probable that the serious incident occurred as JA8299 attempted to land because the Tower had issued a landing clearance to JA8299 on the runway occupied by the Work Vehicle.

It is probable that the Tower had issued a landing clearance to JA8299 to land because the Supervisor, who had the combined duties of the Tower and the Ground, had forgotten about the presence of the Work Vehicle.

It is probable that contributing factors were that, in a situation in which only one Air Traffic Controller was on duty in the aerodrome control tower and no support could be received from other controllers, he was preoccupied with selecting a runway for the Departure Aircraft, and that he did not use a reminder indicating that the runway was unusable for take-offs and landings.

For details, please refer to the serious incident investigation report. (Published on August 25, 2016)
http://www.mlit.go.jp/jtsb/eng-air_report/JA8299.pdf

Column

Training of aircraft accident investigators (participation in basic helicopter training)

Aircraft Accident Investigator

Of the 257 aircraft accidents and serious incidents (hereinafter "accidents") investigated by the JTSB over the ten years between 2006 and 2015, 50 or about 20% involved helicopters.

Investigators who were formerly helicopter pilots all say there is nothing more interesting to handle than a helicopter, but very advanced and specialized skills are required in order to do so. While investigating accidents in general demands a high level of knowledge and specialty, helicopters are especially unique and complex in their structure and flying characteristics. This means, in turn, that their behavior in accidents is also varied; the accident locations are often in places that are difficult to access, causing headaches for investigators.

Aircraft accident investigators are a collection of experts with different backgrounds, experience and skills, and when an accident occurs, they are sent to the accident site in teams. Having a broad range of knowledge outside one's own special field significantly enhances the overall performance of an investigation team. To make helicopters easier to understand, the Japan Transport Safety Board provides training on various type of aircraft, with regard to their physical structure, maintenance, handling method, and so on. This gives us a chance to learn the necessary knowledge and skills in between our investigations.

This time, we were given a precious opportunity to train about the structure, operational parameters, safety measures and other aspects of helicopter, using the real thing at Tokyo Heliport over the space of four days. We were thus able to receive valuable training while feeling great admiration for the feats of the early aviators, who had developed helicopters that can maintain such a subtle and exquisite balance while flying. In particular, taking a ride as a passenger on an engine test run was very exciting, as we were able to confirm the range of the instruments, just as we had learned in the classroom.

Taking a ride on an engine test run

Helicopters are active in so many essential aspects of our lives, whether in the construction of various facilities, or in transporting people and goods, disaster relief, medical emergencies (air ambulances), or media reporting. Indeed, our need for these services continues to grow. The progress and hi-tech development of helicopters is quite remarkable, and much effort is being invested in safety measures. Nevertheless, there were six helicopter accidents over the last year, and unfortunately this number is by no means in a decreasing trend.

To achieve a high quality of accident investigation and truly prevent accidents from recurring, we aircraft accident investigators will strive to improve and educate ourselves through various forms of drills and training.

Chapter 4 Railway accident and serious incident investigations

1 Railway accidents and serious incidents to be investigated

<Railway accidents to be investigated>

◎Paragraph 3, Article 2 of the Act for Establishment of the Japan Transport Safety Board

(Definition of railway accident)

The term "Railway Accident" as used in this Act shall mean a serious accident prescribed by the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism among those of the following kinds of accidents; an accident that occurs during the operation of trains or vehicles as provided in Article 19 of the Railway Business Act, collision or fire involving trains or any other accidents that occur during the operation of trains or vehicles on a dedicated railway, collision or fire involving vehicles or any other accidents that occur during the operation of vehicles on a tramway.

◎Article 1 of Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board (Serious accidents prescribed by the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism, stipulated in paragraph 3, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The accidents specified in items 1 to 3 inclusive of paragraph 1 of Article 3 of the Ordinance on Report on Railway Accidents, etc. (the Ordinance) (except for accidents that involve working snowplows that specified in item 2 of the above paragraph);

2 From among the accidents specified in items 4 to 6 inclusive of paragraph 1 of Article 3 of the Ordinance, that which falls under any of the following sub-items:

(a) an accident involving any passenger, crew, etc. killed;

(b) an accident involving five or more persons killed or injured;

(c) a fatal accident that occurred at a level crossing with no automatic barrier machine;

(d) an accident found to be likely to have been caused owing to a railway officer's error in handling or owing to malfunction, damage, destruction, etc. of the vehicles or railway facilities, which resulted in the death of any person;

3 The accidents specified in items 4 to 7 inclusive of paragraph 1, Article 3 of the Ordinance which are found to be particularly rare and exceptional;

4 The accidents equivalent to those specified in items 1 to 7 inclusive of paragraph 1, Article 3 of the Ordinance which have occurred relevant to dedicated railways and which are found to be particularly rare and exceptional; and

5 The accidents equivalent to those specified in items 1 to 3 inclusive which have occurred relevant to a tramway, as specified by a public notice issued by the Japan Transport Safety Board.

[Reference] The accidents listed in each of the items of paragraph 1, Article 3 of the Ordinance on Reporting on Railway Accidents, etc.

Item 1: Train collision
Item 2: Train derailment
Item 3: Train fire
Item 4: Level crossing accident
Item 5: Accident against road traffic
Item 6: Other accidents with casualties
Item 7: Heavy property loss without casualties

◎Article 1 of the Public Notice of the Japan Transport Safety Board (Accidents specified by the public notice stipulated in item 5, Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board)

1 From among the accidents specified in items 1 to 6 inclusive of paragraph 1 of Article 1 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), that which falls under any of the following sub-items:

(a) an accident that causes the death of a passenger, crewmember, etc.;
(b) an accident involving five or more casualties (with at least one of the casualties dead);
(c) a fatal accident that occurs at a level crossing with no automatic barrier machine;

2 The accidents specified in items 1 to 7 inclusive of paragraph 1 Article 1 of the Ordinance which are found to be particularly rare and exceptional; and

3 From among the accidents occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the accidents equivalent to those specified in items 1 to 3 of Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

[Reference] The accidents specified in the items of paragraph 1, Article 1 of the Ordinance on Reporting on Tramway Accidents, etc.

Item 1: Vehicle collision
Item 2: Vehicle derailment
Item 3: Vehicle fire
Item 4: Level crossing accident
Item 5: Accidents against road traffic
Item 6: Other accidents with casualties
Item 7: Heavy property loss without casualties

Railway accidents to be investigated

<table>
<tr><th>Category</th><th>Train collision*2)</th><th>Train derailment*2)</th><th>Train fire*2)</th><th>Level crossing accident</th><th>Accident against road traffic</th><th>Other accidents with casualties</th><th>Heavy property loss without casualties</th></tr>
<tr><td rowspan="2">Railway (including tramway operated as equivalent to railway)
[Notice 1-3]</td><td colspan="3" rowspan="2">All accidents*1)
(These refer to train accidents and do not include vehicle accidents on railways.
[Ordinance 1-1]</td><td colspan="3">・ Accidents involving the death of a passenger, crew member, etc
・ Accidents involving five or more casualties with at least one of the casualties dead
・ Fatal accidents that occur at level crossings with no automatic barrier machines
・ Accidents found to have likely been caused by a railway worker's error in procedure or due to the malfunction, damage, destruction, etc., of vehicles or railway facilities, which resulted in the death of a person
[Ordinance 1-2]</td><td></td></tr>
<tr><td colspan="4">Accidents that are particularly rare and exceptional
[Ordinance 1-3]</td></tr>
<tr><td>Dedicated railway</td><td colspan="7">Accidents that are particularly rare and exceptional [Ordinance 1-4]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 1-5]</td><td colspan="6">Accidents involving the death of a passenger, crewmember, etc., accidents involving five or more casualties with at least one of the casualties dead, and fatal accidents that occur at level crossings with no automatic barrier machines.
[Notice 1-1]</td><td></td></tr>
<tr><td colspan="7">Accidents that are particularly rare and exceptional [Notice 1-2]</td></tr>
</table>

*1 Except for derailment accidents of working snowplows. [Ordinance 1-1]
However, accidents that are particularly rare and exceptional are to be investigated. [Ordinance 1-3]

*2 If these categories occur on a tramway, the accident types shall each be renamed to “vehicle collision”, “vehicle derailment”, or “vehicle fire”.

(Note) “Ordinance” refers to the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board; “Notice” refers to the Public Notice by the Japan Transport Safety Board; and the numbers refer to the Article and paragraph numbers.

< Railway serious incidents to be investigated>

◎Item 2, paragraph 4, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of railway serious incident)

A situation, prescribed by the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism (Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board), deemed to bear a risk of accident occurrence.

◎Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board

(A situation prescribed by the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism, stipulated in item 2, paragraph 4, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The situation specified in item 1 of paragraph 1 of Article 4 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), wherein another train or vehicle had existed in the zone specified in said item;

[A situation where a train starts moving for the purpose of operating in the relevant block section before completion of the block procedure: Referred to as "Incorrect management of safety block."]

2 The situation specified in item 2 of paragraph 1 of Article 4 of the Ordinance, wherein a train had entered into the route as specified in said item;

[A situation where a signal indicates that a train should proceed even though there is an obstacle in the route of the train, or the route of the train is obstructed while the signal indicates that the train should proceed: Referred to as "Incorrect indication of signal."]

3 The situation specified in item 3 of paragraph 1 of Article 4 of the Ordinance, wherein another train or vehicle had entered into the protected area of the signal which protects the zone of the route as specified in said item;

[A situation where a train proceeds regardless of a stop signal, thereby obstructing the route of another train or vehicle: Referred to as "Violating red signal."]

4 The situation specified in item 7 of paragraph 1 of Article 4 of the Ordinance, which caused malfunction, damage, destruction, etc. bearing particularly serious risk of collision or derailment of or fire in a train;

[A situation that causes a malfunction, etc., of facilities: Referred to as "Dangerous damage in facilities."]

5 The situation specified in item 8 of paragraph 1 of Article 4 the Ordinance, which caused malfunction, damage, destruction, etc. bearing particularly serious risk of collision or derailment of or fire in a train;

[A situation that causes a malfunction, etc., of a vehicle: Referred to as "Dangerous trouble in vehicle."]

6 The situation specified in items 1 to 10 inclusive of paragraph 1 of Article 4 of the Ordinance which is found to be particularly rare and exceptional; and

[These are referred to as: item 4 “Main track overrun”; item 5 “Violating closure section for construction”; item 6 “vehicle derailment”; item 9 “Heavy leakage of dangerous object”; and item 10 “others,” respectively.]

7 The situations occurred relevant to the tramway as specified by a public notice of the Japan Transport Safety Board as being equivalent to the situations specified in the in preceding items.

○Article 2 of the Public Notice of the Japan Transport Safety Board

(A situation prescribed by the public notice stipulated in item 7, Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board (Serious incident on a tramway))

1 The situation specified in item 1 of Article 2 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), wherein another vehicle operating on the main track had existed in the zone specified in said item;

[A situation where a vehicle is operating on the main track for the purpose of operating in the relevant safety zone before the completion of safety system procedures: Referred to as “Incorrect management of safety block.”]

2 The situation specified in item 4 of Article 2 of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment of or fire in a vehicle operating on the main track;

[A situation that causes a malfunction, etc., of facilities: Referred to as “Dangerous damage in facilities.”]

3 The situation specified in item 5 of Article 2 of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment or fire in a vehicle operating on the main track;

[A situation that causes a malfunction, etc., of a vehicle: Referred to as “Dangerous trouble in vehicle.”]

4 The situation specified in items 1 to 7 inclusive of Article 2 of the Ordinance which is found to be particularly rare and exceptional; and

[These are referred to as: item 2 “Violating red signal;” item 3 “Main track overrun;” item 6 “Heavy leakage of dangerous object;” and item 7 “others,” respectively.]

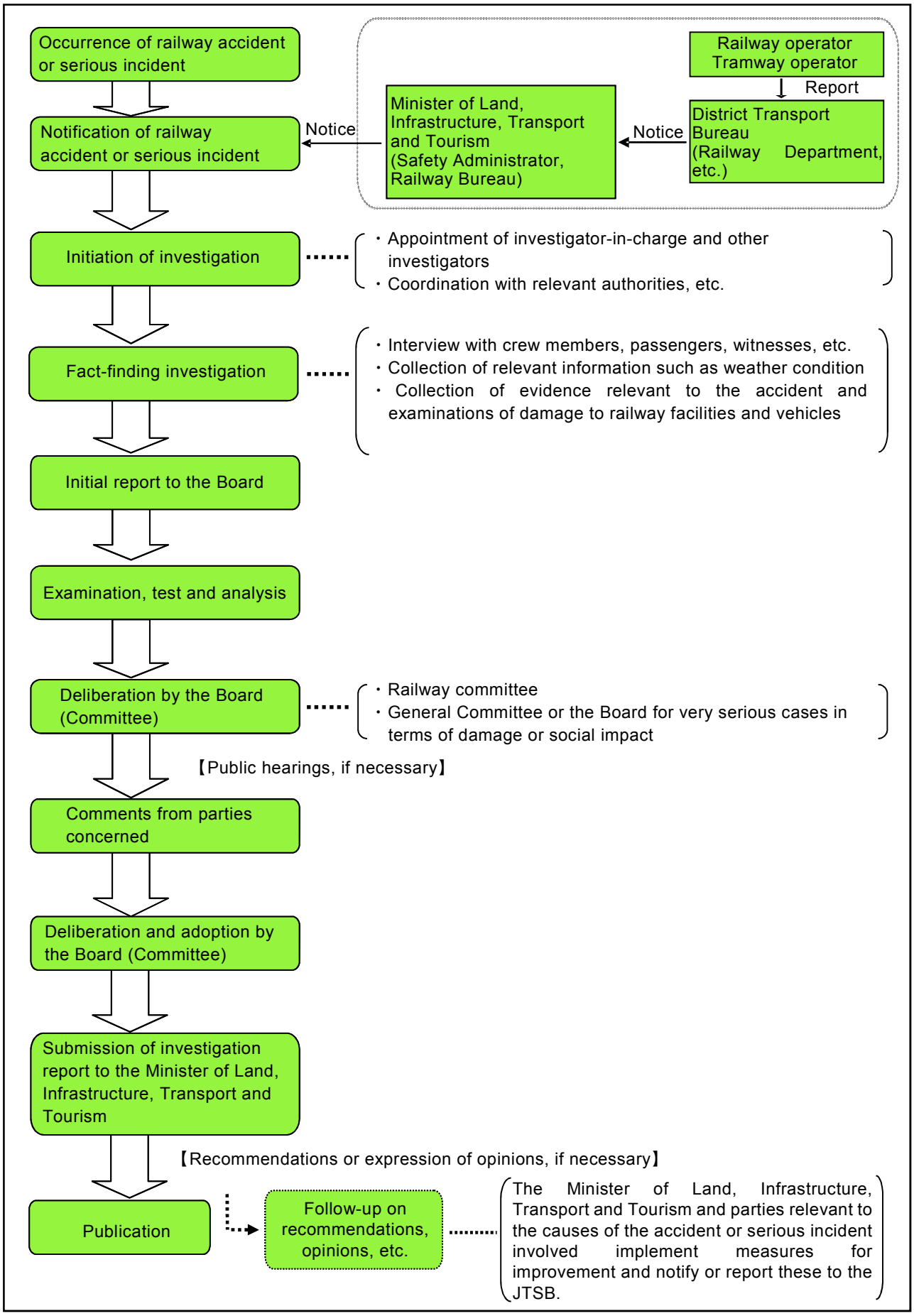
5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the situations equivalent to those specified in items 1 to 6 of Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

Serious incidents to be investigated

<table>
<tr><th>Category</th><th>・Incorrect management of safety block (Railway)
・Incorrect management of safety block (Tramway)</th><th>・Incorrect indication of signal (Railway)
・Violating red signal</th><th>Dangerous damage in facilities</th><th>Dangerous trouble in vehicle</th><th>・Main track overrun
・Violating closure section for construction (Railway)
・Vehicle derailment (Railway)
・Heavy leakage of dangerous object
・Others</th></tr>
<tr><td rowspan="2">Railway (including tramway operated as equivalent to railway) [Notice 2-5]</td><td colspan="2">Certain conditions such as the presence of another train [Ordinances 2-1, 2-2, and 2-3]</td><td colspan="2">Risk of collision, derailment or fire [Ordinances 2-4 and 2-5]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Ordinance 2-6]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 2-7]</td><td>Certain conditions such as the presence of a vehicle [Notice 2-1]</td><td></td><td colspan="2">Risk of collision, derailment or fire [Notices 2-2 and 2-3]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Notice 2-4]</td></tr>
</table>

(Note) “Ordinance” refers to the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board; “Notice” refers to the Public Notice by the Japan Transport Safety Board, and the numbers refer to the Article and paragraph numbers.

2 Procedure of railway accident/incident investigation



3 Statistics for the investigations of railway accidents and serious incidents

The JTSB carried out investigations of railway accidents and serious incidents in 2016 as follows:

13 accident investigations had been carried over from 2015, and 23 accident investigations were newly launched in 2016. 17 investigation reports were published in 2016, and thereby 19 accident investigations were carried over to 2017.

Two serious incident investigations had been carried over from 2015, and two serious incident investigations were newly launched in 2016. Two investigation reports were published in 2016, and thereby two serious incident investigations were carried over to 2017.

Investigations of railway accidents and serious incidents in 2016

(Cases)

Category	Carried over from 2015	Launched in 2016	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2017	(Interim report)
Railway accident	13	23	36	17	(0)	(0)	19	(0)
Railway serious incident	2	2	4	2	(0)	(0)	2	(0)

4 Statistics of investigations launched in 2016

The railway accidents and serious incidents that were newly investigated in 2016 consisted of 23 railway accidents, up by 10 from 13 for the previous year, and two railway serious incidents, down by one from three for the previous year.

The breakdown by type of accidents and serious incidents is as follows: The railway accidents included seven train derailments, 15 level crossing accidents, and one vehicle derailment. The railway serious incidents included one violating closure section for construction, and one incorrect management of safety block.

Number of investigated railway accidents and serious incidents by type in 2016

In the 23 railway accidents, the number of casualties was 16, consisting of 15 death and one injured person.

The number of casualties (in railway accidents)

(Persons)

2016							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	0	15	1	0	0	16
Total	15			1			

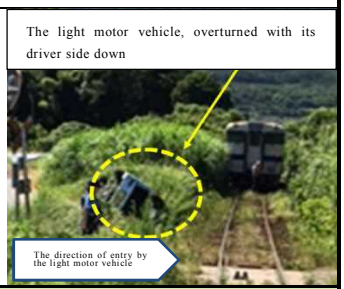
5 Summaries of railway accidents and serious incidents that occurred in 2016

The railway accidents and railway serious incidents that occurred in 2016 are summarized as follows. The summaries are based on information available at the start of the investigations and therefore are subject to change depending on the course of investigations and deliberations.

(Railway accidents)

1	Date and accident type	Railway operator	Line section (location)
	March 3, 2016 Level crossing accident	Nagano Electric Railway Company	Gosyokubo Crossing (class four level crossing without automatic barrier machine nor road warning device) Between Zenkojishita Station and Hongo Station, Nagano Line (Nagano Prefecture)
	Summary	While the train was running between Zenkojishita Station and Hongo Station, the train driver noticed a pedestrian entering the Gosyokubo Crossing, class four level crossing, and applied the emergency brake immediately, but the train collided with the pedestrian. The pedestrian died as a result of the accident.	
2	Date and accident type	Railway operator	Line section (location)
	March 20, 2016 Level crossing accident	Ryutetsu Co., Ltd.	No.10 Crossing (class four level crossing without automatic barrier machine nor road warning device) between Koya Station and Koganejoshi Station, Nagareyama Line (Chiba Prefecture)
	Summary	While travelling in the above section, the driver noticed the pedestrian in the No.10 Crossing, class four level crossing, and applied an emergency brake, but the train collided with the pedestrian. The pedestrian died as a result of the accident.	
3	Date and accident type	Railway operator	Line section (location)
	April 14, 2006 Train derailment accident	Kyushu Railway Company	Between Kumamoto Station and Kumamoto Railway Depot, Kyushu Shinkansen (Kumamoto Prefecture)
	Summary	The train driver felt a violent jolt while the train was running, applied the emergency break and brought the train to a halt. On subsequently checking, cars 1-6 had become derailed.	
4	Date and accident type	Railway operator	Line section (location)
	April 15, 2016 Train derailment accident	Nagaragawa Railway	Between Hanno Station and Suhara Station, Etsumi-Nan Line (Gifu Prefecture)
	Summary	The train driver felt an abnormal sound accompanied by a violent jolt while running in the Suhara Tunnel with coasting, and therefore immediately applied the emergency brake to bring the train to a halt. When the driver alighted and checked, both axles of the rear bogie had become derailed to the left. The driver was injured as a result of this accident.	

5	Date and accident type	Railway operator	Line section (location)
	April 16, 2016 Train derailment accident	Kyushu Railway Company	In the premises of Akamizu Station, Hohi Line (Kumamoto Prefecture)
	Summary	The train departed Akamizu Station at 1:24. Just after the train passed through the turnout for Oita Station in Akamizu Station, the train driver felt violent tremor as if the train were having upward. At the same time, he noticed the sound of the earthquake early warning information from the cellular phone, and applied an emergency brake to stop the train. It was found that the all axles in the front bogie of the first vehicle derailed to the right, and the all axles in the front bogie of the second vehicle derailed to the left and the all axles in the rear bogie of the second vehicle derailed to the right. There was the driver onboard the train, but he was not injured. As the train was not in service operation, there was no passenger onboard. Here, at about 1:25, of the same day, the earthquake, of which magnitude was 7.3 and epicenter was Kumamoto district in Kumamoto Prefecture, in the series of earthquake, named "Heisei 28th year, 2016, Kumamoto Earthquake", had occurred, and the maximum seismic intensity of 7 was observed in Mashiki town, Kumamoto Prefecture.	
6	Date and accident type	Railway operator	Line section (location)
	May 18, 2016 Train derailment accident	Tobu Railway Co., Ltd.	Between Naka-Itabashi Station and Oyama Station, Tobu Tojo Main Line (Tokyo)
	Summary	The train driver felt that the train was slowly accelerating after leaving Naka-Itabashi Station, and at the same time the emergency alarm button inside the train was operated, and so the driver immediately stopped the train. On subsequently alighting and checking, both axles of the 2nd bogie of the 5th car from the front had become derailed.	
7	Date and accident type	Railway operator	Line section (location)
	June 2, 2016 Vehicle derailment accident	Nagasaki Electric Tramway Co., Ltd.	Between Suwa Jinja-Mae Tram Stop and Kokaido-Mae Tram Stop, Sakuramachi Branch Line (Nagasaki Prefecture)
	Summary	The tram driver stopped temporarily just before the Kokaido-mae Intersection, then set off again after checking the indication of the departure signal on the track signals and the points opening direction. Near the middle of the intersection, when the tram accelerated to about 6km/h, the driver noticed an abnormal sound accompanied by irregularity in the direction of travel, and so applied the emergency break to stop the tram. On alighting and checking, both axles of the rear bogie had become derailed to the left in the direction of travel. 	
8	Date and accident type	Railway operator	Line section (location)
	June 10, 2016 Level crossing accident	Tarumi Railway Company	Motosu-Minami Crossing (class three level crossing without automatic barrier machine, with road warning device) between Itonuki Station and Motosu Station, Tarumi Line (Gifu Prefecture)
	Summary	While travelling in the above section, the train driver noticed the light motor vehicle entering the Motosu-Minami Crossing, class three level crossing. He applied the emergency brake immediately, but the train collided with the light motor vehicle. The driver of the light motor vehicle died as a result of the accident.	
9	Date and accident type	Railway operator	Line section (location)
	June 17, 2016 Level crossing accident	Chichibu Railway Co., Ltd.	Ishihara No.12 Crossing (class four level crossing without automatic barrier machine nor road warning device) inside the premises of Hirosegawara Station, Chichibu Main Line (Saitama Prefecture)
	Summary	While the train was passing through Hirosegawara Station, the train driver noticed a pedestrian on the Ishihara No.12 Crossing (class four level crossing) and sounded the emergency whistle and applied the emergency brake, but the train collided with the pedestrian. The pedestrian died as a result of this accident.	

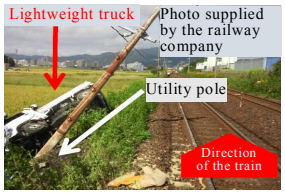
10	Date and accident type	Railway operator	Line section (location)
	June 23, 2016 Train derailment accident	West Japan Railway Company	Between Seno Station and Hachihommatsu Station, Sanyo Line (Hiroshima Prefecture)
	Summary	Noticing that earth sediments had spilled onto the tracks, the train driver applied the emergency brake but could not stop the train in time before entering the area of the sediments. On alighting and checking, the driver confirmed that the train had ridden over the sediments, and that both axles of the front bogie on the front car had become derailed.	
11	Date and accident type	Railway operator	Line section (location)
	July 7, 2016 Level crossing accident	Shikoku Railway Company	Miyaji Crossing (class four level crossing without automatic barrier machine nor road warning device) between Iyo-Yokota Station and Torinoki Station, Yosan Line (Aichi Prefecture)
	Summary	While traveling in the above section, the train driver noticed a pedestrian on the Miyaji Crossing (class four level crossing) and applied the emergency brake, but the train collided with the pedestrian. The pedestrian died as a result of the accident.	
12	Date and accident type	Railway operator	Line section (location)
	July 14, 2016 Train derailment accident	West Japan Railway Company	Between Nishi Miyoshi Station and Shiwachi Station, Geibi Line (Hiroshima Prefecture)
	Summary	While traveling at a speed of about 70km/h, the train driver noticed that earth sediments had spilled onto the track. He applied the emergency brake but could not stop the train in time before entering the area of the sediments. On alighting and checking, the driver confirmed that the train had ridden over the sediments, and that multiple axles of the front and rear bogies on the front car had become derailed.	
13	Date and accident type	Railway operator	Line section (location)
	July 29, 2016 Level crossing accident	East Japan Railway Company	Ainoya-Momogashira Crossing (class four level crossing without automatic barrier machine nor road warning device) between Kunisada Station and Iwajuku Station, Ryomo Line (Gunma Prefecture)
	Summary	While travelling in the above section, the train driver noticed a person riding a bicycle entering into the Ainoya-Momogashira Crossing, class four level crossing. He applied an emergency brake immediately, but the train collided with the bicycle. The cyclist died as a result of the accident.	
14	Date and accident type	Railway operator	Line section (location)
	August 22, 2016 Level crossing accident	Kyushu Railway Company	Dai-ni Motoyashiki Crossing (class four level crossing without automatic barrier machine nor road warning device) between Ei Station and Irino Station, Ibusuki Makurazaki Line (Kagoshima Prefecture)
	Summary	While traveling in the above section at a speed of about 44km/h, the train driver noticed a light motor vehicle entering the Dai-ni Motoyashiki Crossing (class four level crossing). He therefore applied the emergency brake, but the train collided with the light motor vehicle. The driver of the light motor vehicle died and a passenger in the vehicle was injured as a result of this accident.	
15	Date and accident type	Railway operator	Line section (location)
	September 6, 2016 Level crossing accident	Tsugaru Railway Company	Level crossing located 6.1km from the origin at Goshogawara (class four level crossing without automatic barrier machine nor road warning device) between Tsugaru-Iizume Station and Bishamon Station, Tsugaru Railway Line (Aomori Prefecture)

	Summary	While traveling in the above section, the train driver noticed that a light motor vehicle had entered the level crossing located 6.1km from the origin at Goshogawara (class four level crossing). He immediately applied the emergency brake, but the train collided with the light motor vehicle. The driver of the light motor vehicle died as a result of this accident.  The level crossing (class four)

16	Date and accident type	Railway operator	Line section (location)
	September 12, 2016 Level crossing accident	Kanto Railway Co., Ltd.	Inoue 1st Crossing (class four level crossing without automatic barrier machine nor road warning device) between Kurogo Station and Otago Station, Joso Line (Ibaraki Prefecture)
	Summary	While traveling in the above section, the train driver noticed that a person riding a bicycle had entered the Inoue 1st Crossing (class four level crossing), immediately sounded the whistle and applied the emergency brake, but the train collided with the cyclist. The cyclist died as a result of this accident.	

17	Date and accident type	Railway operator	Line section (location)
	September 27, 2016 Level crossing accident	East Japan Railway Company	Nakahara Crossing (class four level crossing without automatic barrier machine nor road warning device) between Minamihara Station and Chitose Station, Uchibo Line (Chiba Prefecture)
	Summary	While traveling in the above section, the train driver noticed that a motorcycle had entered the Nakahara Crossing (class four level crossing), immediately sounded the whistle and applied the emergency brake, but the train collided with the motorcycle. The rider of the motorcycle died as a result of this accident.	

18	Date and accident type	Railway operator	Line section (location)
	October 6, 2016 Train derailment accident	Seino Railway Co, Ltd.	Inside the premises of Mino-Akasaka Station, Ichihashi Line (Gifu Prefecture)
	Summary	While operating the brakes on entering Mino-Akasaka Station, the train driver felt that the brakes were not having the same effect as usual, and immediately stopped the train. On checking, all axles in the 11th and 12th cars from the locomotive had become derailed.	

19	Date and accident type	Railway operator	Line section (location)
	October 8, 2016 Level crossing accident	West Japan Railway Company	Nakata No.1 Crossing (class four level crossing without automatic barrier machine nor road warning device) between Yotsutsuji Station and Shin-Yamaguchi Station, Sanyo Line (Yamaguchi Prefecture)
	Summary	While traveling in the above section, the train driver noticed that a lightweight truck had entered the Nakata No.1 Crossing (class four level crossing) and immediately applied the emergency brake, but the train collided with the lightweight truck. The driver of the lightweight truck died as a result of this accident.  	

20	Date and accident type	Railway operator	Line section (location)
	October 16, 2016 Level crossing accident	Kumamoto Electric Railway Co., Ltd.	No.8 Crossing between Hakenomiya and Horikawa (class four level crossing without automatic barrier machine nor road warning device) between Horikawa Station and Hakenomiya Station, Kikuchi Line (Kumamoto Prefecture)
	Summary	When approximately 8 meters ahead of the No.8 Crossing between Hakenomiya and Horikawa, the train driver noticed a motor vehicle entering the level crossing and immediately applied the emergency brake, but the train collided with the vehicle. The driver of the motor vehicle died as a result of this accident.	

21	Date and accident type	Railway operator	Line section (location)
	November 2, 2016 Level crossing accident	East Japan Railway Company	Takami-Kita Crossing (class four level crossing without automatic barrier machine nor road warning device) between Hakuba Station and Shinano-Moriue Station, Oito Line (Nagano Prefecture)
	Summary	The train driver noticed a motorcycle entering the Takami-Kita Crossing from the right side in the direction of travel just before the train was about to pass over the level crossing. He simultaneously sounded the whistle and applied the emergency brake, but the train collided with the motorcycle before stopping. The rider of the motorcycle died as a result of this accident.	
22	Date and accident type	Railway operator	Line section (location)
	November 6, 2016 Level crossing accident	East Japan Railway Company	Hatchonome Crossing (class four level crossing without automatic barrier machine nor road warning device) between Kogota Station and Kitaura Station, Rikuu East Line (Miyagi Prefecture)
	Summary	The train driver noticed a light motor vehicle entering the Hatchonome Crossing from the left side in the direction of travel about 30m before reaching the level crossing. He simultaneously sounded the whistle and applied the emergency brake, but the train collided with the light motor vehicle before stopping. The driver of the light motor vehicle died as a result of this accident.	
23	Date and accident type	Railway operator	Line section (location)
	November 10, 2016 Level crossing accident	East Japan Railway Company	No.2 Shinmachi Crossing (class three level crossing without automatic barrier machine, with road warning device) between Nakagomi Station and Otabe Station, Koumi Line (Nagano Prefecture)
	Summary	The train driver noticed a pedestrian entering the No.2 Shinmachi Crossing from the right side in the direction of travel just before passing over the level crossing. He simultaneously sounded the whistle and applied the emergency brake, but the train collided with the pedestrian before stopping. The pedestrian died as a result of this accident.	

(Railway serious incidents)

1	Date and incident type	Railway operator	Line section (location)
	July 27, 2016 Violating closure section for construction	Keisei Electric Railway	Between Keisei Usui Station and Keisei Sakura Station, Keisei Main Line (Chiba Prefecture)
	Summary	While traveling at approximately 70km/h between Keisei Usui Station and Keisei Sakura Station, the train driver noticed a workman approximately 50m ahead and applied the emergency stop operation, but could only stop approximately 140m beyond the works site. When the driver alighted and checked, the worker had evacuated to a safe place and was unharmed, but the train had collided with a plastic work basket that had been near the tracks. After reporting this incident to Transport Command and stopping at the site for nine minutes, the driver set off again. The works site in question was included in the railway track section closed after a permission for work was obtained.	
2	Date and incident type	Railway operator	Line section (location)
	November 17, 2016 Incorrect management of safety block	Tosaden Traffic Co., Ltd.	Between Asakura Tram Stop and Asakura Ekimae Tram Stop, Ino Line (Kochi Prefecture)
	Summary	The driver of an outbound tram forgot to collect the token that is supposed to be collected when an inbound tram has arrived at Asakura tram stop (a tram passing point), as part of the procedure for entering a single track section. The driver then set off from the tram stop even though the inbound tram had not yet arrived. While traveling, the driver realized that there was no token and reduced speed, then noticed an inbound tram ahead and immediately stopped the tram.	

6 Publication of investigation reports

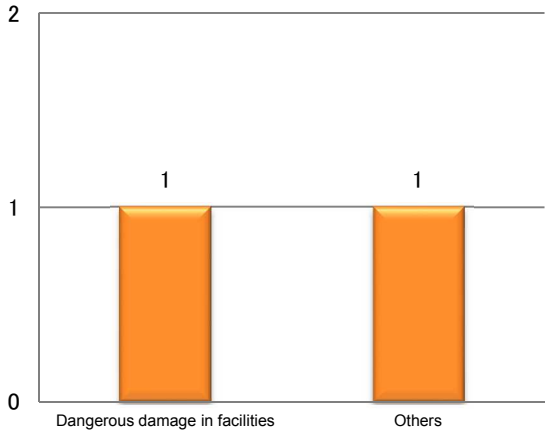
The number of investigation reports of railway accidents and serious incidents published in 2016 was 19, consisting of 17 railway accidents and two serious incidents.

Breaking them down by type, the railway accidents contained one train collision accident, five train derailment accidents, one train fire, eight level crossing accidents, one other accidents with casualties and one vehicle derailment. The railway serious incidents contained one dangerous damage in facilities and one others.

In the 17 accidents, the number of casualties was 86, consisting of 10 death and 76 injured persons.

Railway accident reports (17 cases) published in 2016

Railway serious incident reports (two cases) published in 2016



Summaries of the investigation reports for railway accidents and serious incidents published in 2016 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/railrep.html

7 Actions taken in response to recommendations in 2016

Actions taken in response to recommendations were reported with regard to one serious railway incident in 2016. Summaries of these reports are as follows.

① Hokkaido Railway Company: Train derailment in the premises of Seifuzan signal station, Sekisho Line

(Recommendations on May 31, 2013)

Following its investigation of a train derailment in the premises of Seifuzan signal station on the Sekisho Line of the Hokkaido Railway Company on May 27, 2011, the Japan Transport Safety Board published an investigation report and issued recommendations to the Hokkaido Railway Company as a party relevant to the cause of the serious incident on May 31, 2013. The Board received the following report concerning actions taken based on the recommendations (completion report).

○ Summary

The six-car of the inbound train limited express "Ki-4014D train" (Super Ozora 14), of Hokkaido Railway Company, starting from Kushiro station bound for Sapporo Station, departed Tomamu Station about 2 minutes behind schedule, on May 27, 2011.

The conductor, in the conductor's compartment of the fourth vehicle of the train, running toward Seifuzan signal station, have heard an abnormal sound and have felt irregular vibration, so he notified those events to the train driver. The train driver applied braking operation immediately after notified from the conductor. The train stopped in Niniu No.1 tunnel in the premises of Seifuzan signal station.

After that, the smoke of the fire which broke out from the train flowed into the train. The train driver tried to move the train halting in the tunnel to outside of the tunnel, but the train could not be moved.

Status of the burnt cars

There were 248 passengers, the train driver, the train conductor, and 2 cabin attendants on board the train. All members had evacuated outside the tunnel on foot, but 78 passengers and the conductor were injured.

It was found that the first axle of the rear bogie of the fifth vehicle of the train had derailed to the left. There were many parts of the dropped power transmission device, etc. scattered along the track for about 2 km length away from the halted point of the train. Moreover, all the 6 vehicles of the train were burnt by the fire.

○ Probable Causes

It is probable that all 2 axles of the rear bogie of the forth vehicle and the first axle of the rear bogie of the fifth vehicle of the train were derailed as a results of the following steps, originated from the pin dropping out the reduction gear device on the rear part of the fourth vehicle fell down.

(1) When the reduction gear device was hung down forward as rotate around the axle, the propeller shaft was also hung down. As a result, the universal joint was broken and finally the reduction gear and the propeller shaft were separated.

(2) As the separated reduction gear device further rotated, the suspender of the reduction gear device hit the lead rail of the turnout No.12-Ro in the premises of Seifuzan signal station. At this moment, the rear bogie of the fourth vehicle was pushed to the left along the lead rail and the first axle derailed, the second axle of the rear bogie derailed following the first axle. The derailed 2 axles were restored at the turnout No.11-I.

(3) As the rear bogie of the fifth vehicle hit the bevel gear on the track fallen off from the hanged reduction gear device, the rear bogie was pushed up and the first axle was derailed.

It is probable that the pin suspending the reduction gear device fell down following the process described below. It is also probable that these process were related with huge vibration acting on the rear bogie of the fourth vehicle, due to the circular irregularity of the tread profile of the left wheel in the first axle of the rear bogie of the forth vehicle.

(1) There were local wear caused by contacts with other components in the split pin which fixed the grooved hexagonal nut for the suspension pin supporting the reduction gear device, and in the stopper split pin which was inserted at the head of the suspension pin to prevent fallen out.

(2) As the grooved hexagonal nut was loosened, the split pin inserted in the groove was exposed to the iterative tangential load and finally fell out of the groove of the hexagonal nut.

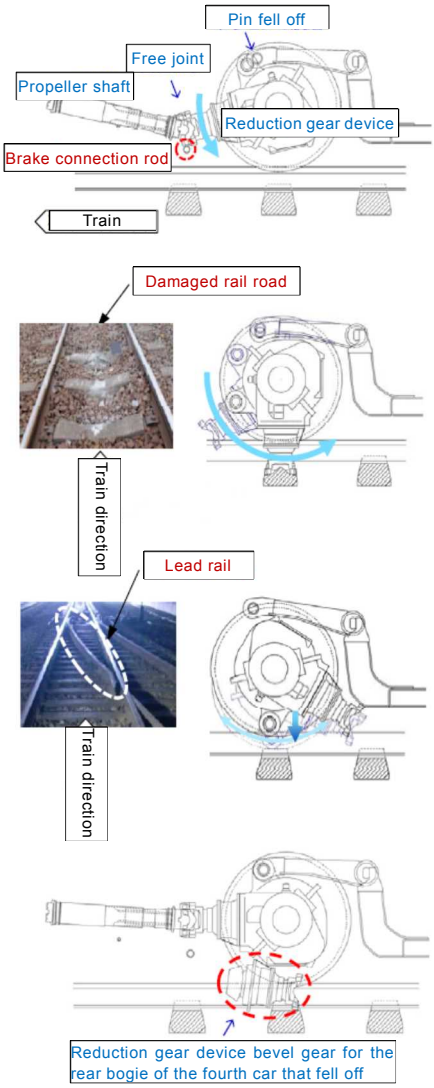
(3) The grooved hexagon nut loosened by missing the split pin and rotated still more until fell out.

(4) The stopper split pin which was inserted at the head of the suspension pin fell out by the iterative tangential load from the suspension pin.

(5) After the grooved hexagonal nut and the stopper split pin fell out, the suspension pin dropping out the reduction gear device fell out of the guide.

About the damage of the train by fire after the train derailment accident, it is probable that the fallen bevel gear of the reduction gear device hit and broke the fuel tank in the front part of the sixth vehicle, the light oil scattered on the track around the wooden sleeper had caught a fire ignited at around the generator or rear upper part of the engine and spread to the whole train.

According to the results of the overhaul inspection about the under floor equipments that were badly burnt and the equipments to get high temperature during operation, it is probable that all equipments caught fire by the external heat sources, then, the precise point where a fire was outbreak and the cause of outbreak fire were not identified.



The process of derailment (presumption)

○ Recomendations

Hokkaido Railway Co. should establish the proper inspection system, i.e., inspection period and methods for monitoring the condition of the wheel tread, and should manage the condition of the wheel tread throughout, and never use the wheel which should be treated as the wheel whose size of the tread defects or exfoliation are exceeded the limit to be used.

○ Actions based on the recommendations (completion report)

1. Actions taken in connection with the plan to “investigate the causative relationship with vibration while wheels are in motion, the progression of peeling, and other matters over several winter seasons, because ‘peeling caused by thermal cracking’ occurs gradually across the whole circumference of the wheel tread.”

(1) Since December 2013, the vehicle related planning division has been handling cases of consecutive occurrences of wheel abrasion, peeling and others as a single issue, in addition to the standard values during normal wheel inspections (including operational and alternating inspection). As a result, wheel turning is carried out before “peeling caused by thermal cracking” extends to the whole circumference of the wheel tread.

(2) At the same time as 1.(1), we set targets for wheel turning frequency based on each type of car for electric trains and limited express cars that cover particularly large distances per day, and changed to systematic wheel turning.

(3) On July 24, 2015, the vehicle-related planning division installed a “wheel flat detection device” in Naebo Station, through which all electric trains in the Sapporo region and all limited express gas-electric trains pass. With this device, situations where thermal cracking and abrasion (including peeling) are suspected can be detected continuously and quantitatively (i.e. the state and size of the damage) while trains are in motion. This has facilitated continuous investigation of the state of wheel tread in all trains and limited express cars that cover particularly large distances per day.

(4) Using the “wheel flat detection device”, vibration (vertical acceleration) due to wheel tread peeling, abrasion and other factors during vehicle motion can be measured. Since the device was installed, we have continuously cross-checked the data obtained from the device with actual wheel tread (in trial operation until June 2016).

(5) In conjunction with the initiatives in 1. (1)-(4), we are continuously investigating abrasion, peeling and other problems on actual wheels, based on wheel inspection results from pre-departure inspection and regular inspection, etc., data from the "wheel flat detection device", and confirmation of actual wheel tread. So far, no progression of "peeling caused by thermal cracking" that could cause obstruction to vehicle motion has been recognized.

Wheel tread exfoliation condition

(6) In vehicles that do not pass through the installation location mentioned in 1.(3) above, thermal cracking occurs extremely rarely as the top speeds are low and the distances run within pre-departure inspections are short. For these vehicles, we periodically maintain and manage the state of wheel tread through pre-departure inspections.

(7) In future, we will continue to manage the state of wheel tread for different vehicles using the "wheel flat detection device", which is due to come into full operation in July 2016, in conjunction with the traces in 1.(1) and (2).

2. Actions taken in connection with the plan to "optimize wheel turning frequency for different types of vehicle by applying the initiatives in 1."

(1) On the frequency of wheel turning, as stated in 1.(2) above, since December 2013, for electric trains and limited express cars that cover particularly large distances per day and whose wheels are thus thought likely to be strongly impacted, the vehicle-related planning division, consulted with site managers engaged in wheel repair in December 2013, based on the wheel management situation of each site, decided targets for wheel turning frequency for each type of vehicle, and is currently engaged in wheel turning.

(2) Judging from the state of wheel tread during wheel inspections to date, as well as data from the "wheel flat detection device", no "peeling caused by thermal cracking" had occurred in wheel tread to the extent that would obstruct vehicle motion, in any vehicle type, during the above period targeted for wheel turning frequency.

(3) At present, we feel the wheel turning frequency decided for each vehicle type to cause no problem in terms of safety. We will continue to undertake the efforts in 1. above, while also confirming the wheel turning frequency each time a new vehicle type is introduced or there is a significant change in the vehicle operation status.

Also, whenever we detect problems such as abrasion in excess of standard values for wheel tread, arising from emergency stop operations, etc., we perform wheel turning regardless of the target for wheel turning frequency.

3. Actions taken in connection with the plan to "Check whether standard values need to be revised for high-speed vehicles and vehicles that use small-diameter wheels, which have been managed under conventional standards for tread abrasion and peeling length."

(1) In collaboration with third-party bodies, we conducted experiments on three types of wheel to ascertain the relationship between vehicle speed and axle box vibration (vertical acceleration) under the standard limit for length of tread abrasion and peeling (75mm). Specifically, the experiment tested wheels with a diameter of 860mm (basic wheel diameter), 810mm (basic diameter for small-diameter wheels) and 730mm (usable limit diameter for small-diameter wheels).

(2) As a result, it was found that axle box vibration (vertical acceleration) increases with the rise in vehicle speed after starting the engine, but that vertical acceleration reaches a peak at vehicle

speeds of around 30km/h, then falls as the vehicle speed increases. This tendency was the same for all three wheel types.

The maximum value for vertical acceleration was also more or less the same for all three types, proving that the impact on the vehicle diminishes as the speed increases.

(3) In this experiment, we investigated the bending stress of axles under some of the most severe conditions of intensity unsprung units. As a result, we proved that axle bending stress was sufficiently within the tolerable stress for axles even in the case of small-diameter wheels (810mm and 730mm).

(4) In view of 3.(1)-(3) above, we judge there to be no problem if we apply the conventionally used standard values for high-speed vehicles and vehicles with small-diameter wheels, and so will not revise those standard values.

○ Actions based on the recommendations (completion report (supplement))

(1) On July 24, 2015, the vehicle-related planning division installed, on a trial basis, a "wheel flat detection device" in Naebo Station, through which all electric trains in the Sapporo region and all limited express gas-electric trains pass. With this device, situations where thermal cracking and abrasion (including peeling) are suspected can be detected continuously and quantitatively (i.e. the state and size of the damage) while trains are in motion. This has facilitated continuous investigation of the state of wheel tread in all trains and limited express cars that cover particularly large distances per day.

(2) Using the "wheel flat detection device", vibration (vertical acceleration) due to wheel tread peeling, abrasion and other factors during vehicle motion can be measured. Since the device was installed, we have continuously cross-checked the data obtained from the device with actual wheel tread. As a result, we drew up standards for extra wheel inspection needed in addition to the conventional wheel inspection, and started full operation on July 1, 2016.

(3) In future, we will continuously make efforts in connection with our revision of the wheel inspection standards in December 2013, our setting of targets for wheel turning frequency in electric trains and limited express vehicles at that time, and other matters, while at the same time continuously managing the state of wheel tread for each vehicle using the "wheel flat detection device" that we have now brought into full operation.

* The completion report can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/railkankoku/railway-kankoku3re-4_20160823.pdf

② Sangi Railway Co., Ltd.: Serious railway incident on the premises of Higashi -Fujiwara Station on the Sangi Line

(Recommendation issued on October 25, 2013)

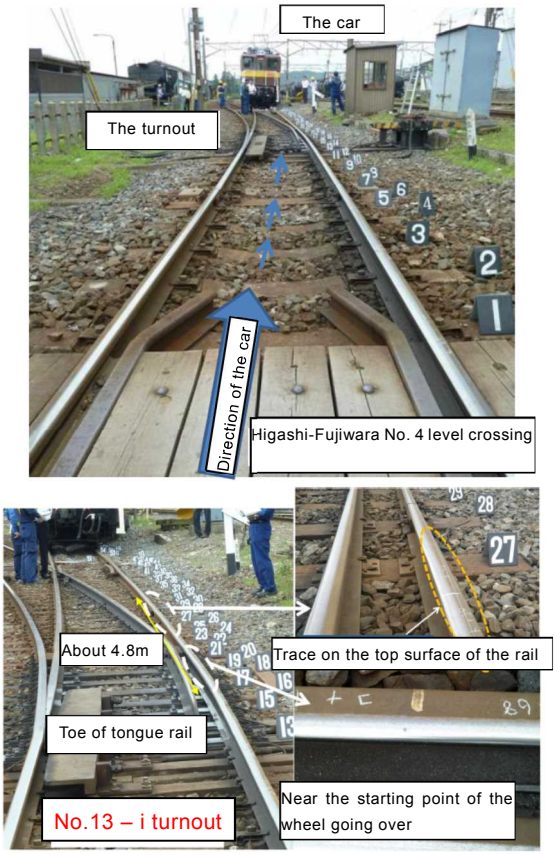
On October 25, 2013, the Japan Transport Safety Board (JTSB) published an investigation report and issued a recommendation to Sangi Railway Co., Ltd. as one of the parties relevant to the cause of the serious incident, regarding the serious railway incident that occurred on the premises of Higashi-Fujiwara Station on the Sangi Line on June 27, 2012. The Board received the following report concerning actions based on the recommendations (completion report).

○ Summary of the serious incident

At about 3:00 P.M. on June 27 2012, one of Sangi Railway Co., Ltd.'s 18-car shunting train (two electric locomotives and 16 freight cars) sets started from the private siding of a cement factory for the downbound main line in Higashi-Fujiwara Station.

The driver of the train set, noticing an abnormal condition when it was passing the Higashi-Fujiwara No. 13-I turnout, immediately applied the emergency brake to stop the train. The first axle in the front bogie of the second locomotive was derailed to the right.

A driver was working in the second locomotive, and two guides were in the first one, as well as a switchman in the third one. None of them were injured.



Derailment site

○ Probable causes

This serious incident occurred when the set of 18-car shunting train (two electric locomotives and 16 freight cars) was running along the section of the base line side of a turnout that goes in the same direction as the curve. The turnout was in a section that contained four consecutive curves. The situation was attributable to an increase in the derailment coefficient, which occurred at the same time as a decrease in the threshold derailment coefficient. As a result, the right wheel in the first axle of the second locomotive's front bogie subsequently ran up the outside rail and derailed to the right.

It is probable that the increase in the derailment coefficient is a result of the increase in lateral force, as well as a decrease in the wheel weight. This situation can be deduced from the following factors: the track was deformed in a direction that results in the reduction of the radius; the twist of the track increased so that the train leaned to the front right, and; it is probable that that the train was running with excess of cant, which was due to its low-speed. It is somewhat likely that the shift of the axle load due to the power running at an ascent was also a contributing factor.

It is probable that the decrease in the threshold derailment coefficient results from a shifting of track, which is associated with an excessive reduction of the radius, resulting in an increase in the angle of attack for the first axle of the front bogie.

It is probable that the rapid shifting of track and the increase in twists resulted from their poor management of the shapes and shifts of the tracks. They did not understand the specification of plain curves, or did not inspect the shifts of the tracks in the turnouts. As a result, they were not able to recognize that the state of the tracks exceeded the allowances of its maintenance criteria.

○ Description of the recommendation to Sangi Railway Co., Ltd.

Sangi Railway Co., Ltd. should make sure that their tracks are well maintained. They should do so by grasping the design values for maintenance and management and by inspecting shifts properly in accordance with the "Practice Criteria for construction works" in sections involving curves and/or turnouts.

○ Actions based on the recommendations (completion report)

Since specifications of curves have been clarified for curves of our Sangi main line between each station, we have utilized them for track maintenance. However, some specifications of curves were not clarified in the main line, side lines, and curves with turnouts on the premises of each station.

We had depended on the "long experience" and "review" of field workers.

As a result of investigations, we have clarified that stations, in which the specifications of curves were unclear, are 10 stations, including Tomida Station, Oyachi Station, Heizu Station, Hobo Station, Umedoi Station, Misato Station, Nyugawa Station, Ise-Hatta Station, Higashi-Fujiwara Station, and Nishi-Fujiwara Station. We took measurements in order to clarify the specifications in these stations, and performed work to define the specifications of curves one by one by reading the current curves from the survey maps. Of these, we have reported on the completion of work in Higashi-Fujiwara and Umedoi Stations in Sangi Tetsu No. 64 dated May 28, 2014, and in Tomida, Oyachi, Heizu, Hobo, Misato, Nyugawa, Ise-Hatta and Nishi-Fujiwara Stations in Sangi Tetsu No. 69 dated August 25, 2015.

With regard to turnouts in three locations inside station premises (Tomida Station *Sa* Nos. 60 and 91 and Higashi-Fujiwara Station No. 60), which were adjusted on site due to a lack of specifications (hereinafter referred to as "similar turnouts"), we took steps to remove and replace branches. We have reported on the completion of work on Higashi-Fujiwara Station No. 60 turnout in Sangi Tetsu No. 69 dated August 25, 2015. This time, we report on the completion of measures for Tomida Station *Sa* No. 60 and No. 91 turnouts.

1. Actions taken for "similar curve locations"

・Tomida Station

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps for 11 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Oyachi Station

We started taking measurements on January 10, 2014, and the field measurements were completed on January 18.

Based on these measurement results, we have prepared line survey maps for 3 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Heizu Station

We started taking measurements on December 4, 2013, and the field measurements were completed on June 25, 2014.

Based on these measurement results, we have prepared line survey maps for 2 curves,

including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Hobo Station

We started taking measurements on March 4, 2014, and the field measurements were completed on April 4.

Based on these measurement results, we have prepared line survey maps for 8 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Misato Station

We started taking measurements on April 5, 2014, and the field measurements were completed on April 15.

Based on these measurement results, we have prepared line survey maps for 4 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Nyugawa Station

We started taking measurements on January 20, 2014, and the field measurements were completed on February 10.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No.90, dated November 7, 2014) regarding the new track shapes and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No.159, dated November 26, 2014). In response to this, we have implemented the construction to exchange to heavy turnouts with heavy tracks within the station in accordance with the defined track shape (37 kg → 50 kgN) (a total of 4 turnouts, including No. 11-I turnout, No. 11-Ro turnout, No. 12-I turnout, and No. 12-Ro turnout) as well as the curve improvement construction along with it by March 16, 2015. Due to these constructions, all 2 curves have been improved to the new track shapes.

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Ise-Hatta Station

We started taking measurements on February 25, 2014, and the field measurements were completed on March 3.

Based on these measurement results, we have prepared line survey maps for 5 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

・Nishi-Fujiwara Station

We started taking measurements on December 4, 2013, and the field measurements were completed on June 25, 2015.

Based on these measurement results, we have prepared line survey maps for 2 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new track shapes and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

2. Actions taken for “similar turnouts”

・Tomida Station *Sa* No. 60 turnout

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of modification of railway facilities when replacing turnouts (Sangi tetsu No. 39 dated April 14, 2016) and have received the approval of the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No.19 dated April 26, 2016). In response to this, the turnouts were replaced and curve improvements were completed by August 10, 2016.

・Tomida Station No. 91 turnout

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of modification of railway facilities when removing turnouts (Sangi tetsu No. 39 dated April 14, 2016) and have received the approval of the Director-General of the Chubu District Transport

Bureau (Chu-untetsugi No.19 dated April 26, 2016). In response to this, the turnouts were removed and the change to straight tracks was completed by July 20, 2016.

・Higashi-Fujiwara Station No. 60 turnout

We started taking measurements on May 22, 2012, and the field measurements were completed on August 7, 2012.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of modification of railway facilities when removing turnouts (Sangi tetsu No. 76, dated July 3, 2014) and have received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 84, dated July 14, 2014). In response to this, the turnouts were removed and the change to straight tracks was completed by January 27, 2015.

* The completion report can be found on the JTSB website.
http://www.mlit.go.jp/jtsb/railkankoku/railway-kankoku5re-6_20160826.pdf

8 Provision of factual information in 2016

There were no cases of provision of factual information in 2016.

Column

Outreach Lecture

- Workshop with Senior High School Pupils -

Railway Accident Investigator

As the autumn took hold, we received a request from a school in the Kansai region for a workshop on the theme of "Railway Accident Investigation". The workshop was attended by 20 pupils in grade 1 of senior high school, and as if by coincidence, was overseen by two railway accident investigators who have children of the same age.

In the workshop, we attempted to explain the work of investigating railway accidents in a way that the pupils could envisage and readily understand. We encouraged them to express themselves as far as possible, and tried to give them a feeling for the subject.

The central focus of the workshop was the mission of the Japan Transport Safety Board, situations in which investigations are made, and the methods we use to conduct those investigations. On this basis, we asked questions like "How many railway accident investigators do you think there are?" or "What do you think we do when we don't go to investigate in the actual site?", and explained aspects that we thought would interest senior high school pupils.

The pupils themselves asked questions like "How can I become an accident investigator?", "At least how many years does it take to become an investigator?", and "What was the hardest thing you have ever done?" We were a little nervous to face pupils who were the same age as our own children, but we were once again reminded of the weight of responsibility we bear as accident investigators, and it was an invigorating experience.

Through this workshop, we would be happy if the pupils could intensify their understanding of accident investigation by the Japan Transport Safety Board and take an interest in the work of railway accident investigators.

The workshop in progress

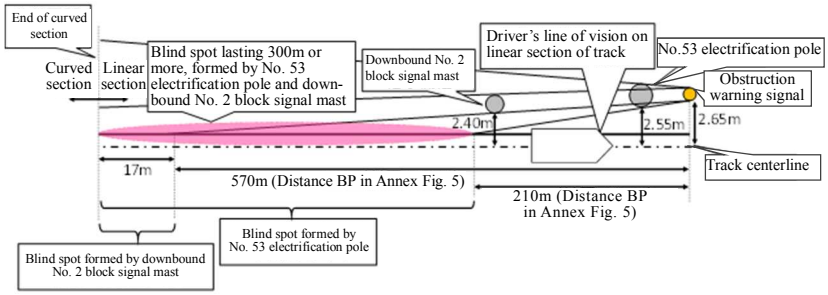
9 Summaries of major railway accident and serious incident investigation reports (case studies)

Collision with a truck on a level crossing when it was not possible to confirm the indication on the stop signal of an obstruction warning indicator West Japan Railway Company: Level crossing accident between Nishi-Achi Station and Shin-Kurashiki Station on the Sanyo Line

Summary: On February 13, 2015, the train, composed of 6 vehicles, started departed from Nishiach station on schedule. The driver of the train cruising with the speed of about 95 km/h, noticed the stop signal of the obstruction warning signal at Hachinin-yama level crossing and, at the same time, noticed the truck stopped in the level crossing, so that he immediately applied an emergency brake and blew the whistle, but it was too late, the train collided with the truck and stopped at about 210 m passed the level crossing. There were about 300 passengers, the train driver and the conductor onboard the train, among them, 44 passengers and the train driver were injured, including one seriously injured passenger. The driver of the truck was not injured because he evacuated out of the level crossing when the collision occurred. The train was not derailed but damaged in the parts of the vehicles. The truck was seriously damaged but fire was not ignited.

Findings

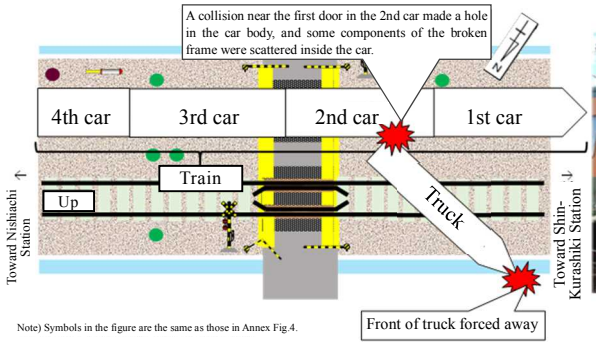
The obstruction warning signal to outbound trains on the level crossing was in a blind spot formed by electrification poles along the track, and there was a section extending to at least 300m in which the outbound train driver could not confirm the indication of the stop signal on the obstruction warning signal.



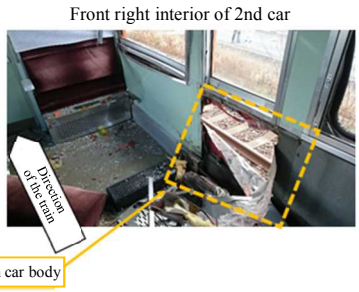
Note: Distances are not to scale.

It is probable that the occurrence of serious injury was caused by the impact of the 2nd or later collision between the truck and the train, and by a collision with objects that appear to have been parts of the frame that broke due to the collision and parts of the train that became scattered inside the vehicle. It is probable that the occurrence of numerous injuries was caused by a strong impact when the train collided with the truck.

* Obstruction warning signal: A signal that is linked to the emergency stop button, level crossing obstruction detector, etc., and presents a stop signal when these are activated.



Note) Symbols in the figure are the same as those in Annex Fig.4.



It is somewhat likely that the truck stopped on the level crossing because its engine power could not be transferred owing to an abnormality in the transmission when shifting gears just before this accident occurred. However, it could not be determined why this kind of situation occurred, because the records in the truck's control unit did not include time records, and because the state of the truck's transmission just before this accident occurred is unknown.

Probable causes (Excerpt): It is certain that the accident had occurred because the truck had stopped in Hachinin-yama level crossing road, the approaching train collided with the truck. It is highly probable that the train could not stop before the level crossing because the train driver could not notice the obstacle in the level crossing promptly. It is somewhat likely that the reason why the train driver could not notice the obstacle promptly, was related with that there were over 300 m long section where the driver of the outbound train could not confirm stop signal indication of the obstruction warning signal, as the obstruction warning signal against the outbound trains in the level crossing was in the blind angle by the track side electrification poles.

For details, please refer to the accident investigation report. (Published on March 31, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-3-1.pdf

A fire caused when a passenger sprinkled gasoline inside the train and ignited it
Central Japan Railway Company: Train fire accident between Shin-Yokohama Station and Odawara Station on the Tokaido Shinkansen

Summary: On June 30, 2015, the train departed from Shin-Yokohama station on schedule. At about 11:30, the driver of the train, while the train was in powering operation at about 250 km/h, confirmed indication showing that the communication buzzer installed in the cabin of the second vehicle was operated, he applied an emergency brake. and asked the conductor to check the first vehicle using the public address system. On the other hand, the conductor of the train, engaged in examination of tickets in the 4th vehicle, informed from the passenger that a passenger sprinkled oil in the first vehicle, and find the fire outbreak in the first vehicle on his way to the first vehicle. After the train had stopped, the driver and the conductor checked the cabin of the first vehicle, as they found the fallen passenger in the rear deck, they took relief activities. Furthermore, as they found another passenger fallen in the aisle of the front cabin in smoked surroundings, they carried out firefighting with the fire extinguisher.

There were about 900 passengers, the train driver, 3 train conductors and 5 pursers onboard the train, among them, two passengers fallen in the first vehicle were dead. Furthermore, 25 passengers, 2 of them were seriously injured, and the train driver and 2 train conductors were injured.

The seats, floor, side wall, sealing, etc., from the front to the mid part of the first vehicle were burnt by the fire.

Findings

It is probable that the operation by the driver after the fire broke out was appropriate, because the driver momentarily applied the emergency brake in accordance with the proper handling whenever the emergency buzzer has been sounded, since there was an intermittent series of tunnels and bridges near the accident site, he subsequently judged it possible that a fire had broken out on the train, and thus avoided tunnels or bridges when stopping the train, in accordance with the company's internal rules.

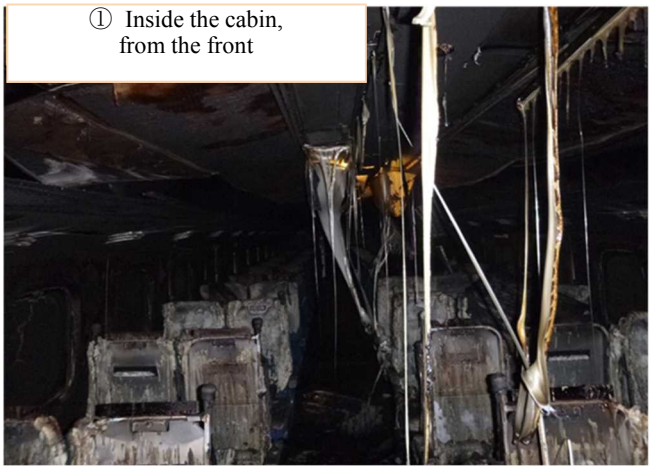
Many passengers started to evacuate independently after becoming aware of an abnormality inside the cabin of the 1st car, but some passengers subsequently did not evacuate to the rear cars but stopped and lingered on the deck, then evacuated to the rear cars when smoke started to spread inside the deck.

It is probable that initial fire extinguishing activities could not be performed, because the smoke was so thick that they could not check inside the 1st and 2nd cars immediately after the fire broke out.

It is probable that the measures are worked to prevent the spread of fire by using materials compliant with the technical standards on fire resistance, because the main damage for the cars was limited between around the middle of the cabin and the front deck of the 1st car, near the location where the fire broke out.

Since it is probable that it was difficult to confirm whether any passengers were left in the car in which the fire broke out, it is desirable that smoke masks, fireproof gloves, etc. should be equipped in the crew cabins and other locations, based on the situation of the train route and other factors, so that the crew members can assist the passengers to evacuate and support for necessary measures to be taken, as far as they can when a fire breaks out.

It is probable that, to reduce further casualties in the similar accidents, efforts will be needed to encourage passengers to evacuate independently and as quickly as possible toward other cars from those in which fire or signs of fire have been seen, until the crew can start guiding the evacuation.



① Inside the cabin, from the front

Probable causes: It is highly probable that the accident occurred because the passenger onboard the train sprinkled gasoline and ignited fire by himself in the cabin of the first vehicle.

It could not be determined precise reason why the passenger ignited the fire by himself, because the passenger was dead by the accident.

For details, please refer to the accident investigation report. (Published on June 30, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-5-2.pdf

Third derailment at the same intersection since 2007
Nagasaki Electric Tramway Co., Ltd.: Vehicle derailment between Suwa-Jinja-Mae tram stop and Kokaido-Mae tram stop on the Sakuramachi Branch Line

Summary: On October 11, the tram departed from Suwajinja-Mae tram stop on schedule. While the vehicle was passing through the right curved branch line to Nagasaki Eki-Mae tram stop, of the turnout in the Kokaido-Mae intersection, the tram driver noticed the tram turned to the different direction from the scheduled route and applied brake to stop the vehicle. The driver got off the tram and checked and found that the all two axles in the rear bogie derailed to left of the rail.

There were 4 passengers and the driver onboard the tram, but there was no casualty. Here, the accident site was in the intersection of roads with tramway, but the derailed tram did not contact nor collide with automobiles etc., before and after the derailment.

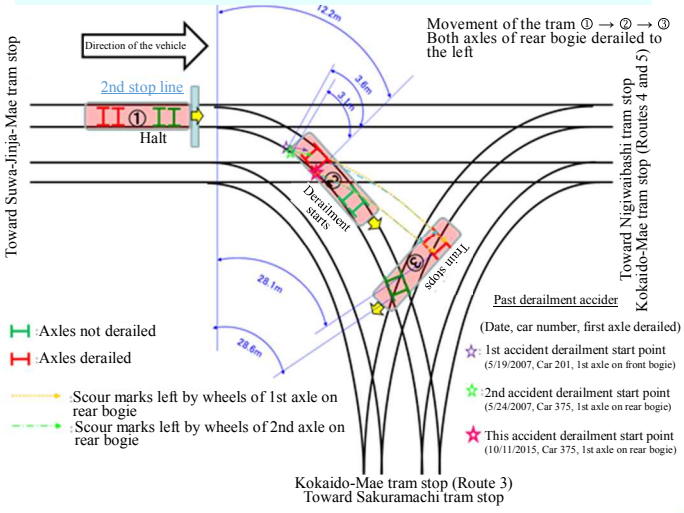
Findings

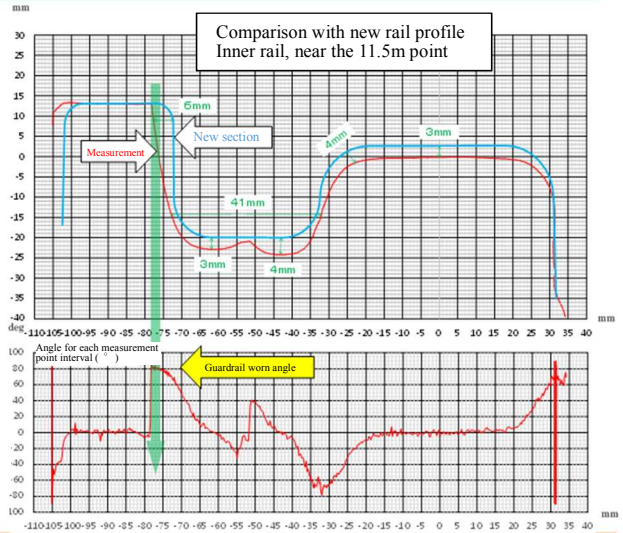
It is somewhat likely that the occurrence of the derailment was influenced by a critical variation in lateral force acting on the inner wheel back surface and increased derailment coefficient of the inner wheel back surface due to the sudden change of the back gauge and flangeway width just before the derailment start point.

When this accident occurred, the worn angle of the guardrail near the derailment start point was about 80°, smaller than the 90° at new. It is somewhat likely that the occurrence of the derailment was influenced by the resultant decrease in the critical derailment coefficient for the inner wheel back surface derailment.

It is somewhat likely that the friction coefficient was high at the point of contact between the wheel back surface and the guardrail near the derailment start point when this accident occurred, in comparison to those under the wet rail condition or sufficiently lubricated condition. It is somewhat likely that the derailment was influenced by the resultant decrease in the critical derailment coefficient for inner wheel back surface derailment.

It is probable that the main cause of both the 1st and 2nd accidents was that the finished state was inappropriate after the tracks were repaired. By contrast, it is somewhat likely that this accident was caused by a combination of factors, such as the train speed, the friction coefficient at points of contact between the wheel back face and the guardrail, the worn angle of the guardrail, and the irregularity of the back gauge, etc.





Probable causes (Excerpt): It is probable that the accident occurred as follows, while the tram was running in the right curved branch line in the turnout, as the back side of the right wheel of the first axle in the rear bogie was contacting with side surface of the rail, having the role of guard rail, in the diamond crossing, the back side of the right wheel climbed up the guard rail and derailed to left, and after that, the left wheel of the first axle climbed up the left rail and derailed to left, furthermore, the second axle on the rear bogie also derailed to left.

It is probable that the right wheel of the first axle in the rear bogie derailed due to the increased derailment coefficient against the derailment from the back surface of the inner wheel, as the wheel load decreased and the lateral force on the back surface in the right wheel increased in the diamond crossing existed in the very small radius curve, also, due to the derailment coefficient exceeded the critical derailment coefficient as the critical derailment coefficient against derailment was decreased.

For details, please refer to the accident investigation report. (Published on November 24, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-8-1.pdf

A vehicle derailment also occurred at the same intersection on the Sakuramachi Branch Line on June 2, 2016. The Japan Transport Safety Board published its investigation report on that accident on March 30, 2017. For a summary of the accident, see “5. Summaries of railway accidents and serious incidents that occurred in 2016” No. 7 (p.54).

Driver missed to check starting signal, causing train to run into piled gravel buffer stop and become derailed

Shikoku Railway Company: Train derailment in the premises of Orange Town Station on the Kotoku Line

Summary: On December 31, 2015, the inbound train driver opened the passenger doors after the train arrived at Orange-Town station, while he was waiting passengers got on and off, he noticed that it was the time of scheduled departure, and started the train. While the train was running in powering operation at about 33 km/h in the premises of Orange-town station, the train driver noticed the sound of the ATS alarm of the train and operation of an emergency brake, as he reminded that he had started the rain without confirming the signal indication, then he immediately set the brake handle to the emergency brake position. The train decelerated by the emergency brake, but entered into the safety siding from the main line in Orange-town station, and ran into the piled gravel as the buffer stop, and the first axle in the front bogie derailed from the end of rails in the piled gravel.

The opposite outbound train stopped urgently at around the entry signal as the signal turned red due to operation of the urgent protection device for safety siding according to the entrance of the car stop by the inbound train.

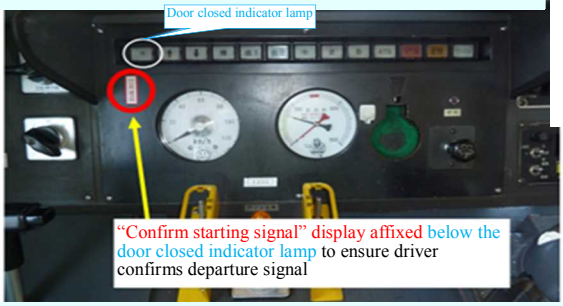
There were 45 passengers and the driver onboard the train, one of the passenger was injured.

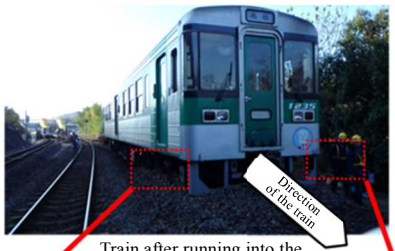
Findings

It is highly probable that the starting signal was indicating the stop signal from the time when the train arrived at Platform 1 of Orange Town Station until it departed.

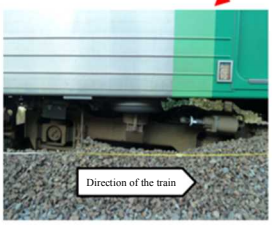
Regarding to the actions and behavior of the driver while the train was waiting at Orange Town Station, it is somewhat likely that the driver was performing driving operations unconsciously, with looking out toward the car park overpass and thinking about something else.

After an incident in which a starting signal was disregarded at Tosakure Station, the company had alerted drivers, as a measure to prevent recurrence since fiscal year 1992, with a "Confirm starting" warning under the door closed indicator lamp, reminding drivers to confirm the departure signal. However, it is somewhat likely that this reminder had merely become a formality as the company had not given guidance on its significance, and as the result, these measures taken in the past were not functioning effectively.





Train after running into the piled gravel buffer stop and stopping



Front bogie buried in piled gravel buffer stop (right side)

1st axle buried in piled gravel buffer stop (left side)

In anticipation of situations such as this accident, it is desirable that the positions of ATS ground coils and on-board coils as well as train stopping positions for dealing with passengers getting on and off, should be comprehensively reviewed and systematically developed through collaboration among staffs involved in the design, so that trains can stop safely.

This accident could have been avoided if an ATS on-board coil had been installed in a position close to the front of the car. In future, it is desirable that the position shall fully considered when designing railway cars.

Probable causes: It is highly probable that the accident occurred as the train derailed from the end of rails under the piled gravel after entered into the safety siding, in spite of the operation of an emergency brake by the automatic train stop, ATS, because the driver started the train although the stop signal was indicated in the starting signal of Orange-town station.

It is probable that the driver started the train irrespective of the stop signal indication of the starting signal because the driver forgot confirming the starting signal after the powering operation because the driver missed to check the starting signal before the powering operation due to the lack of sense to obey the operation procedure, as the driver implemented the other action when he should check the starting signal, furthermore, the driver unconsciously implemented the operation procedures to start train, thinking about something else.

For details, please refer to the accident investigation report. (Published on December 15, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2016-9-1.pdf

Route of other trains obstructed due to conflicting awareness of train position between the parties concerned when issuing instructions

Kyushu Railway Company: Serious incident (other) in the premises of Hizen-Ryuo station on the Nagasaki Line

Summary: On May 22, 2015, the outbound limited express train departed from Hakata station on schedule. While, the train was cruising at about 100 km/h between Hizen-Shiroishi station and Hizen-Ryuo station, the driver felt an abnormal sound after the finger-pointing and call about the proceed signal indication of the down line entry signal of Hizen-Ryuo station, and applied an emergency brake immediately to stop the train. After that, the driver reported to the train dispatcher about the situation to stop the train.

The train dispatcher, after received the report from the driver of the train, changed the interchange point of the outbound limited express train and the inbound limited express train, from Hizen-Kashima station to Hizen-Ryuo station.

The driver of the outbound limited express train, after checked the spot where the abnormal sound was noticed and inspected the train, restart train operation obeying the instruction of the train dispatcher. Then the driver noticed that the train entered into the No.1 line of Hizen-Ryuo station that was different from the scheduled route, and applied an emergency brake immediately to stop the train.

On the other hand, the driver of the inbound limited express train, started the train from Hizen-Kashima station as he received the notice about modification of the interchange point from the train dispatcher. When the train stopped at the designated point in No.1 line of Hizen-Ryuo station, the driver found that the outbound limited express 2019M train was stopped in front of the same No.1 line.

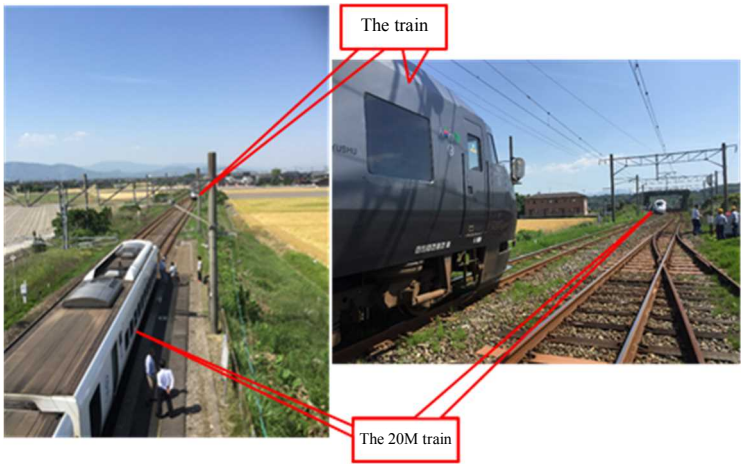
Findings

It is probable that the position where the outbound limited express stopped after feeling an abnormal sound was where the front axle of the front car was positioned between the position of the entry signal 2R and the track circuit demarcation point.

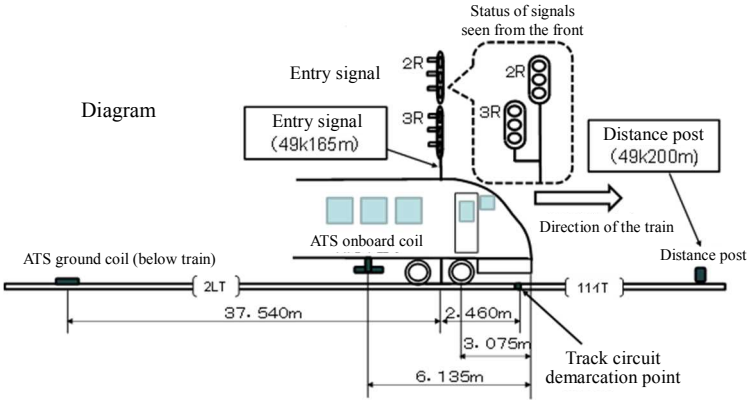
The driver of the outbound limited express only reported the mileage based on the driver console monitor, while the train dispatcher only received a distance report and judged whether the train was inside the station premises or between stations based on the track circuit short-circuit display on the control console screen.

It is probable that, after starting again, the train involved in this incident by entering to the section in which a stop signal was shown. However, because the train had already passed over the ATS ground coil (below the train), the ATS brake was not activated.

It is probable that both the train driver and train dispatcher, did not report or confirm the stopped position determined in past instruction documents and work standards regarding reports on stopped positions. It is also probable that this was because the company had not grasped the working realities of reports and confirmations.



Diagram



Probable causes (Excerpt): It is probable that the railway serious incident occurred as the outbound limited express train, stopped beyond the down line entry signal of Hizen-Ryuo station indicating proceed signal, restarted operation obeying the instruction by the train dispatcher after the entry signal indicated stop signal, resulted in the state of red signal violation against the entry signal, and entered into the safety margin for overrunning section for the inbound limited express train scheduled to stop in the No.1 line of the station, induced the possibility that the two trains were operating at the same time in the section of the safety margin for overrunning, when the inbound limited express train, operated obeying the instruction of the train dispatcher and signal indication, passed through the entry signal for the up line.

For details, please refer to the serious incident investigation report. (Published on June 30, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-inci/RI2016-1-1.pdf

Pole provided for the train operations tilted and fell, obstructing the structure gauge
East Japan Railway Company: Serious incident between Kanda Station and Akihabara Station on the Tohoku Line (Yamanote Line) (Dangerous damage in facilities)

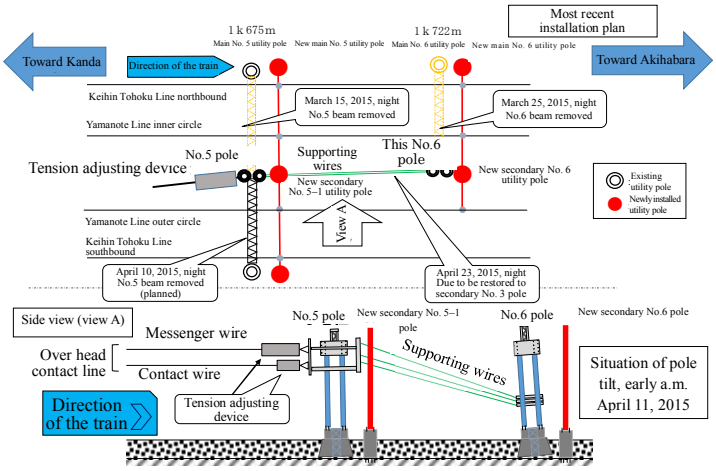
Summary: On April 12, 2015, at about 6:10, while the train was operating between Kanda station and Akihabara station, the train driver noticed that the pole, installed between the neighboring Tohoku Lines, i.e., between Yamanote inner circle line and Yamanote outer circle line, was falling down to the direction of Kanda station, and applied an emergency brake to stop the train and operated the train protection radio.
There was no injured person by the incident.

Findings

The structure of the gravity type block foundation for the pole was such that the allowable tilting moment of the foundation varied according to vertical forces produced by the mass of poles, beams, overhead contact lines, etc. It is therefore probable that the pole tilted and eventually fell during overhead line equipment renewal work, because the safety factor against tilting of the foundation had decreased, due to an increased tilting moment caused by the effect of horizontal tension, because supporting wires that were attached to the pole was at a higher position than normal (1.9m) in July 2011.

It is probable that the safety factor against tilting decreased to 1 or less, because the beam, overhead contact lines and others attached on the top of the pole were removed in March 2015, and these decrease the vertical force acting on the structure of foundation, although the tilting moment due to the force acting on the supporting wires did not change.

The company staffs, who did not understand the structure of the pole foundations, had mistakenly judged the safety factor to be adequate, based on the assumption that the foundations had a more robust structure such as the anchor bolt foundations used in more than half of the cases between Kanda and Akihabara Stations, and it is probable that this played a part in this incident.



Probable causes (Excerpt): It is probable that the serious incident had occurred as that the pole used for train operation tilted, in the process of the dismantling works of poles accompanied with the integrated overhead contact line construction of the electric circuit facility, and the pole was tilting seriously because the required measures did not implemented, though the information that the pole was tilted was announced to the plural staffs concerned, and fell down on the railway track in the service hours of train operation, and obstructed the structure gauge significantly.

It is probable that the reason why the required measures were not implemented when the information about tilting of the pole, was related with the followings.

(1) The prompt temporary measures were not implemented when the tilting of the pole was noticed, because the related staffs could not judge the situation as dangerous due to lack of the similar experiences as tilting of poles previously in the integrated overhead contact line construction work.

Furthermore, although the communication system for an emergency was prepared, the communication to the related section, such as the electric power dispatcher, etc., did not implemented promptly.

(2) No one in the Tokyo general dispatcher room did not understand that the situation was abnormal stage that should be dealt with urgently, because the report from the onsite transport section was "there was no obstruction in train operation".

Furthermore, the conventional procedures implemented in the dispatcher room, that the report to the facility maintenance commander should be done after the precise information of the dispatchers were collected, was related with the delay in communication to the related sections required.

For details, please refer to the serious incident investigation report. (Published on July 28, 2016)
http://www.mlit.go.jp/jtsb/railway/rep-inci/RI2016-2-1.pdf

Chapter 5 Marine accident and incident investigations

1 Marine accidents and incidents to be investigated

<Marine accidents to be investigated>

◎Paragraph 5, Article 2 of the Act for Establishment of the Japan Transport Safety Board

(Definition of marine accident)

The term "Marine Accident" as used in this Act shall mean as follows:

1 Damage to a ship or facilities other than a ship related to the operations of a ship.

2 Death or injury of the people concerned with the construction, equipment or operation of a ship.

<Marine incidents to be investigated>

◎Item 2, paragraph 6, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of marine incident)

A situation, prescribed by Ordinance of Ministry of Land, Infrastructure, Transport and Tourism, where deemed to bear a risk of Marine Accident occurring.

◎Article 3 of Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board

(A situation, prescribed by Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism, stipulated in item 2, paragraph 6, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The situation wherein a ship became a loss of control due to any of the following reasons:

(a) navigational equipment failure;

(b) listing of a ship; or

(c) short of fuel or fresh water required for engine operation.

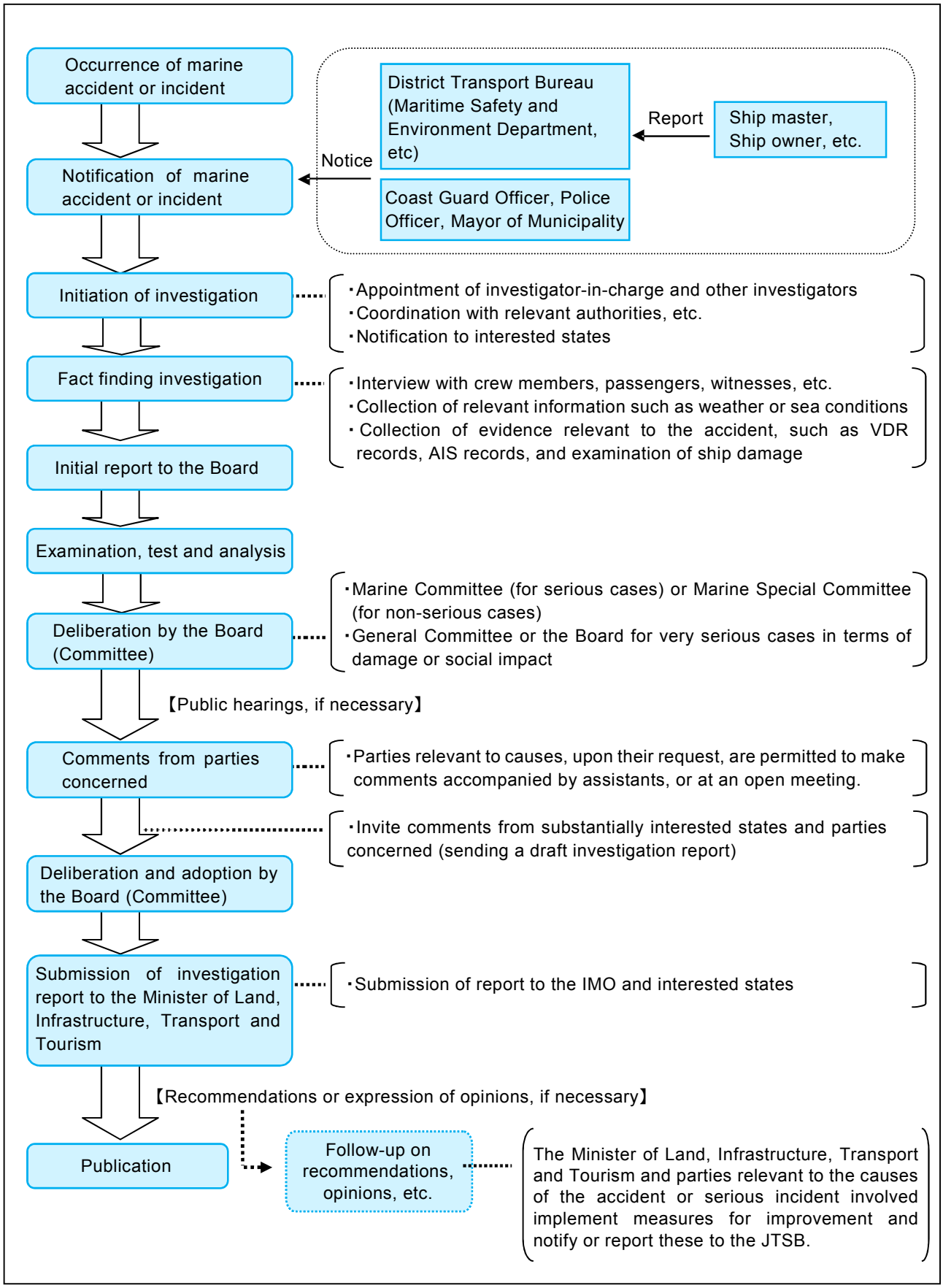
2 The situation where a ship grounded without any damage to the hull; and

3 In addition to what is provided for in the preceding two items, the situation where safety or navigation of a ship was obstructed.

<Category of marine accident and incident>

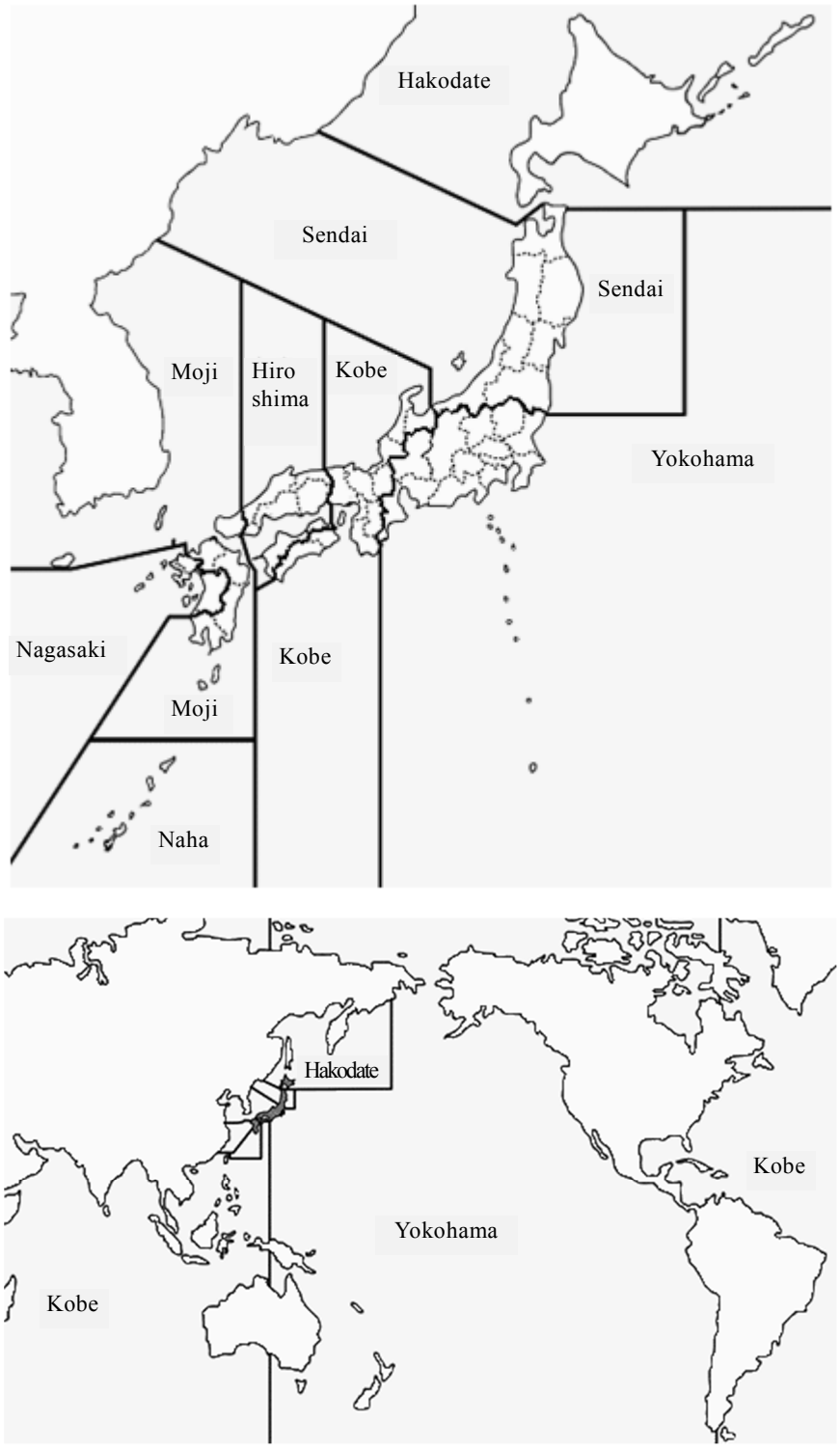
Marine accident and incident to be investigated		Type of marine accident and incident
Marine accident	Damage to ships or other facilities involved in ship operation	Collision, Grounding, Sinking, Flooding, Capsizing, Fire, Explosion, Missing, Damage to facilities
	Casualty related to ship structures, equipment or operations	Fatality, Fatality and injury, Missing person, Injury
Marine incident	Navigational equipment failure	Loss of control (engine failure, propeller failure, rudder failure)
	Listing of ship	Loss of control (extraordinary listing)
	Short of fuel or fresh water required for engine operation	Loss of control (fuel shortage, fresh water shortage)
	Grounding without hull damage	Stranded
	Obstruction of ship safety or navigation	Safety obstruction, Navigation obstruction

2 Procedure of marine accident/incident investigation



3 Jurisdiction of the Offices over marine accidents and incidents

For the investigation of marine accidents and incidents regional investigators are stationed in the regional offices (eight offices). Our jurisdiction covers marine accidents and incidents in the waters around the world, including rivers and lakes in Japan. The regional offices are in charge of investigations in the respective areas shown in the following map. Marine accident investigators in the Tokyo Office (Headquarters) are in charge of serious marine accidents and incidents.



Jurisdiction map

4 Role of the Offices and Committees according to category of accident and incident

Serious marine accidents and incidents are investigated by the marine accident investigators in the Headquarters, and are deliberated in the Marine Committee. However, particularly serious accidents are deliberated in the General Committee, and extremely serious accidents are deliberated in the Board.

Non-serious marine accidents and incidents are investigated by regional investigators stationed in the eight regional offices, and deliberated in the Marine Special Committee.

(For the deliberation items of the Board and each Committee, refer to page 2 of the Appendixes)

<table>
<tr><td>Serious marine accidents and incidents</td><td>Office in charge of investigation: Marine accident investigators in the Headquarters
Committee in charge of deliberation and adoption: Marine Committee</td></tr>
<tr><td colspan="2">Definition of ”serious marine accidents and incidents”
•Cases where a passenger died or went missing, or two or more passengers were severely injured.
•Cases where five or more persons died or went missing.
•Cases involved a vessel engaged on international voyages where the vessel was a total loss, or a person on the vessel died or went missing.
•Cases of spills of oil or other substances where the environment was severely damaged.
•Cases where unprecedented damage occurred following a marine accident or incident.
•Cases which made a significant social impact.
•Cases where identification of the causes is expected to be significantly difficult.
•Cases where essential lessons for the mitigation of damage are expected to be learned.</td></tr>
<tr><td>Non-serious marine accidents and incidents</td><td>Office in charge of investigation: Regional investigators in the regional offices
Committee in charge of deliberation and adoption: Marine Special Committee</td></tr>
</table>

5 Statistics of investigations of marine accidents and incidents (As of end of February 2017)

The JTSB carried out investigations of marine accidents and incidents in 2016 as follows:

617 accident investigations had been carried over from 2015, and 738 accident investigations were newly launched in 2016. 778 investigation reports were published in 2016, and thereby 576 accident investigations were carried over to 2017.

62 incident investigations had been carried over from 2015, and 117 incident investigations were newly launched in 2016. 106 investigation reports were published in 2016, and thereby 72 incident investigations were carried over to 2017.

Investigations of marine accidents and incidents in 2016

(Cases)

Category	Carried over from 2015	Launched in 2016	Not applicable	Transferred to Tokyo Office	Total	Publication of investigation report	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2017	(Interim report)
Marine accident	617	738	△1	0	1,354	778	(0)	(2)	(0)	576	(1)
Tokyo Office (Serious cases)	15	15	0	1	31	14		(2)		17	(1)
Regional Offices (Non-serious cases)	602	723	△1	△1	1,323	764				559	
Marine incident	62	117	△1	0	178	106	(0)	(0)	(0)	72	(0)
Tokyo Office (Serious cases)	0	0	0	0	0	0				0	
Regional Offices (Non-serious cases)	62	117	△1	0	178	106				72	
Total	679	855	△2	0	1,532	884	(0)	(2)	(0)	648	(1)

Note 1. The figures for “Launched in 2016” includes cases which occurred in 2015 or earlier, and which the JTSB was notified of in 2016 as subjects of investigation.

Note 2: The column “Not applicable” shows the number of cases which did not come under the category of accident or incident as defined in Article 2 of the Act for Establishment of the Japan Transport Safety Board.

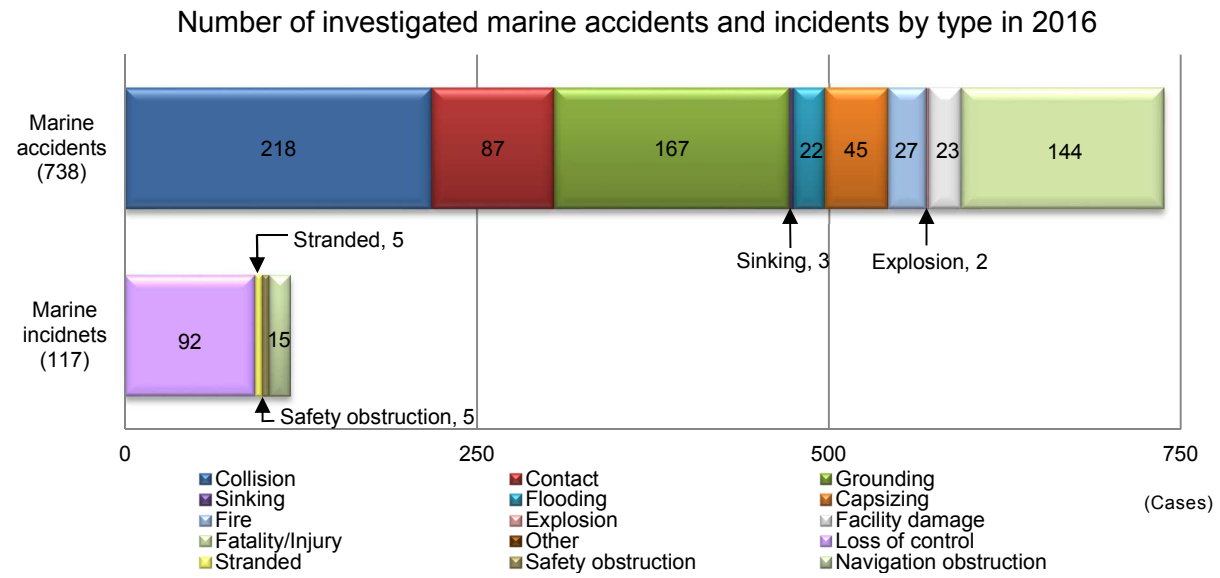
Note 3: The column “Transferred to Tokyo Office” shows the number of cases where the investigation found out that it was serious and the jurisdiction was transferred from the regional office to the Tokyo Office.

6 Statistics of investigations launched in 2016 (As of end of February 2017)

(1) Types of accidents and incidents

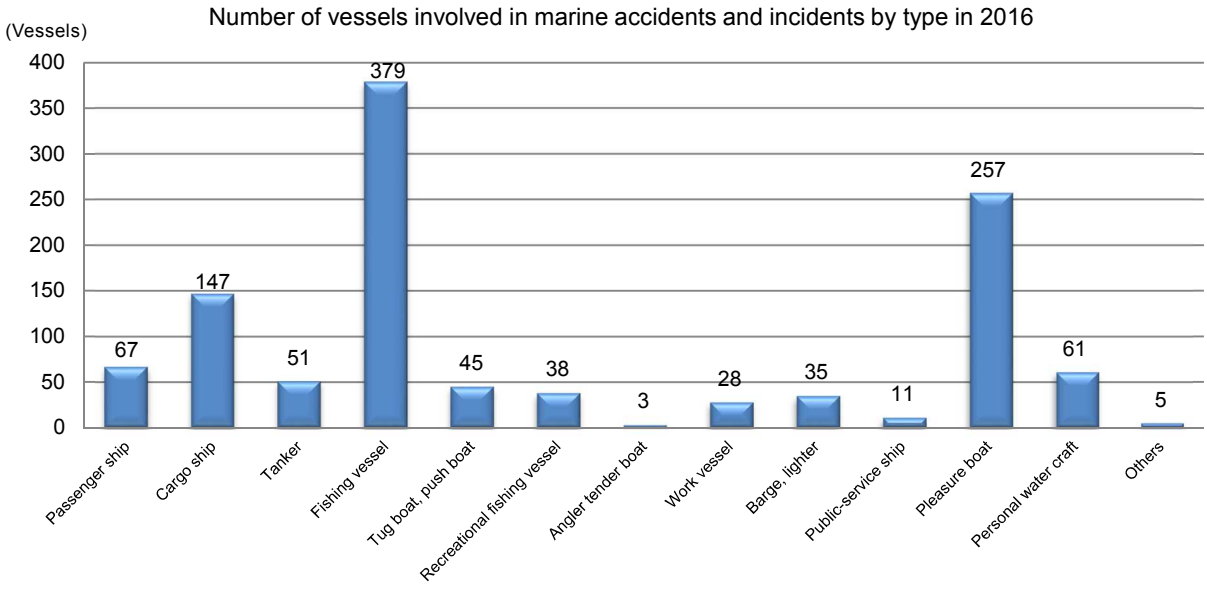
The breakdown of the 855 investigations launched in 2016 by type of accidents and incidents is as follows: The marine accidents included 218 cases of collision, 167 cases of grounding, 144 cases of fatality/injury (not involved in other types of accidents), and 87 cases of contact. The marine incidents included 92 cases of loss of control, 15 cases of navigation obstruction, five cases of stranded, and five safety obstruction. The objects of contact were breakwaters in 20 cases, quays in 10 cases,

and piers in 10 cases.



(2) Types of vessels

The number of vessels involved in marine accidents and incidents was 1,127. By type of vessel, they included 379 fishing vessels, 257 pleasure boats, 147 cargo ships, 67 passenger ships, 61 personal water crafts.



The number of foreign-registered vessels involved in marine accidents and incidents was 60, and they were classified by accident type as follows: 36 vessels in collision, 10 vessels in grounding, and six vessels in contact. As for the flag of vessels, 17 vessels were registered in South Korea, 15 vessels in Panama, three vessels in the Marshall Islands, three vessels in China. The number of vessels registered in Asian countries or regions was accounting for a half of the accidents and incidents.

Number of foreign-registered vessels by flag

(Vessels)

South Korea	17	Cambodia	2	Belize	2
Panama	15	Micronesia	2	Mongolia	2
Marshall Islands	3	Bahamas	2	Others	10
China	3	Thailand	2		

(3) Number of casualties

The number of casualties was 414, consisting of 84 deaths, 24 missing persons, and 306 injured persons. By type of vessel, 137 persons in fishing vessels and 98 persons in pleasure boats. By type of accident, 161 persons in fatality/injury, 100 persons in contact, 86 persons in collision, 31 persons in grounding, and 24 persons in capsizing.

With regard to dead or missing, 59 persons were involved in fishing vessel accidents, 18 persons in pleasure-boat accidents, indicating dead or missing cases occurred frequently in fishing vessels.

Number of casualties (marine accident)

(Persons)

2016										
Vessel type	Dead			Missing			Injured			Total
	Crew	Passengers	Others	Crew	Passengers	Others	Crew	Passengers	Others	
Passenger ship	1	0	0	0	0	0	9	25	1	36
Cargo ship	4	0	2	1	0	0	9	0	3	19
Tanker	5	0	0	2	0	0	5	0	1	13
Fishing vessel	41	0	1	17	0	0	77	0	1	137
Tug boat, push boat	1	0	0	0	0	0	1	0	1	3
Recreational fishing vessel	0	0	0	0	1	0	2	18	1	22
Angler tender boat	1	0	0	0	0	0	0	0	0	1
Work vessel	1	0	0	1	0	0	2	0	1	5
Barge, lighter	1	0	1	0	0	0	0	0	1	3
Public-service ship	0	0	0	1	0	0	17	0	0	18
Pleasure boat	9	0	8	1	0	0	26	0	54	98
Personal water craft	3	0	5	0	0	0	9	0	41	58
Others	0	0	0	0	0	0	0	0	1	1
Total	67	0	17	23	1	0	157	43	106	414
	84			24			306			

7 Summaries of serious marine accidents and incidents which occurred in 2016

The serious marine accidents which occurred in 2016 are summarized as follows: The summaries are based on information available at the initial stage of the investigations and therefore are subject to change depending on the course of investigations and deliberations.

(Marine accident)

1	Date and location of accident	Vessel type and name, accident type
	January 8, 2016 Approximately 19 nautical miles off to the northwest of Tsushima, Tsushima City, Nagasaki Prefecture	Passenger ship BEETLE Collision (with marine creature)
	Summary	While the vessel was navigating from Busan Port in the Republic of Korea toward Hakata Port in Fukuoka Prefecture, it collided with what appeared to be a marine creature, as a result of which six passengers and two crew members suffered bruises and other injuries.
2	Date and location of accident	Vessel type and name, accident type
	January 10, 2016 Wave dissipating blocks near Sakata Port, Yamagata Prefecture	Cargo ship CITY (Panama) Grounding
	Summary	The vessel ran aground on a breakwater, and became submerged up to the bridge.
3	Date and location of accident	Vessel type and name, accident type
	February 19, 2016 Off to the southwest of Iwaishima, Kaminoseki Town, Yamaguchi Prefecture	Container ship SINOKOR INCHEON (Vessel A, South Korea) Fishing vessel TOSHI MARU (Vessel B) Collision
	Summary	Vessel A and Vessel B collided, Vessel B capsized and the skipper died.
4	Date and location of accident	Vessel type and name, accident type
	April 22, 2016 Near the quay wall of the Port of Bassens near Bordeaux, French Republic	Chemical tanker BUCCOO REEF Fatality of crew member
	Summary	While the vessel was engaged in berthing operation, an ordinary seaman who was trying to disengage the tug line of a tug boat became entangled in the messenger rope of the line, fell and died.
5	Date and location of accident	Vessel type and name, accident type
	May 10, 2016 Inside Omaezaki Port	Cargo ship CENTURY SHINE (Panama) Grounding
	Summary	The vessel ran aground in shallows while navigating, causing damage to the hull, but no one was injured.
6	Date and location of accident	Vessel type and name, accident type
	May 16, 2016 Off to the northwest of Heigunto Island, Yamaguchi Prefecture	Cargo ship HUNAN (Singapore) Missing of crew member
	Summary	While the vessel was navigating, one crew member fell into the sea and went missing.
7	Date and location of accident	Vessel type and name, accident type
	May 21, 2016 Off to the south of the Ashizuri Misaki Lighthouse, Kochi Prefecture	Chemical tanker FINE CHEMI (South Korea) Missing of crew member
	Summary	While Vessel A was navigating from China to Chiba Prefecture, one crew member went missing.
8	Date and location of accident	Vessel type and name, accident type
	June 7, 2016 Inside the central passage of Kobe Section, Hanshin Port	Container ship ESTELLE MAERSK (Vessel A, Denmark) Container ship JJ SKY (Vessel B, China) Collision

	Summary	Vessel A and Vessel B collided while both vessels were both navigating, Vessel A sustained scrape marks on its starboard bow and Vessel B suffered denting damage on it port stern, but no one was injured.
9	Date and location of accident	Vessel type and name, accident type
	August 1, 2016 In seas south of Hiroshima, Marugame City, Kagawa Prefecture (inside the Bisan Seto north passage)	Ferry KITAKYUSHU II (Vessel A) LPG vessel KAGOSHIMA MARU No.5 (Vessel B) Collision
	Summary	While navigating toward Shin-Moji Port in Fukuoka Prefecture, Vessel A collided with Vessel B as it navigated toward Niihama Port in Aichi Prefecture.
10	Date and location of accident	Vessel type and name, accident type
	August 7, 2016 Off Ogishima, Kawasaki City, Kanagawa Prefecture	Chemical tanker EASTERN PHOENIX (Vessel A, Panama) Oil tanker KEIHIN MARU No.8 (Vessel B) Collision
	Summary	Vessel A and Vessel B collided off Ogishima Island.
11	Date and location of accident	Vessel type and name, accident type
	August 12, 2016 Off Oshima fishing port, Oi Town, Fukui Prefecture	Recreational fishing vessel KEIAN MARU No.11 Missing of recreational angler
	Summary	While the vessel was returning to Oshima fishing port, one recreational angler went missing.
12	Date and location of accident	Vessel type and name, accident type
	September 9, 2016 Off Hidaka Port, Gobo City, Wakayama Prefecture	Chemical tanker EIWA MARU 3 (South Korea) Explosion
	Summary	While the vessel was navigating off Hidaka Port, it exploded, killing one crew member and injuring two others.
13	Date and location of accident	Vessel type and name, accident type
	September 23, 2016 About 2,900m at a true bearing of 249° from Tomogashima Lighthouse in Kada, Wakayama City, Wakayama Prefecture	Recreational fishing vessel TSURIBITOYA XI Injury of recreational angler
	Summary	While the vessel was navigating in order to change the fishing spot, the vessel shook under the impact of a ship wave from ahead, and three recreational anglers were injured.
14	Date and location of accident	Vessel type and name, accident type
	October 30, 2016 T Wharf, Shinko east pier, Kobe City, Hyogo Prefecture	Cargo ship BBC ASIA (Antigua and Barbuda) Fatality and injury of stevedores
	Summary	While the vessel was engaged in cargo handling work in the Kobe Section of Hanshin Port, two stevedores died and one was injured.
15	Date and location of accident	Vessel type and name, accident type
	December 14, 2016 About 2km north of Mihonoseki Lighthouse, Jizozaki, Mihonoseki Town, Shimane Prefecture	Fishing vessel DAIFUKU MARU Capsizing
	Summary	While Vessel A was being towed off Mihonoseki Lighthouse, it capsized, four crew members died and five went missing.

(Marine incident)

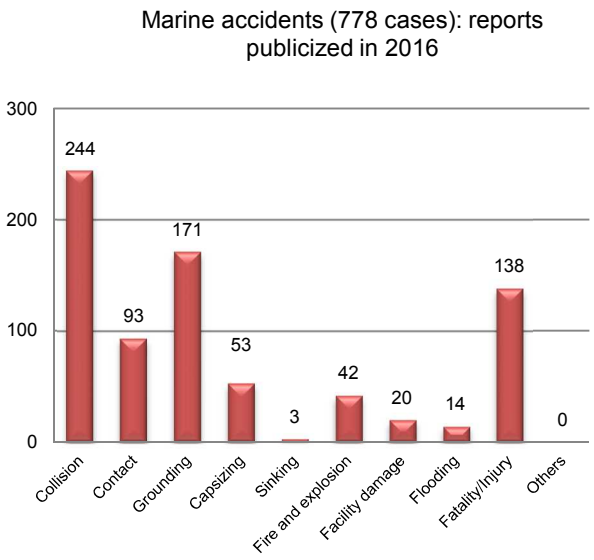
No serious marine incident occurred in 2016.

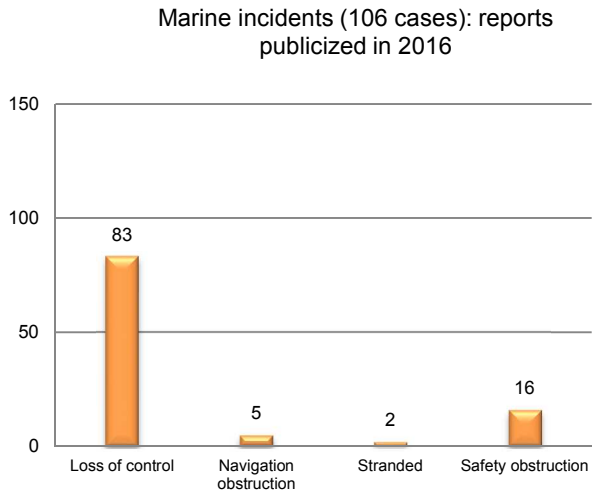
8 Publication of investigation reports

The number of investigation reports of marine accidents and incidents published in 2016 was 884, consisting of 778 marine accidents (among them, 14 were serious) and 106 marine incidents.

Breaking them down by type, the marine accidents included 244 cases of collision, 171 cases of grounding, 138 cases of fatality/injury, and 93 cases of contact. The marine incidents included 83 cases of losses of control, (81 cases of navigational equipment failure and two cases of out-of-fuel), 16 cases of safety obstruction, five cases of navigation obstruction, and two cases of stranded.

As for the objects of contact, 20 were quays, 16 were breakwaters, and 10 were light buoys.





The number of vessels involved in marine accidents and incidents was 1,184. Breaking them down by type, the marine accidents involved 342 fishing vessels, 246 pleasure boats, 160 cargo ships, and 60 personal water craft. The marine incidents involved 35 fishing vessels, 34 pleasure boats, 10 passenger ships, and seven cargo ships.

Number of vessels by type involved in marine accidents and incidents for which reports were publicized in 2016

(Vessels)

Classification	Passenger ship	Cargo ship	Tanker	Fishing vessel	Tug boat, push boat	Recreational fishing vessel	Angler tender boat	Work vessel	Barge, lighter	Public-service ship	Pleasure boat	Personal water craft	Others	Total
Marine accident	52	160	57	342	46	36	6	20	38	8	246	60	7	1,078
Marine incident	10	7	5	35	6	1	0	3	2	2	34	1	0	106
Total	62	167	62	377	52	37	6	23	40	10	280	61	7	1,184
%	5.2	14.1	5.2	31.8	4.4	3.1	0.5	2.0	3.4	0.9	23.6	5.2	0.6	100.0

The investigation reports for serious marine accidents and incidents published in 2016 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/marrep.html

9 Actions taken in response to recommendations in 2016

There were no actions taken in response to recommendations in 2016.

10 Provision of factual information in 2016

There were no cases of provision of factual information in 2016.

コラム

Research and Marine Accident Investigation

Marine Accident Investigator

On November 25th last year, Tokyo University of Marine Science and Technology hosted a "Symposium on Ships, Transportation and Marine Safety", with sponsorship from the Japan Institute of Navigation and others, and support from the Japan Transport Safety Board and others.

In the field of ship engineering, there is a traditional system whereby the causes of damage to hull compartments, hull breakage, fishing vessel capsizing and others are researched in engineering departments at universities and elsewhere, then safety regulations are drawn up by public authorities as measures to prevent a recurrence. As such, research and investigation on the causes of accidents have been undertaken as a single process (empirical engineering). The Symposium provided an opportunity to consider whether this sort of close relationship also exists between research and accident investigation on the topic of collisions, which account for 20% of all marine accidents.

For many years, the process of identifying the causes of collisions in Japan involved taking disciplinary action against seafarers as a system of inquiries on marine accidents. As a result, from the viewpoint of traffic rules (navigation law), the central thrust of investigation lay in assessing the actions of seafarers who were involved in handling vessels at the time of the accident. By assigning this process to employees with long experience as seafarers, conclusions with a sense of currency were drawn. I think a connection with the research field was not very necessary in this kind of situation.

Then, about eight years ago, the Japan Transport Safety Board was set up to investigate causes of accidents, with a view to preventing recurrence. Merely assessing the actions of seafarers who were involved in handling vessels does not lead to a radical prevention of recurrence; instead, discovering the interactions with organizations, environments, devices, etc., leads to identifying the cause. Rather than merely drawing conclusions with a sense of currency, this means also pointing out underlying factors that will help to prevent recurrence, and as such, knowledge in research fields related to collisions, such as human factors and human engineering, are now necessary for accident investigation. Under present circumstances, however, although efforts are being made to train investigators and cite literature, more attempts to collaborate with universities and academic societies, such as outsourcing analysis and personnel exchanges, have to be made.

Currently, marine accident investigators are focusing attention on three research areas in order to scientifically identify causes of collisions. These are (1) indicators that quantitatively show the risk of a collision, (2) methods of analyzing underlying factors (CREAM), and (3) ways of use and the usability of equipment such as electronic charts. On (1), there is already a large body of research on collision risk indicators; besides the traditional concepts of distance and time of closest point of approach, various indicators based on inputting the size, speed and other factors of ships are being studied with a view to improving warnings, for example. This approach may help to quantitatively evaluate how the expected enlargement of container ships from now on will impact the risk of collision. (2) CREAM appears to be a method of analysis that is already used in the field of power generation facilities and other land-based plant. Although there is still a lot to learn, I would like to try this in marine accident investigation as well. Finally, (3) focuses on whether there is any problem with the widespread use of electronic charts, such as the ways in which AIS, radar and other information overlaid on a screen, or their usability in operations and others that differ depending on the equipment manufacturer, or the precision of simplified charts. Linkage between research on collisions and accident investigation is now needed for analysis from this kind of perspective.

11 Summaries of major marine accident investigation reports (case studies)

Cargo ship and container ship collide at entrance to Tokyo Bay, cargo ship sinks, seven fatalities

Collision between cargo ship BEAGLE III and container ship PEGASUS PRIME

Summary: **The cargo ship BEAGLE III (Vessel A, gross tonnage 12,630 tons)** with a master, second officer, and 18 crews proceeding in the south-southwest direction toward Kobe-ku Hanshin Port and **the container ship PEGASUS PRIME (Vessel B, gross tonnage 7,406 tons)** with a master, second officer, and 12 crews proceeding in the northeast direction toward Tokyo-ku Keihin Port collided with each other at the baymouth of Tokyo Bay, south-east offshore Tsurugizaki, Miura City, Kanagawa Prefecture, Japan at around 03:10, March 18, 2014.

Seven crews of Vessel A died, two are missing, and the ship sank due to a damage hole in side shell plating of the central port-side.

A crew of Vessel B was injured and the ship bow buckled.

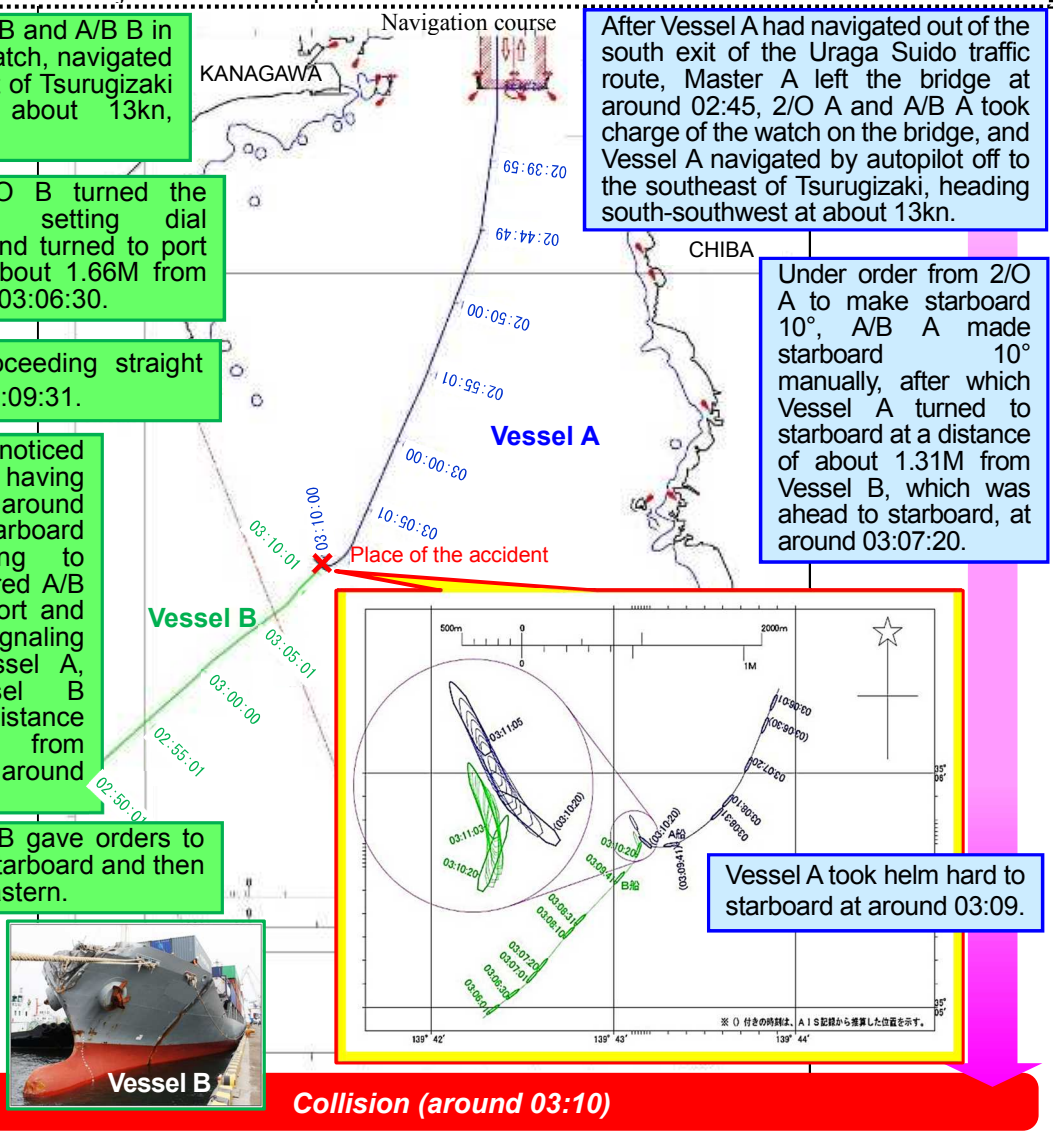
Vessel B, with 2/O B and A/B B in charge of bridge watch, navigated off to the southeast of Tsurugizaki by autopilot at about 13kn, heading northeast.

On Vessel B, 2/O B turned the autopilot course setting dial counterclockwise and turned to port at a distance of about 1.66M from Vessel A at around 03:06:30.

Vessel B was proceeding straight from 03:08:10 to 03:09:31.

On Vessel B, 2/O B noticed that Vessel A, having approached at around 0.5M on the starboard bow, was turning to starboard, so ordered A/B B to turn 20° to port and flashed a daylight signaling light twice to Vessel A, whereupon Vessel B turned to port at a distance of about 0.32M from Vessel A at around 03:09:41.

On Vessel B, 2/O B gave orders to take helm hard to starboard and then put the engine full astern.



After Vessel A had navigated out of the south exit of the Uraga Suido traffic route, Master A left the bridge at around 02:45, 2/O A and A/B A took charge of the watch on the bridge, and Vessel A navigated by autopilot off to the southeast of Tsurugizaki, heading south-southwest at about 13kn.

Under order from 2/O A to make starboard 10°, A/B A made starboard 10° manually, after which Vessel A turned to starboard at a distance of about 1.31M from Vessel B, which was ahead to starboard, at around 03:07:20.

Vessel A took helm hard to starboard at around 03:09.

Probable Causes: It is probable that the accident occurred because, when Vessel A was navigating in south-southwest direction and Vessel B was navigating in northeast direction at night and the both ships came closer to each other, Vessel A turned to starboard, Vessel B turned to port and kept proceeding straight, and the both ships collided with each other.

It is somewhat likely that Vessel A turned to starboard because 2/O A of Vessel A did not notice Vessel B in the starboard ahead.

It is probable that Vessel B kept proceeding straight because, after Vessel B turned to port for passing by Vessel A on the starboard side, 2/O B of Vessel B did not conduct look-out properly and hence could not notice that Vessel A in the starboard ahead turned to starboard.

For details, please refer to the accident investigation report. (Published on May 19, 2016)
http://www.mlit.go.jp/jtsb/eng-mar_report/2016/2014tk0009e.pdf

Fire breaks out in engine room and spreads, ship sinks, two fatalities

Fire on passenger ship FUNADA

Summary: **The passenger ship FUNADA (Vessel A, gross tonnage 19 tons)** was navigating inside Oge Port en route to Okamura Port in Imabari City, Ehime Prefecture with the skipper and four passengers on board, when fire broke out at around 21:27 on April 12, 2015.

After everyone on board Vessel A had escaped such as by jumping into the sea, two of the passengers died and the skipper was injured, while the vessel was consumed by fire and sank.

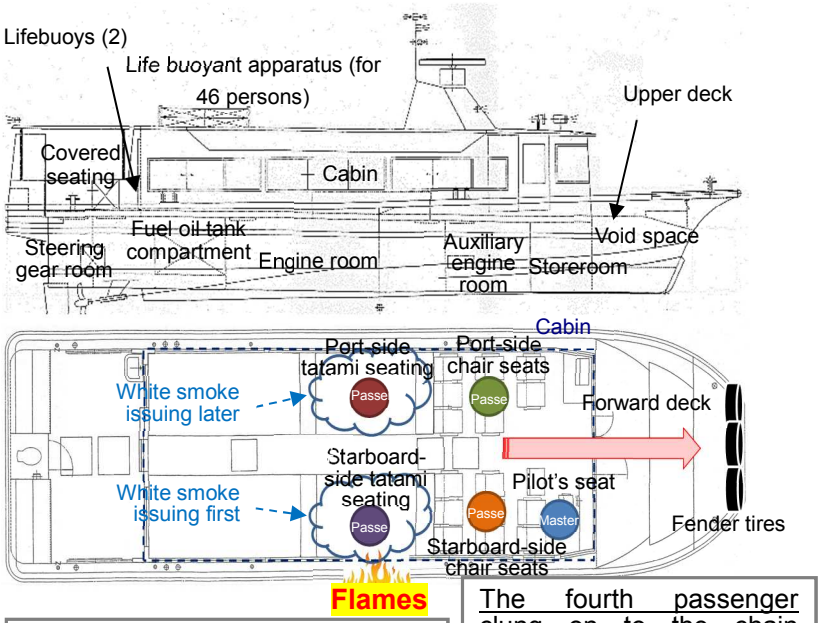
Vessel A set off from the pier of Oge Port at around 21:25 on April 12, 2015, and headed for Okamura Port using both main engines at about 500rpm ahead. While the vessel was proceeding northwest around 50m west-northwest of the southern end of Ichimonji Breakwater in Oge Port, white smoke started to issue from all four sides of the starboard-side tatami seating, and after the skipper had stopped both main engines, white smoke also started to issue from all four sides of the port-side tatami seating.

The cabin became filled with white smoke and flames rose up on the outside of the starboard central partition

Fire breaks out (around 21:27)

Vessel A in flames (photo: Japan Coast Guard)

Structures on the upper deck caught fire, and although a Japan Coast Guard patrol boat discharged firefighting water, the fire was not extinguished, and at around 23:55 the vessel sank in the sea off to the southwest of Oge Port.



The skipper and three passengers evacuated to the forward deck and jumped into the sea without putting on life jackets.

The fourth passenger clung on to the chain linking the fender tires at the front of the bow, and awaited rescue while immersed in seawater up to the knee.

Passenger → Found in the sea on May 17 **Confirmed dead**

Passenger → **Confirmed dead**

Passenger, Passenger, Skipper, Passenger → **Rescued by boats that came to their assistance**

It is somewhat likely that the fire started as a result of contact between gasoline or similar spurting from pressurized pipes and the exhaust system piping of the starboard main engine, which had grown hot, or of a short circuit, power leakage or other such problem in power cables of the power circuit that were hung near the ceiling of the starboard partition in the engine room. However, the source of the fire on the starboard side of the engine room could not be clarified.

It is somewhat likely that the fire that started in the engine room spread to the rest of the vessel because a ventilator fan was working and fresh air was continuously fed inside the engine room as a result.

Probable causes (excerpt): It is probable that this accident occurred because, while Vessel A was navigating inside Oge Port at night, fire broke out in the engine room and then spread throughout the rest of the vessel.

It is somewhat likely that the fire that started in the engine room spread to the rest of the vessel because a ventilator fan was working and fresh air was continuously fed inside the engine room as a result.

For details, please refer to the accident investigation report. (Published on June 30, 2016)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-6-1_2015tk0003.pdf

Vessel capsizes after increased listing due to simultaneous movement of fish shoal, etc.
Capsize of fishing vessel GENPUKU MARU No.1

Summary: The **fishing vessel Genpuku Maru No.1 (Vessel A, gross tonnage 135 tons)** was engaged in hauling a net off to the west-northwest of Hamada Port, Hamada City, Shimane Prefecture, with the master, the fishing chief and 18 other crew members on board, when it capsized and sank at around 04:30 on December 24, 2014.

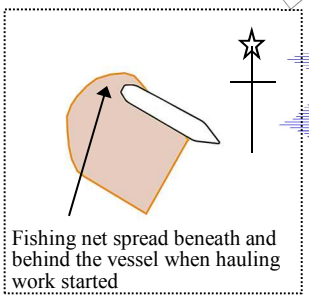
Of the 20 crew members, four died and one went missing but was subsequently certified dead.

Vessel A set off from Hamada Port together with Genpuku Maru No.13, Genpuku Maru No.17 and Genpuku Maru No.68 (hereinafter "No.13", "No.17" and "No.68") at around 14:20 on December 23, and started searching for fish shoals at around 15:00. Later, the vessels were joined by Genpuku Maru No.67 (hereinafter "No.67"), and after No.13 and No.17 had gathered fish, the net was cast between around 02:40-45 on the 24th.

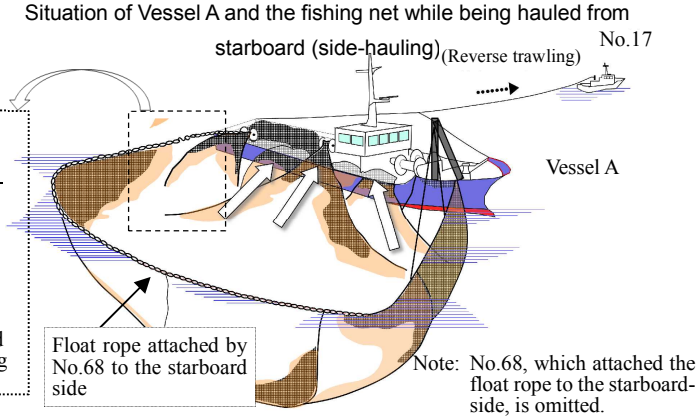
Vessel A started to haul the net at around 03:20, and at around 04:25, off to the west-northwest of Hamada Port, 19 crew members lined up on the starboard side and started the work of side-hauling.

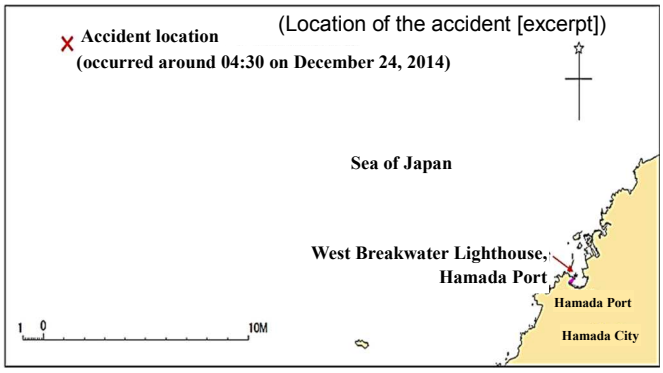
About five minutes after the hauling work started, the vessel listed to starboard, seawater washed onto the upper deck twice, and about one minute after the vessel started listing to starboard, it capsized.

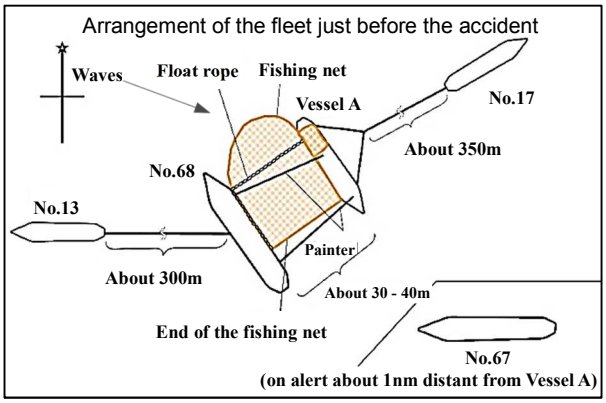
Capsized (around 04:30)



Situation of Vessel A and the fishing net while being hauled from starboard (side-hauling)







(Situation of capsizing)

- Without filling its port-side ballast tank with seawater, Vessel A took up a position in which it encountered waves from the stern, then started the work of side-hauling while being connected to No.68 by a painter rope on the starboard side with the fishing net in between, and pulled by a rope by No.17 on the port side.
- Vessel A swung its stern to port by reverse trawling under a wave height of about 2.0-2.5m, and took up a position in which it encountered waves from about 30°-40° starboard stern.
- A shoal of mackerel inside the fishing net on the starboard side of Vessel A simultaneously descended, and when the heel angle of the vessel reached about 4.9°, seawater started to flow onto the upper deck from the scuppers.
- When Vessel A had listed to a working deck submersion angle of up to about 9.5°, it was struck by the first wave from the starboard stern and seawater collected on the upper deck, after which more waves washed in, the starboard list increased and the vessel capsized.

Probable causes: It is probable that this accident occurred because, while Vessel A was engaged in the work of hauling in a purse seine fishing net from the starboard side off to the west-northwest of Hamada Port at night under a wave height of about 2.0-2.5m, while being pulled by a rope by a lighting ship on the port side, it fell into a state of diminished stability combined with impact from external heeling moment, causing the starboard list to increase and the vessel to capsize.

It is probable that it fell into a state of diminished stability combined with impact from external heeling moment as a result of the following.

(1) That the shoal of mackerel simultaneously descended and the starboard side was pulled downwards.

(2) That seawater washed onto the upper deck and collected there.

For details, please refer to the accident investigation report. (Published on July 28, 2016)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-7-1_2014tk0019.pdf

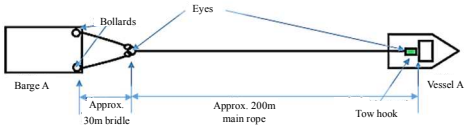
While towing a barge when a gale warning and other alerts had been issued, vessel capsized after being pulled sideways, etc.

Capsize of tugboat MEIYU No. 18 and barge SK-106

Summary: While the **tugboat MEIYU No. 18 (Vessel A, 19 tons)** was towing **barge SK-106 (Barge A, 65m)** and proceeding south to south-southwest off to the south-southeast of Obana Misaki in Hakodate City, Hokkaido, with the skipper and two other crew members on board accompanied by one instructor for the skipper, it capsized at around 14:26 on March 27, 2015. On Vessel A, the skipper and the instructor died and one deckhand went missing, while another deckhand was injured and the vessel was totally lost.

At around 12:30 on March 27, 2015, Vessel A informed the responsible person in Company A that it had departed Hakodate Port heading for Ishinomaki Port, and after stopping temporarily off the West Breakwater of Hakodate Port, extending its main rope to about 200m and forming a tug and tow, it continued to proceed.

Layout diagram of the tug and tow



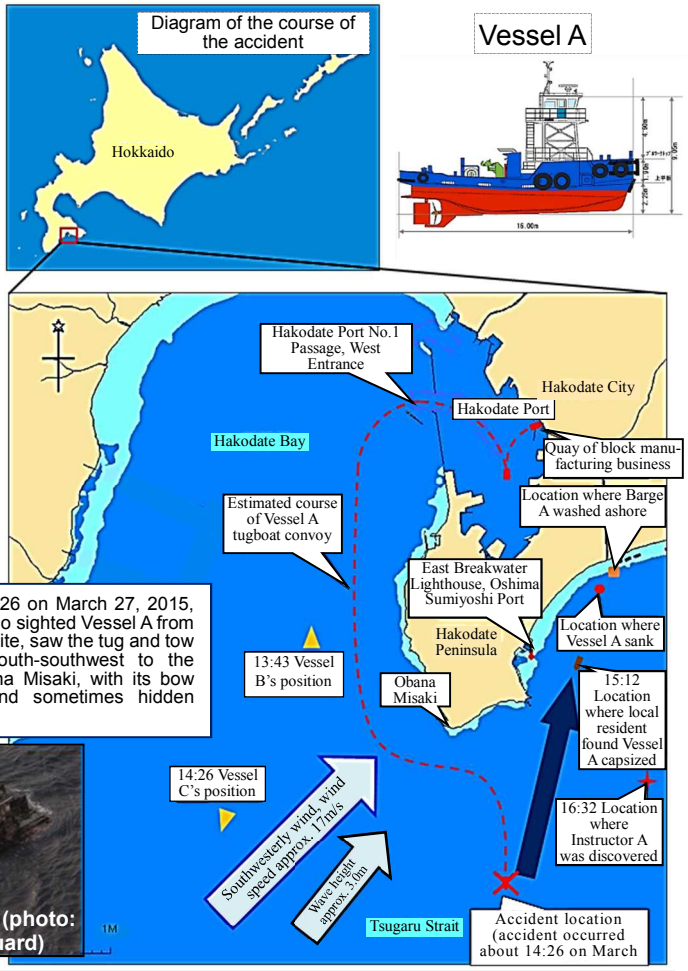
At around 13:43, Vessel A was proceeding south about 1.4M to the northwest of Obana Misaki at a speed of about 2-3kn.

At around 14:18, the vessel was proceeding south to south-southwest about 1-3M south-southeast of Obana Misaki at a speed of about 4-5kn, under a southwest wind and while being struck from the bow by waves from the southwest.

At around 14:21, there was a call from the instructor (Instructor A) to the cellphone of the responsible person at Company A but the call was cut off, and although the responsible person in Company A returned the call to the ship's telephone and others no more than five minutes later, there was no connection.

Capsized *(around 14:26)*

(Situation of capsizing [excerpt])



At around 14:18 and 14:26 on March 27, 2015, an officer of Vessel C, who sighted Vessel A from the west of the accident site, saw the tug and tow proceeding south to south-southwest to the south-southeast of Obana Misaki, with its bow covered with waves and sometimes hidden behind waves.


Capsized Vessel A (photo: Japan Coast Guard)

- It is probable that the positional relationship between Vessel A and Barge A would cause a situation of being pulled sideways when in a state of swinging around at ship speeds of 4kn and 5kn.
- In situations where a towed barge causes a swinging motion at a speed of 4kn and wave encounter angle of 20° or a speed of 5kn and an encounter angle of 30°, it is probable that, though not immediately leading to capsizing, the maximum angle of heel to port in Vessel A would be larger than the maximum angle of stability and would exceed the angle of bulwark top immersion of 17.3°, even when taking into account the steady heel angle due to towline tension and wind as well as rolling due to waves.
- It is somewhat likely that Vessel A was subjected to "waves, towline tension when the barge made a swinging motion, and wind pressure" (hereinafter "compound external force") and was pulled sideways, and that the port-side heel angle became larger than the maximum angle of stability, stability was reduced and the bulwark was submerged in the sea, as a result of which resistance from the bulwark made it difficult to stabilize, the vessel continued to be subjected to waves and capsized.

Probable causes: It is somewhat likely that this accident occurred because Vessel A departed from Hakodate Port under conditions in which a gale warning had been issued for the Tsugaru Strait and a gale and high waves advisory for Hakodate City, then formed the tug and tow and started navigating toward Ishinomaki Port, but while it was proceeding south to south-southwest about 1-3M to the south-southeast of Obana Misaki, Vessel A became subjected to compound external force and became pulled sideways, the port-side heel angle became larger than the maximum angle of stability, stability was reduced and the bulwark was submerged in the sea, as a result of which resistance from the bulwark made it difficult to stabilize, the vessel continued to be subjected to waves and capsized to port.

It is somewhat likely that the tug and tow left port under conditions in which a gale warning had been issued for the Tsugaru Strait and a gale and high waves advisory for Hakodate City because, although the responsible person at Company A had given verbal instructions on standards for halting port departures by small tugboats, Company A had not sufficiently familiarized crews with these standards and crews did not have sufficient knowledge of them.

For details, please refer to the accident investigation report. (Published on July 28, 2016)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-7-2_2015tk0002.pdf

Several fishing vessels capsize off to the east Tsushima, five fatalities

Capsize of fishing vessel KICHIEI MARU No.1 and others

Summary: When the **fishing vessel KICHIEI MARU No.1 (Vessel A , 18 tons)**, with the skipper and one deckhand on board, had dropped a parachute sea anchor and was drifting off to the east of Kamijima in Tsushima City, Nagasaki Prefecture, under conditions in which a gale advisory and thunderstorm advisory with the addition of tornadoes had been issued for the Kami-Tsushima and Shimo-Tsushima districts, it capsized at around 03:29 on September 1, 2015.

The skipper and deckhand on Vessel A were injured and the vessel was totally lost.

At around 15:00 on August 31, 2015, Vessel A departed from Chiromo fishing port heading for fishing grounds off to the east of Kamijima, arrived at the fishing grounds at around 16:00, dropped a parachute anchor with a diameter of about 20m from the bow, connected to a main rope with a length of about 40m and started fishing operations while drifting.

Since Skipper A hardly ever used weather information issued over the radio by the Tsushima fisheries radio station, he had not obtained the gale advisory and thunderstorm advisory with the addition of tornadoes issued for the Kami-Tsushima and Shimo-Tsushima districts, as the gale advisory issued by the Japan Meteorological Agency at 00:45 on September 1 was broadcast over the radio by the fisheries radio station at 04:55.

At around 03:00 on September 1, Vessel A stopped fishing and tried to return to port while subject to a south wind blowing at a speed of about 20-30m/s and waves from the east with a height of about 3m, but was unable to hoist the parachute anchor, so returned the hoisting cable to its original position and continued to drift.

Seawater washing in from the stern of Vessel A flowed in through the sliding door that had been left open for ventilation, pushed through the closed door to the engine room and flowed into the engine room, and at around 03:10 the main engine stopped. Seawater repeatedly washed in, the Vessel A slowly listed to port and the bulwark top was submerged at around 03:20, the stability could not be restored and the vessel capsized.

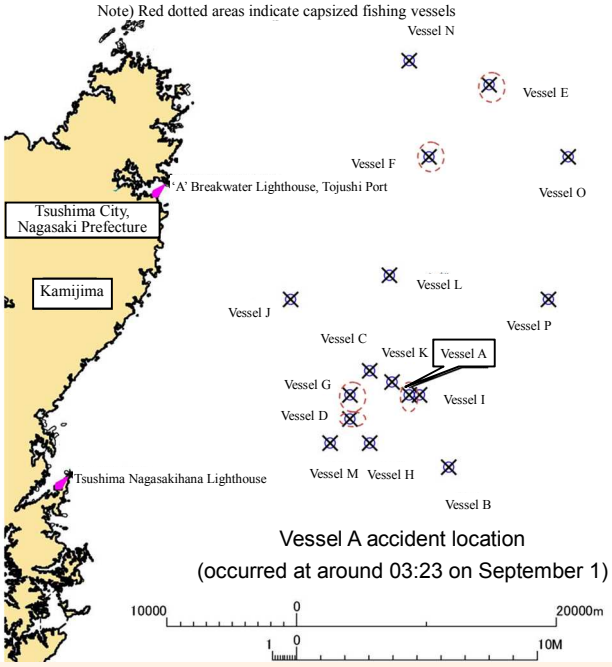
Capsized (around 03:29)

Vessel A in its capsized state

When this accident occurred, 15 other fishing vessels besides Vessel A (Vessels B-P) were engaged in fishing operations off to the east of Kamijima. Of these, five including Vessel A capsized and a total of five persons died.

Vessel D	Around 03:23 on September 1	2 on board 2 fatalities
Vessel E	Around 03:55 on September 1	1 on board No injuries
Vessel F	Around 03:55 on September 1	2 on board 2 fatalities
Vessel G	Around 03:35 on September 1	1 on board 1 fatality

Location of the accident (near Tsushima)



Probable causes: It is probable that this accident occurred because, while Vessel A was drifting on a parachute sea anchor off to the east of Kamijima at night while subject to a south wind blowing at a speed of about 20-30m/s and waves from the east with a height of about 3m, under conditions in which a gale advisory and thunderstorm advisory with the addition of tornadoes had been issued for the Kami-Tsushima and Shimo-Tsushima districts, seawater washing in from the stern flowed into the engine room because the sliding door on the stern side of the galley that served as an entrance to the crew quarters had been left open, the vessel listed to port and the bulwark top was submerged, the vessel lost its stability and capsized.

It is probable that the sliding door on the stern side of the galley that served as an entrance to the crew quarters had been left open because the crew members did not think the weather would deteriorate and were ventilating the crew quarters as usual.

It is probable that the crew members could not predict the increased force of the wind because they had not obtained the gale advisory and thunderstorm advisory with the addition of tornadoes issued for the Kami-Tsushima and Shimo-Tsushima districts.

For details, please refer to the accident investigation report. (Published on March 31, 2016)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-3-38_2015mj0090.pdf

Capsize of Vessel D, fishing vessel KAIRYO MARU No.3 http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-3-37_2015mj0089.pdf
Capsize of Vessel E, fishing vessel EBISU MARU http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-3-40_2015mj0092.pdf
Capsize of Vessel F, fishing vessel KONPIRA MARU No.8 http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-3-41_2015mj0093.pdf
Capsize of Vessel G, fishing vessel SUMIYOSHI MARU No.5 http://www.mlit.go.jp/jtsb/ship/rep-acci/2016/MA2016-3-39_2015mj0091.pdf

Chapter 6 Efforts toward accident prevention

1 Publications

The JTSB prepares and issues various publications, as well as investigation reports, regarding specific cases.

We place these publications on our website and, in order to make them more accessible to the public, we also introduce them through our monthly JTSB E-Mail Magazine service (only available in Japanese).

Our e-mail magazine service is widely used by people in the aviation, railway, and shipping industries, as well as administrative agencies and educational/research organizations.

We also exchange opinions with business operators and other parties on effective information dissemination from the JTSB, and we will continue to make improvements based on the opinions that we receive.

JTSB Website

2 Issuance of the JTSB Digest

With the aim of fostering awareness of safety, and preventing similar accidents from occurring, we issue “JTSB Digests.” This publication introduces you to statistics-based analyses and must-know cases of accidents.

We also issue the English version of “JTSB Digests” as part of our efforts to disseminate information overseas.

In 2016, we released four issues of “JTSB Digests” (April, June, September and December: Issues No. 20-23) as well as one issue of the English version of “JTSB Digests” (May).

The contents of each issue are as follows.

① **JTSB Digests Issue No.20 [Analyses of Railway Accidents] "Toward the prevention of level crossing accidents involving automobiles, etc." (issued on April 15, 2016)**

- Outline of accidents
- Accident investigation case study: "Truck enters level crossing as train is approaching and collides with train"
- Accident investigation case study: "Derailment caused when train collides with light motor vehicle that has stopped with wheels stuck on a level crossing"
- Accident investigation case study: "Train collides with medium-duty truck that has stopped inside a level crossing"
- Accident investigation case study: "Light truck enters level crossing as train is approaching and collides with train"

② **JTSB Digests Issue No.21 [Analyses of Marine Accidents] "Toward the prevention of passenger ship accidents" (issued on June 30, 2016)**

- Accident trends
- Accident investigation case study: "Ferry is pushed sideways by the wind into the quay wall, injuring passengers who were not seated"
- Accident investigation case study: "Ferry avoids a fishing vessel fleet outside the port, but runs aground on shallows and the car deck is flooded"
- Accident investigation case study: "Small passenger ship deviates from the course on a GPS plotter and runs aground, injuring 14 passengers"
- Accident investigation case study: "Fire breaks out on a sea taxi, killing two passengers who jump into the sea"
- Accident investigation case study: "Small passenger ship falls from the crest into the trough of a wave, injuring three passengers"

③ **JTSB Digests No. 22, [Digest of Aircraft Accident Analyses] "For prevention of Accidents Involving Private Small Aircraft and Gliders" (issued on September 27, 2016)**

- Statistics on Accident Occurrence
- Accident investigation case study: "After being released from the towing aircraft, the motor Glider greatly lost height due to failure to start the engine, and finally crashed."
- Accident investigation case study: "When returning from a familiarization flight, the Small Aircraft made a forced landing due to fuel exhaustion and was damaged."
- Accident investigation case study: "Training was continued below the required altitude, causing the Glider to make a hard landing and become damaged."
- Accident investigation case study: "After a familiarization flight, the Small Aircraft made a belly-landing due to negligence in forgetting to extend the landing gear."

④ JTSB Digests Issue No.23 [Analyses of Marine Accidents] "Toward the prevention of collision accidents involving coastal cargo ships and tankers" (issued on December 13, 2016)

- Circumstances of accidents
- Accident investigation case study: "Collision with fishing vessel in glaring sunlight, not detected on radar set to 8nm range"
- Accident investigation case study: "Collision with fishing gear when passing behind a boat engaged in pair trawling, assuming it to be operating alone"
- Accident investigation case study: "Navigate at constant course and speed, and collide with ocean-going cargo ship on the opposite course"
- Accident investigation case study: "In restricted visibility, focus attention on overtaking vessels on the same course, and collide with an ocean-going cargo ship"
- Accident investigation case study: "Collision between coastal tanker on which information was not shared among the bridge team and coastal cargo ship that did not increase its bridge manning level"
- Accident investigation case study: "Collision in restricted visibility between a coastal cargo ship navigating to the left of a channel and a coastal cargo ship continuing a starboard turn"
- Accident investigation case study: "Collision with a pushboat unit when a bridge watchkeeper inexperienced in maneuvering turns the autopilot dial in an attempt to avoid it"
- Accident investigation case study: "Collision with a tugboat towing a barge when proceeding south along the left (east) side of Hirado Seto"

⑤ Close call incidents in the field of aviation (issued on May 17, 2016)

3 Issuance of the Analysis Digest Local Office Edition

The JTSB has issued the analysis digest local office edition (only available in Japanese). It has issued this publication in order to provide various kinds of information to help prevent marine accidents. The information is based on the analyses made by our regional offices and relates to specific accidents that occurred in their respective jurisdictions. This information focuses on cases with characteristic features such as the sea area, the type of vessel, and the type of accident.

(Analysis Digest Local Office Edition in 2016)

Hakodate	**Situation of fatal accidents involving fishing vessel crews – Latent dangers of Hokkaido coastal fisheries** (Main content) ・Situation of accidents involving fishing vessels in coastal waters of Hokkaido ・Situation of fatal accidents involving fishing vessel crews ・Accident case studies (3 cases) ・Summary – To prevent the recurrence of fatal accidents involving fishing vessel crews 

Sendai	**Situation of accidents with damage to aquaculture facilities or other fishing-related facilities in Tohoku coastal areas** **– For zero accident on aquaculture facilitiesor other fishing-related facilities based on obtaining accurate information (monitoring of ship's position and gathering information beforehand)** (Main content) ・ Circumstances of occurrence of accidents with damage to aquaculture facilities or other fishing-related facilities ・Accident case studies (3 cases) ・Lessons learned from accidents 
Yokohama	**For marine leisure to be enjoyed in safety** **– Toward the prevention of accidents with fatalities or injuries in waters around Tokyo Bay** (Main content) ・Circumstances of occurrence ・Situation of accidents ・Accident case studies (3 cases) ・Summary – For marine leisure to be enjoyed in safety 
Kobe	**Now appearing in the sea! The "different faces" of laver farming facilities in Shikanose** (Main content) ・Accident case studies (3 cases) 
Moji	**Are you sure you can get through there?** **– Grounding accidents between Jinoshima and Kanezaki in Munakata City, Fukuoka Prefecture** (Main content) ・Accident case studies (3 cases) ・Safety information ・Summary 
Naha	**Sleep deprivation and fatigue are the main causes of dozing off** **- Toward the prevention of accidents caused by dozing off while navigating fishing vessels in waters around Okinawa** (Main content) ・Circumstances of occurrence ・Accident case studies (2 cases) ・Summary 

As you read these local office digests, you can not only find out the circumstances of local accidents, but can also gain some tips for accident prevention.

The local offices will make further efforts to regularly issue the analysis digest local office editions. By doing so, they will ensure that you will be provided with more satisfactory content.

4 Issuance of the JTSB Annual Report

In July 2016, we issued the JTSB Annual Report 2016. We did so in order to share the lessons learned from accidents and incidents with interested parties, by introducing our general activities in 2015.

As part of our efforts to provide information overseas, we issued the English version of the report "Japan Transport Safety Board Annual Report 2016" on October 2016. We did so to let people overseas know about the topics in this Annual Report.

Column

The Riddle of Telephone Inquiries

Kobe Office

The JTSB Kobe Office is mainly concerned with investigating the cause of marine accidents. But sometimes, we receive telephone inquiries or requests for advice on matters that have nothing to do with our work.

For example, we have been asked "Where can I get a license to drive a truck?" Another caller said, "A shiny part of a guard rail has fallen down in front of my house. It has an MLIT seal on it, but is it OK to throw it away?" And another asked, "I drive a certain make of car, but can you tell me whether it is affected by the newspaper recall announcement?"

We began to wonder why calls like this were being made to the Kobe Office, and so decided to ask one of the callers. The answer was that our telephone number was the first one listed in the yellow telephone directories distributed by the telephone company.

We checked this straight away, and found that the Japan Transport Safety Board was indeed listed at the top of the MLIT page in the section on public authorities. That's because *Unyu*, the first word of our name in Japanese, comes before the names of other bodies in the Japanese system of ordering sounds.

The riddle was solved.

So how should we handle telephone inquiries and requests for advice that have nothing to do with our work?

JTSB employees always go about their work with the Board's mission and principles uppermost in their minds. But at the same time, our intention is always to respond courteously to telephone inquiries from members of the public, and to do whatever we can to help them by seeking out the information they need, or pointing them in the right direction for advice. Together with the mission of the Japan Transport Safety Board, we go about our daily work with this attitude in mind.

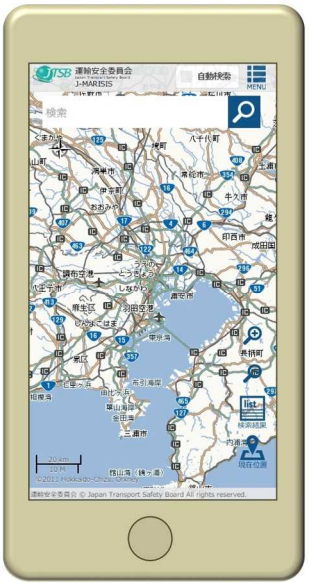
5 J–MARISIS – Now even easier to use

So that more effective use can be made of published marine accident investigation reports, the Japan Transport Safety Board began providing the Japan-Marine Accident Risk and Safety Information System (J - MARISIS) as an Internet service from the end of May 2013, allowing users to search reports from maps. In April 2014, we also released the global version of J-MARISIS, further allowing users to search investigation reports published by overseas marine accident investigation organizations from world maps.

Given the increase in the number of people using the Internet on mobile terminals, as well as requests to make this system easier to use on smartphones and tablets, we released the mobile version of J-MARISIS at the end of June 2015.

With touch panel support as well as revised display buttons and layouts, its ease of use has been increased, and the GPS functions of mobile terminals can be used to display information on areas near the user's current location. As a result, users on pleasure boats, recreational fishing boats or other small vessels can easily check information on accidents and other relevant information on navigation in sea areas they are planning to visit.

J-MARISIS http://jtsb.mlit.go.jp/hazardmap/mobile/index_en.html



Screen displaying accident information

The Japan Transport Safety Board welcomes your views, requests and other comments/communication from users of J-MARISIS. Please use the "Contact us" section of our website.

Contact us http://www.mlit.go.jp/jtsb/contact.html

Column

Accident Investigation and the Weather

Director for Analysis, Recommendation and Opinion

The Director for Analysis, Recommendation and Opinion handles a variety of tasks within the JTSB. These include analyzing accident investigation data from the respective sectors of aviation, railways and marine, and issuing recommendations and opinions designed to prevent accidents from occurring in the first place, or to reduce damage when they do occur. As well as these roles, the Director is also in charge of preparing safety publications focusing on specific themes (as in the "JTSB Digests") and disseminating safety information that highlight accident hotspots and types of accident (as in "J-MARISIS"). As a result, the staff responsible for gathering and analyzing data have many opportunities for contact with reports outside their own special areas of transportation.

There is no difference between the sectors in terms of the basic composition of accident investigation reports – namely, descriptions and analysis of factual information, and the causes of accidents deduced from the analysis. In certain aspects, on the other hand, the details of information given and the style of writing display unique characteristics depending on the sector.

For example, it is essential in accident investigation that we analyze whether or not the meteorological conditions affected the occurrence of an accident, and information on the meteorological factors is therefore given in reports on all three sectors. However, details common to reports on aviation, railways and marine are limited to the weather at the time when the accident occurred – in other words, whether it was "fair" or "cloudy", etc. Information other than this differs slightly from sector to sector. In investigation reports on aircraft accidents, for example, information on wind, atmospheric pressure and other conditions that impact flight are naturally more detailed; another particular characteristic of aviation-related reports is that they include information on clouds, such as the amount of cloud, cloud type and cloud base. Of course, wind has a significant bearing on marine navigation as well, but a characteristic of marine accident reports is rather that the sea conditions – namely, conditions such as wave height, length and frequency, and high or low tide – are described in particular detail. Sea temperature is sometimes mentioned as information that affects the survival of accident victims who fall into the sea. In the case of railway accidents, meanwhile, information on earthquakes is sometimes mentioned. This is because we also investigate derailment and other accidents caused by earthquakes, and terms like "P-waves" and "S-waves" are often seen in these reports.

Incidentally, when giving information about the wind, the international system of units uses the term "m/s (meters per second)", but "kt (knots; 1kt = 0.514m/s = 1.852km/h)" is also commonly used in air accident investigation. Again, in marine accident investigations, "wind force" based on a graded scale of strength is also commonly used; according to the wind force scale used by the Japan Meteorological Agency (JMA), wind force 1 represents "wind speed 0.3m/s up to less than 1.6m/s (1kt to less than 4kt)". In the "Beaufort wind force scale", which provided the basis for the JMA wind force scale, the land condition under wind force 1 is explained as "Direction shown by smoke drift but not by wind vanes". No unique usage is evident in the case of railway accident investigations, where m/s is the unit used. These differences are interesting in that they are based on units that have always been used in the respective transport sectors, and reflect different treatment depending on the characteristics of the information source.

As readers of the "JTSB Annual Report", you may well have a connection with one of these transport sectors, but if you should care to look at accident investigation reports in sectors other than your own special field, you will surely notice the respective characteristics of each.

6 Outreach lectures (dispatch of lecturers to seminars, etc.)

Scene of an outreach lecture

The Japan Transport Safety Board launched a series of outreach lectures in April 2014, as part of its efforts to raise awareness on the work of the Board, and to create an opportunity for collecting the feedback and opinions of the general public.

Seminars that lecturers can be dispatched to cover topics that are useful in preventing or mitigating damage from aircraft, railway, and marine accidents. Members of the staff are dispatched as lecturers to various seminars and schools.

We can provide flexible support for the content of lectures, such as by incorporating content to match the needs of participants, based on courses chosen by requesting groups.

http://www.mlit.go.jp/jtsb/demaekouza.html (in Japanese)

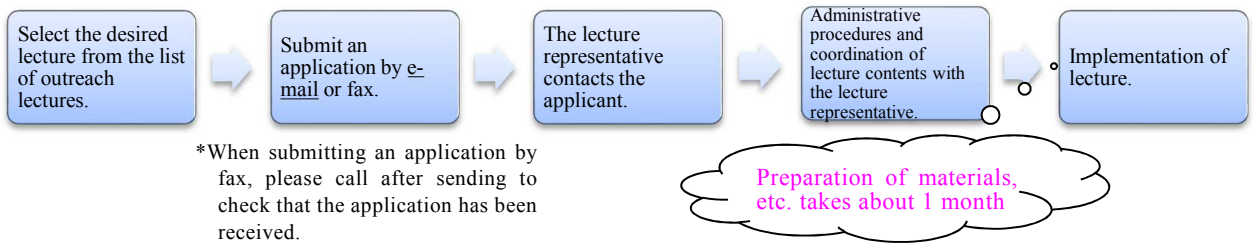
List of outreach lectures

No.	Course	Main audience	Contents
1	About the Japan Transport Safety Board	General (High school students and older), transportation businesses, etc.	Easy-to-understand explanation about the organizational background, work, etc. of the Japan Transport Safety Board
2	What is accident investigation?	Elementary school students	Easy-to-understand explanation about accident investigation for elementary school students and older
3	About aircraft accident investigation	General (High school students and older), aviation businesses, etc.	Easy-to-understand explanation about aircraft accident investigations, including the background, concrete examples, etc.
4	About railway accident investigation	General (High school students and older), railway businesses, etc.	Easy-to-understand explanation about railway accident investigations, including the background, concrete examples, etc.
5	About marine accident investigation	General (High school students and older), maritime businesses, etc.	Easy-to-understand explanation about marine accident investigations, including the background, concrete examples, etc.
6	About marine accident investigation (fire, explosion, engine failure)	General (High school students and older), maritime businesses, etc.	Explanation about marine accident investigations related to fire, explosion and engine failure, including the background, concrete examples, countermeasures, etc.
7	About the JTSB Digests	General (High school students and older), transportation businesses, etc.	Introduction to case studies of accidents and explanation of various statistical materials across various modes, based on the JTSB Digests that have been issued to date.
8	About the JTSB Digests (Analyses of Aircraft Accidents)	General (High school students and older), aviation businesses, etc.	Explanation about various themes taken up in the analyses of aircraft accidents in the JTSB Digests.
9	About the JTSB Digests (Analyses of Railway Accidents)	General (High school students and older), railway businesses, etc.	Explanation about various themes taken up in the analyses of railway accidents in the JTSB Digests.

10	About the JTSB Digests (Analyses of Marine Accidents)	General (High school students and older), maritime businesses, etc.	Explanation about various themes taken up in the analyses of marine accidents in the JTSB Digests.
11	Trends in the occurrence of marine accidents, and preventing recurrence	General (High school students and older), maritime businesses, etc.	Schematic explanations about risks and waters where marine accidents frequently occur using the J-MARISIS, and explanations about accident prevention methods.
12	Analysis digests of regional offices (marine accident-related) [each regional office in Hakodate, Sendai, Yokohama, Kobe, Hiroshima, Moji, Nagasaki, and Naha]	General (High school students and older), maritime businesses, etc.	Explanations on each topic regarding analysis digests from regional offices. *Lists can be found by clicking the link below. http://www.mlit.go.jp/jtsb/bunseki-kankoubutu/localanalysis/localanalysis_new.html

*No. 12, in principle, is restricted to requests from the areas under the jurisdiction of the local office.

Flow chart from application to implementation of lecture



7 Activities of the Accident Victim Information Liaison Office

The Japan Transport Safety Board gives full consideration to the emotions of the victim and their families, as well as bereaved families. In addition to providing information on accident investigations in an appropriate manner at the appropriate time, a contact point for providing accident investigation information to victims, etc. was established in April 2011 with the aim of providing attentive response to opinions and feedback. Furthermore, in order to promote the provision of information, the Accident Victim Information Liaison Office was established under the directive of the organization in April 2012. Contact points for the provision of information were also set up in local offices to provide integral support alongside with Tokyo.

In 2016, information on accident investigation and other matters was provided to 49 persons, including the victims, of 32 cases of aircraft/railway/marine accidents.

The status for other activities is as follows.

○Memorials for accident victims

The JTSB made memorial visits to accident sites including Mount Osutaka in Ueno Village, Tano District, Gumma Prefecture, the site of the JAL Flight 123 crash, and presented offerings of flowers from the Board members and the Director-General at each accident site to express our deepest sympathy for those lost in these accidents.

By presenting these memorial offerings first-hand, we deeply felt the emotions of those who still have painful memories of these events, and renewed our awareness of the importance of closely sharing

the feelings of bereaved families and victims.

Prayer at the altar for flowers at the
Mount Osutaka crash site

Prayer at the altar for flowers at the
Takenotsuka level crossing accident site

The Accident Victim Information Liaison Office hands out "Contact Information Cards" to victims of accidents.

The Office receives inquiries and consultation about the accident investigations from victims and families of accidents, as well as bereaved families. Please feel free to contact the following where necessary.

Contact Information Cards

Information for Victims and their Families

Japan Transport Safety
Victims and their Families
Liaison Office

Japan Transport Safety Board

(Front)

Japan Transport Safety Board
Victims and their Families
Liaison Office

2-1-2 Kasumigaseki, Chiyoda,
Tokyo, Japan 100-8918

Tel: +81-3-5253-8823 Fax: +81-3-5253-1680
e-mail: jtsb_faminfo@mlit.go.jp

Japan Transport Safety Board

(Back)

Chapter 7 International efforts for accident prevention

1 Objectives and significance of international cooperation

Aircraft and marine accidents, which are part of Japan Transport Safety Board's investigation scope, are international in nature. Creating and operating systems for these kinds of investigations therefore involve international organizations. Also, it is necessary to cooperate and coordinate with the accident investigation authorities of the states concerned during the investigation process.

In addition to the nation where an aircraft accident occurred, the state of registry, the state of the operator, and the state where the aircraft was designed and manufactured are the states concerned. An annex to the Convention on International Civil Aviation (the Chicago Convention) states that the state of occurrence is responsible for starting and accomplishing an accident investigationwhile the other states also have the right and responsibility to appoint a representative to participate in the investigation. Proper cooperation with the accident investigation authorities of those states concerned is necessary for the accomplishment of the investigation.

Similarly, in marine accidents involving vessels above a certain level, the International Convention for the Safety of Life at Sea (SOLAS) places the obligation of investigation on the flag state of the vessel. Additionally, other states concerned, such as coastal states in whose territory the marine accident occurs and the state(s) of victims are entitled to investigate the accident. The convention defines the standard framework of marine accident investigations. The flag state and states concerned must cooperate with each other in multiple ways, such as through information sharing, when conducting accident investigations.

Based on this background, a variety of international meetings are held for each mode, which JTSB actively participates in. The meetings are for the purpose of facilitating collaboration in the case of accidents or incidents, sharing information on accidents and investigation methods on a regular basis, and achieving results of prevention for repeated accidents all over the world. Additionally, for the investigation of railway accidents, for which there is no international organization, various international seminars to exchange information on accident and incident investigations are held in major countries. In regards to this, the fundamental investigation system of each state is generally standardized. Furthermore, some universities overseas have specialized training courses for accident and incident investigations, to which JTSB is also actively dispatching investigators.

As shown above, JTSB aims to improve transport safety in Japan and all over the world. It hopes to do so through sharing of our findings worldwide, which have been acquired in individual accident and incident investigations. Relating to this, the following sections introduce each of our international activities in 2016.

2 Efforts of international organizations and JTSB's contributions

(1) Efforts of the International Civil Aviation Organization and JTSB's involvement

The International Civil Aviation Organization (ICAO, Headquarters: Montreal, Canada) was established as a specialized agency of the United Nations in 1947. Japan acceded to it in 1953. ICAO

comprises the Assembly, Council, Air Navigation Commission (a supporting body of the Council), Legal Committee, Air Transport Commitee, Committee on Joint Support of Air Navigation Services, all of which are the subordinate bodies of the Council, secretariat and regional offices. In addition, Air Navigation Conferences, Regional Air Naviation meetings, a variety of working groups and panel meetings, which are called in for certain projects. As of March 2016, 191 states are members of ICAO.

The objectives of ICAO is provided in Article 44 of the Convention on International Civil Aviation as being "to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport." ICAO is engaging in a wide variety of activities, including the drafting of conventions regarding international air transport services and aviation security such as countermeasures against hijacking. It also engages in audits of contracting states' safety monitoring systems, and responses to environmental problems.

ICAO establishes the Annexes of the Convention on International Civil Aviation for items that must be covered by globally unified rules. The Annexes determines the rules for 19 fields, including personnel licensing, rules of the air, registration of aircraft, airworthiness, aeronautical telecommunications, search and rescue, security, and the safe transport of dangerous goods and safety management. Among them, Annex 13 establishes the standards and recommendations for aircraft accident and incident investigations. In addition, the Act for the Establishment of the Japan Transport Safety Board states that: "The Board shall conduct investigations prescribed in items (i) to (ii) of Article 5 in conformity with the provisions of the Convention on International Civil Aviation and with the Standards, Practices and Procedures adopted as Annexes thereto." (Article 18).

In addition, the Asia Pacific Accident Investigation Group (APAC-AIG) operates as a framework for safety in Asia and Pacific Regions, and considers the building of a cooperative system for accident investigation in these regions.

APAC-AIG/4
(Japan)

In September 2016, the 4th Meeting (APAC-AIG/4) was held in Japan. It was attended by a total of 50 delegates representing 21 countries and regions, two organizations and aircraft manufacturers. At the Meeting, the participants reaffirmed the need to promote the independence of air accident investigation bodies in Asian countries, and to achieve intra-regional cooperation in the education and training of aircraft accident investigators, among other issues.

(2) Efforts of the International Maritime Organization and JTSB's involvement

The International Maritime Organization (IMO, Headquarters: London, United Kingdom) was established in 1958 as a specialized agency of the United Nations. It was originally called as the Inter-Governmental Maritime Consultative Organization (IMCO). The IMO comprises the Assembly, the Council and five committees. These are the

III3

Maritime Safety Committee (MSC), Legal Committee (LEG), Marine Environmental Protection Committee (MEPC), Technical Co-operation Committee (TC) and Facilitation Committee (FAL). In addition, there is a Secretariat, and the MSC (and MEPC) has seven subcommittees. As of March 2017, IMO has 172 member states/teritorries and three regions as associate members.

IMO engages in various activities, such as the facilitation of intergovernmental cooperation, effective safety measures and drafting of conventions that relate to technical and legal problems with maritime life safety and safe marine navigations. The Sub-Committee on Implementation of IMO Instruments (III) is a subordinate group of MSC and MEPC. It discusses how to ensure the responsibility of the flag state, including the investigation of marine accidents and incidents. III analyzes the accident or incident investigation reports submitted from states based on SOLAS and the International Convention for the Prevention of Pollution from Ships (MARPOL) to draw lessons from, which III subsequently makes public on the IMO website. By doing so, III promotes activities for the prevention of the repeated occurrence of marine accidents. The Correspondence Group (which undertakes analysis during periods outside of the sessions) and the Working Group (which verifies the analysis results during the session period) comprises volunteer investigators from some member states. They discuss these analysis results, which the III plenary subsequetly approves. Depending on the matter in question, if III determines that further discussion is required for a convention revision, it will submit recommendations or information to MSC, MEPCand other IMO subcommittees. The III2 was held in July 2015. In this event, JTSB's marine accident investigators took part as group members and analyzed accident investigation reports from various states. Tentative translations of these analysis results are published on JTSB website.
(URL: http://www.mlit.go.jp/jtsb/casualty_analysis/casualty_analysis_top.html)

3 Cooperation and information exchange with foreign accident investigation authorities and investigators

(1) Participation in international meetings

① Chairman meeting of the International Transportation Safety Association

The International Transportation Safety Association (ITSA) was established by accident investigation boards from the Netherlands, the United States, Canada, and Sweden in 1993. As of March 2016, the international organization has members from the transport accident investigation authorities of 16 countries and teritorries. Organizations that are permitted to join must be permanent accident investigation bodies that are independent from any regulatory body.

Based on the idea that any findings from an accident and incident investigation in one field can be used as a lesson for another field, ITSA holds annual chairman meetings where the participating accident investigation authorities present their experiences in accident investigation. These presentations are for all the modes of aviation, railway, and marine accidents and incidents. The chairpersons learn about the causes of accidents and the methodologies of

Participants in the ITSA chairman meeting (France)

accident investigations, thus aiming to improve transport safety in general. As for Japan, the Aircraft and Railway Accidents Investigation Commission was approved for accession in June 2006. The board has participated in all the meetings held after 2007.

Chairman Nakahashi and others from the JTSB attended the conference held in Paris, France in May 2016, and gave explanations about progress in bringing the MRJ into service and the accompanying intensification of the JTSB investigation system, as well as freight train derailment accidents at steep curves.

②Board meetings of the International Society of Air Safety Investigators and the Asian Society of Air Safety Investigators

The International Society of Air Safety Investigators (ISASI) has been organized by national aircraft accident investigation authorities. The purpose of this society is to support accident investigations aimed at preventing repeating occurrences of aircraft accidents and incidents. This aims is to be achieved by improving further a cooperative system of investigation bodies, through the facilitation of communications between member countries about their experience and knowledge, as well as information about the technical aspects of aircraft accident investigations.

ISASI holds annual seminar each year, and the Japan Aircraft Accident Investigation Commission has participated in each one of them since its establishment in 1974. In this seminar, a flight recorder workshop, an accident investigation training workshop, a cabin safety workshop and a government investigators meeting are held in parallel with the general meeting. Japan also participates in these workshops to contribute to technical improvements in these areas.

ISASI (Iceland)

The annual seminar in 2016 was held in Reykjavik, Iceland, with the theme “Every link is important”. This was attended by aircraft accident investigators from the JTSB, who participated in active exchange of opinions with accident investigation personnel from various countries.

ISASI has regional associations in Australia (ASASI), Canada (CSASI), Europe (ESASI), France (ESASI French), Latin America (LARSASI), New Zealand (NZSASI), Russia (RSASI), the United States (USSASI) and Asia (AsiaSASI). Each of these associations also holds their own seminars.

In AsiaSASI, the Hong Kong Civil Aviation Department currently serves as the Chairman, with JTSB as the Vice Chairman, and the Air Accident Investigation Bureau of Singapore as the Secretariat. In August 2016, the 4th AsiaSASI Workshop was held in Japan. It was attended by a total of 73 delegates from 21 countries and regions, as well as four aviation-related organizations and companies, among others. At the Workshop, participants exchanged information on the situation of air accident investigation in Asian countries, and questions about new investigation techniques were exchanged. From the


The 4th AsiaSASI Workshop (Japan)

JTSB, a Senior Aircraft Accident Investigator gave a presentation about rotorcraft accidents.

③The Accident Investigator Recorder (AIR) Meeting

The Accident Investigator Recorder (AIR) Meeting is an international conference for aircraft accident investigators who analyze digital flight data recorders (DFDR) and cockpit voice recorders (CVR). At this meeting, aircraft accident investigation analysts from all over the world share know-how by exchanging their experience, knowledge, information relating to the analysis of DFDR, and discuss the relevant technologies on DFDR. The conference aims to further develop the technical capacity of accident investigation authorities around the world and to further improvement the cooperative system amongst the authorities.

This meeting was established in 2004, and the accident investigation bodies of each country hold a meeting every year. JTSB has participated in nearly all the conferences since 2006.

The 2016 conference was held in September in Paris, France. JTSB dispatched aircraft accident investigators to acquire the latest information and know-how for the analysis of flight recorders. This was achieved through the exchange of information and ideas with foreign accident investigation analysts.

④The Marine Accident Investigators' International Forum

The Marine Accident Investigators' International Forum (MAIIF) is an international conference held annually since 1992. It was originally based on a proposal from the Transportation Safety Board of Canada. Its purpose is to maintain and develop international cooperation among marine accident investigators and to foster and improve international cooperation in marine accident investigations. Its aim is to advance maritime safety and prevent marine pollution. In 2008, MAIIF was granted the status of an Inter-Governmental Organization (IGO) in IMO.


MAIIF25 (Germany)

Under this forum, marine accident investigators around the world take the opportunities to exchange frankly opinions and share information on marine accident investigations. Recently, there has been more demand to make use of the findings obtained from the marine accident and incident investigations in the discussions in IMO. In 2009, MAIIF made a proposal based on the investigation results from the state investigation authorities to IMO for the first time. Japan has joined and actively contributed to the forum every year since the third conference and hosted the eighth conference in Tokyo in 1999.

The 25th conference, held in Hamburg, Germany in August 2016, was attended by a Deputy Investigator-General for Marine Accident and others from the JTSB, who gave presentations on topics including passenger ferry grounding accidents and accident case studies concerning very large container ships.

⑤The Marine Accident Investigators Forum in Asia

The Marine Accident Investigators Forum in Asia (MAIFA) was established by a proposal from Japan to build a mutual cooperation system for marine accident and incident investigations in the Asia region and to assist developing countries in enhancing their investigation systems. Since 1998, meetings have been held annually, and Japan has been playing a leading role in this forum, including the sponsorship of the 13th meeting in Tokyo in 2010. The network of investigators that has been established through the forum is now effective in its promotion of rapid and smooth international cooperation in accident and incident investigations. Encouraged by the success of MAIFA, E-MAIIF was established in Europe in 2005. A-MAIF was then established in North, Central and South Americas in 2009. These trends contribute more than ever in furthering the exchange and cooperation between marine accident investigators in each region. In the Asia region, there are not only a lot of straits with sea traffic congestion, but also severe weather and hydrographic phenomena that often give rise to tragic marine accidents. Nonetheless, some countries have insufficient capacities or systems for accident investigations. This situation makes these regional fora very important.

MAIFA19 (Australia)

The 19th meeting, held in Canberra, Australia, in October 2016, was attended by a Deputy Investigator-Genral for Marine Accident and others from the JTSB, who gave presentations on topics including a collision accident between a container ship and a cargo ship involving VHF communication and J-MARISIS.

(2) Examples of international cooperation among accident investigation agencies in individual cases

For the aircraft accident and incident investigations, based on the provisions in Annex 13 of ICAO, the state where an aircraft accident occurred must notify the state of registry, the state of design/manufacturing, and the state of operation. If necessary, these states concerned may appoint their own Accredited Representative (AR) to join the investigation.

On the accident in July 2015 in which a small aeroplane, after taking off from Chofu Airfield, crashed in Fujimi Town, Chofu and was destroyed, an investigation is being conducted jointly with the accident investigation authority in the USA, the state of design/manufacturing of the aircraft, which has appointed its own AR. Meanwhile, on the serious incident in which an engine malfunction occurred to a Korean Air Lines Boeing 777-300 while rolling for takeoff at Tokyo International Airport (Haneda Airport) in May 2016, followed by emergency evacuation, the USA, as the state of design/manufacturing of the aircraft and South Korea, as the state of registry and the state of operator, have appointed their own ARs and are took part in the investigation. In this case, the JTSB is conducting the investigation in cooperation with both the accident investigation authorities.

In marine accident and incident investigations, the IMO Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code) states that the interested states, including the flag state of the ship

and the coastal state of the accident, must cooperate in the marine accident investigation. Also in Japan, if a marine accident or incident occurs that concerns more than one state, Japan's accident investigators are to collaborate with the accident investigation authorities of the other interested states in order to obtain information about the accident.

Among the marine accidents and incidents that the JTSB launched investigations in 2016, with regard to the 10 serious accidents involving ships engaged on international voyages, the accident investigation authorities of the countries to which the ships were registered were notified of the accidents.

On the accident in which the passenger ship BEETLE collided with what appeared to be a marine creature off to the northwest of Tsushima, Tsushima City, Nagasaki Prefecture, and passengers and crew members were injured in January 2016, investigation is in progress with the cooperation of the accident investigation authority of South Korea as the interested state. Again, on the accident in which a crew member fell from the chemical tanker BUCCOO REEF and died while it was engaged in mooring operation near the berth in the Port of Bassens, France in April 2016, investigation is in progress with the cooperation of the accident investigation authority of France as the coastal state pertaining to the accident.

Among the marine accident and incident investigation reports that were published in 2016, JTSB sent eight draft reports to the flag states upon request, in order to invite their comments.

4 Participation in overseas training

JTSB is making efforts to advance the capacity of accident investigators through measures such as training and international information exchanges to investigate accidents accurately, and also actively participates in overseas training for accident investigations.

In 2016, JTSB made efforts to improve our accident investigation capabilities, continuing from the previous year to dispatch an aircraft accident investigator and a marine accident investigator to Cranfield University in the UK, which has a good track record in accident and incident investigation training. The content of this training session lets the participants learn about a variety of topics, from the basics to expert knowledge about accident investigations. After the training, the participating investigators made the other investigators of each mode of transport aware of what was learned in the training, thereby helping to improve the capabilities of all of our investigators.

JTSB also dispatches aircraft accident investigators to training held by US manufacturers to familiarize themselves with methods for using tools to retrieve and analyze data from damaged DFDRs and CVRs, in preparation for future investigations.

Column

Thoughts on International Conferences

Director for International Affairs

As mentioned in Chapter 7, we hosted a conference and workshop attended by air accident investigation personnel from the Asia-Pacific region in Tokyo between August 30 and September 2, 2016. Thanks to a high level of interest in the agenda this time, the event attracted participants from more than 20 countries and regions, an increase compared to previous years.

Some of the participants were from countries requiring a letter of guarantee from Japan before they could be issued with tourist visas. In one case, we issued the letter of guarantee based on the personal history and other details provided by the applicant, but when we sent the letter stamped with the official seal of the JTSB, the meaning of the seal was not understood and we were asked to provide the signature of the responsible person.

Again, we rarely bother ourselves over differences of religion in Japan, but since some of the participants were Muslims, we made various preparations such as researching meals not based on pork, providing a separate room for prayers besides the conference room, and so on. However, perhaps because the Muslim participants already had plenty of experience of overseas trips, all of these preparations proved unnecessary. On the other hand, because everything is so expensive in Tokyo, I could hardly resist a wry smile when approached with unexpected questions like “Where can I get cheap subway tickets?” or “Where can I find a cheap cosmetics store?”

One country even left it to the day before the conference to confirm participation. Just as we were wondering whether the delegates would really make it in time, around lunchtime on the first day they appeared at reception dragging huge traveling bags behind them. On chatting to them during the break, they said their boss had forgotten to approve the trip. “In our country, it’s considered unthinkable to remind your boss about something, even in work-related matters,” they said. Their grumbling appearance left a lasting impression.

At the conference venue, we made a presentation of “Japanese hospitality” by placing colorful origami cranes on every desk. When the conference was over, some participants took home cranes from other desks as well as their own, and I felt as if we had done our bit to spread the word about Japanese culture.

When preparing for an international conference, it is of course important that the top priority should be on the outcome of the conference; but it’s also important to create in environment in which everyone can feel glad to have attended a conference in Japan. In future, I would like to advertise the quality of transport safety in Japan with an added touch of “hospitality”, and to broaden the circle and harmony of international cooperation on accident investigation.

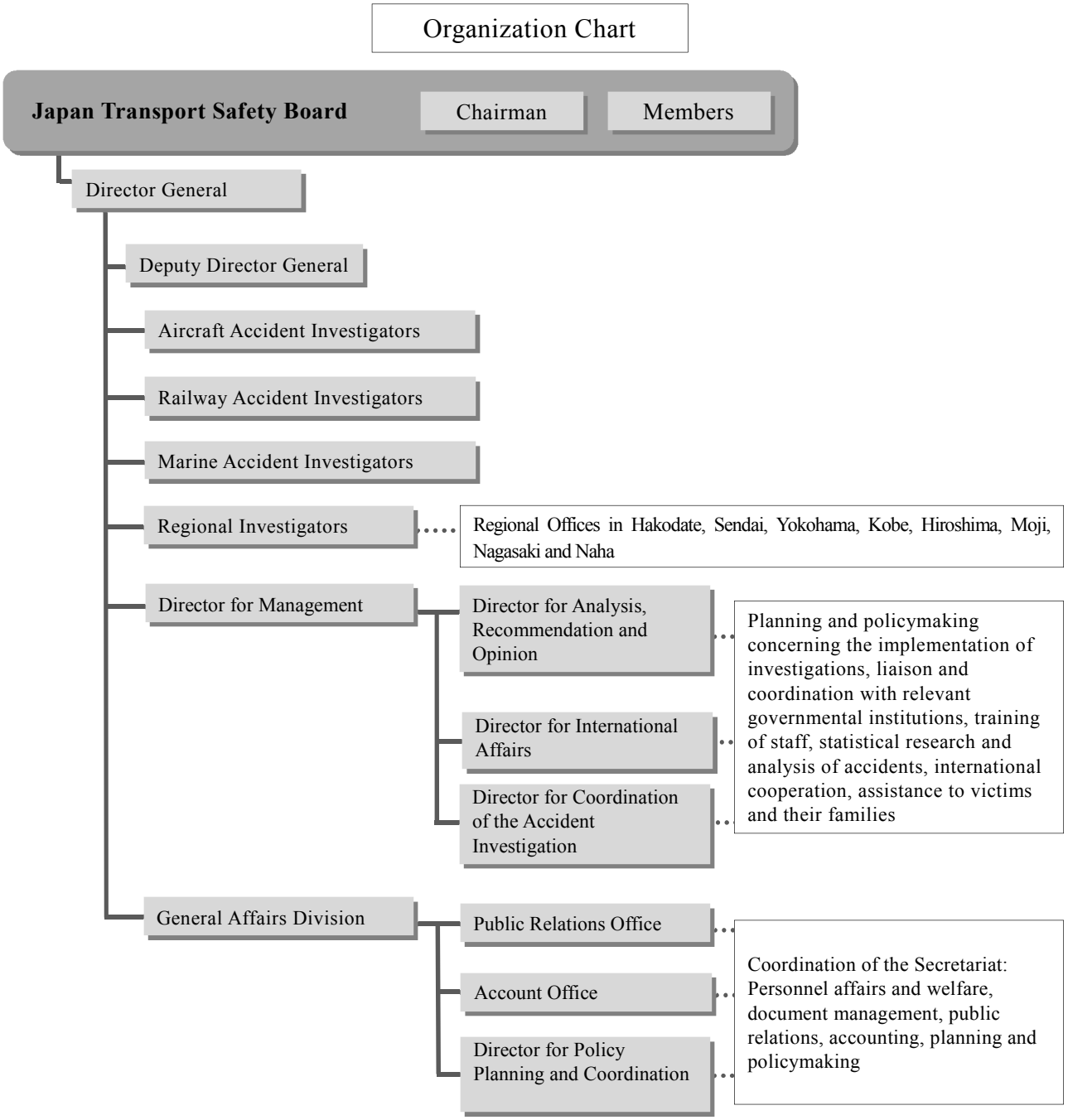
In the ANA Safety Education Center, the participants had first-hand experience of safety education in Japan

Appendixes

Appendixes

1 Outline of the organization

The Japan Transport Safety Board consists of the Chairman, 12 members, and 178 secretariat staff (as of the end of March 2015). The staff in the secretariat consist of investigators who conduct investigations of aircraft, railway and marine accidents; the General Affairs Division that performs coordination-related jobs for the secretariat; and the Director for Management who is dedicated to the support and statistical analysis of accident investigations, and international cooperation. In addition, special support staff and local investigators are stationed at eight regional offices around the country (Hakodate, Sendai, Yokohama, Kobe, Hiroshima, Moji, Nagasaki and Naha). These local investigators investigate marine accidents (excluding serious ones) and support staff provide initial support for aircraft, railway and marine accidents.



2 Deliberation items of Board and each Committee

When investigations of accidents have progressed and the facts, as well as the causes and factors of accidents, have become clear to a certain extent, accident investigators put these results together and prepare a draft investigation report. This draft is then deliberated in the Board or Committees. As indicated in the table below, matters related to extremely serious accidents are deliberated in the Board, and matters related to particularly serious accidents are deliberated in the General Committee, and so nearly all draft investigation reports are deliberated in committees set up for each transport mode (Aircraft, Railway, Marine and Marine Special Committees).

The Board is composed of eight full-time members, including the Chairman, and five part-time members, with its assemblies convened by the Chairman. The Committees are composed of members with expertise related to each Committee, and their meetings are convened by their own Committee Directors. Any matters shall be decided by a majority of the members present for both the Board and Committees, and for both of these, a meeting cannot be convened and a decision cannot be made unless more than half of the members are present.

The Board (Committee) meeting is also attended by the Director General, Deputy Director General, Director for Management, Investigators concerned from the Secretariat.

Deliberation items of Board and each Committee

Board and Committees	Matters to be deliberated
Board	・Matters that the Board considers as extremely serious accidents based on the scale of damage and other matters including social impact
General Committee	・Matters related to particularly serious accidents (i) An accident involving ten or more persons killed or missing (ii) An accident involving twenty or more persons killed, missing or seriously injured (With regard to aircraft accidents and a marine accidents, (i) and (ii) are limited to passenger transport services.) ・Any other matters deemed to be necessary by the Board
Aircraft Committee	・Matters related to aircraft accidents and aircraft serious incidents (excluding the accidents to be handled by the General Committee)
Railway Committee	・Matters related to railway accidents and railway serious incidents (excluding the accidents to be handled by the General Committee)
Marine Committee	・Matters related to marine accidents and marine incidents as may be deemed serious by the Board (excluding the accidents to be handled by the General Committee and the Marine Special Committee)
Marine Special Committee	・Matters related to marine accidents and marine incidents (excluding the accidents to be handled by the General Committee and the Marine Committee)

3 Board Members

As of April 1, 2017

Kazuhiro Nakahashi, Chairman (Full-time), Director of Aircraft Committee

Kazuhiro Nakahashi was appointed as Chairman of the Japan Transport Safety Board on February 27, 2016; belongs to the Aircraft Committee, the Railway Committee and the Marine Committee with special expertise in aerospace engineering and computational fluid dynamics

Career summary: Doctor of Engineering, Graduate School of Engineering, the University of Tokyo
Former Professor in the Graduate School of Engineering, Tohoku University
Former Vice President of the Japan Aerospace Exploration Agency

Toshiyuki Ishikawa, Member (Full-time)

Toshiyuki Ishikawa was appointed as a member on March 15, 2010, currently in the third term of office; belongs to the Aircraft Committee, the Railway Committee and the Marine Committee, with special expertise in legislation of administrative law and others

Career summary: Doctor of Law, Graduate School of Law, Chuo University
Former Professor in the Law School, Chuo University

Toru Miyashita, Member (Full-time), Vice-Chairman, Deputy Director of Aircraft Committee

Toru Miyashita was appointed as a member on February 27, 2016; belongs to the Aircraft Committee, with special expertise in operation and maintenance of aircraft

Career summary: Graduated from the Department of Aeronautics, Faculty of Engineering, the University of Tokyo
Former Executive Director of the Association of Air Transport Engineering & Research

Yuichi Marui, Member (Full-time)

Yuichi Marui was appointed as a member on December 6, 2016; belongs to the Aircraft Committee, with special expertise in maneuvering of aircraft

Career summary: Graduated from Civil Aviation College
Former D.Senior Vice President, Corporate Safety and Security, All Nippon Airways Co., Ltd.

Fuminao Okumura, Member (Full-time), Director of Railway Committee

Fuminao Okumura was appointed as a member on December 6, 2016; belongs to the Railway Committee, with special expertise in railway engineering and geotechnical engineering

Career summary: Doctor of Engineering, graduated from the Department of Civil Engineering, Faculty of Engineering, Tokyo Institute of Technology
Former Executive Director of the Railway Technical Research Institute

Hiroaki Ishida, Member (Full-time), Deputy Director of Railway Committee

Hiroaki Ishida was appointed as a member on December 26, 2016; belongs to the Railway Committee, with special expertise in dynamics of machinery, vehicle dynamics and railway vehicle engineering

Career summary: Doctor of Engineering, graduated from the Department of Industrial Mechanical Engineering, Faculty of Engineering, the University of Tokyo
Former Professor in the Program in Mechanical Engineering, Department of Interdisciplinary Science and Engineering, School of Science and Engineering, Meisei University

Kuniaki Shoji, Member (Full-time), Director of Marine Committee

Kuniaki Shoji was appointed as a member on October 1, 2011, currently in the second term of office; belongs to the Marine Committee and the Marine Special Committee, with special expertise in marine engineering and naval architecture

Career summary: Doctor of Engineering, Graduate School of Engineering, the University of Tokyo
Former Professor in the Faculty of Marine Technology, Tokyo University of Marine Science and Technology

Satoshi Kosuda, Member (Full-time), Deputy Director of Marine Committee

Satoshi Kosuda was appointed as a member on October 1, 2014; belongs to the Marine Committee and the Marine Special Committee, with special expertise in ship maneuvering

Career summary: Graduated from the Department of Navigation at Kobe University of Mercantile Marine
Former Investigator-General for Marine Accidents, Japan Transport Safety Board Secretariat

Keiji Tanaka, Member (Part-time)

Keiji Tanaka was appointed as a member on February 27, 2013, currently in the second term of office; belongs to the Aircraft Committee, with special expertise in flight simulation and flight dynamics

Career summary: Doctor of Engineering, graduated from the Department of Aeronautics, Faculty of Engineering, the University of Tokyo
Former Professor for Aerospace Engineering Course, Monozukuri Engineering Department, Tokyo Metropolitan College of Industrial Technology

Miwa Nakanishi, Member (Part-time)

Miwa Nakanishi was appointed as a member on February 27, 2016; belongs to the Aircraft Committee, with special expertise in ergonomics (human factors)

Career summary: Doctor of Engineering, School of Science for Open and Environmental Systems, Graduate School of Science and Technology, Keio University
Associate Professor in the Department of Administration Engineering, Faculty of Science and Technology, Keio University (current post)

Miyoshi Okamura, Member (Part-time)

Miyoshi Okamura was appointed as a member on December 6, 2010; currently in the third term of office; belongs to the Railway Committee, with special expertise in structural engineering, earthquake engineering and maintenance management engineering (steel structure engineering)

Career Summary: Doctor of Engineering, Graduate School of Engineering, University of Yamanashi
Associate Professor in the Department of Research, Interdisciplinary Graduate School of Medicine and Engineering, University of Yamanashi (current post)

Miwako Doi, Member (Part-time)

Miwako Doi was appointed as a member on December 6, 2016; belongs to the Railway Committee, with special expertise in electrical engineering and traffic management (human interface)

Career Summary: Doctor of Philosophy
Auditor, National Institute of Information and Communications Technology
Executive Director, Nara Institute of Science and Technology

Mina Nemoto, Member (Part-time)

Mina Nemoto was appointed as a member on October 1, 2008, currently in the third term of office; belongs to the Marine Committee and the Marine Special Committee, with special expertise in ergonomics (human factors)

Career summary: Doctor of Philosophy, Graduate School of Media and Governance, Keio University
Senior Consultant, Marine Technical Group, Japan Marine Science Inc. (current post)

The chairman and members of the Board shall be appointed by the Minister of Land, Infrastructure, Transport and Tourism with the consent of both houses of Representatives and Councilors.

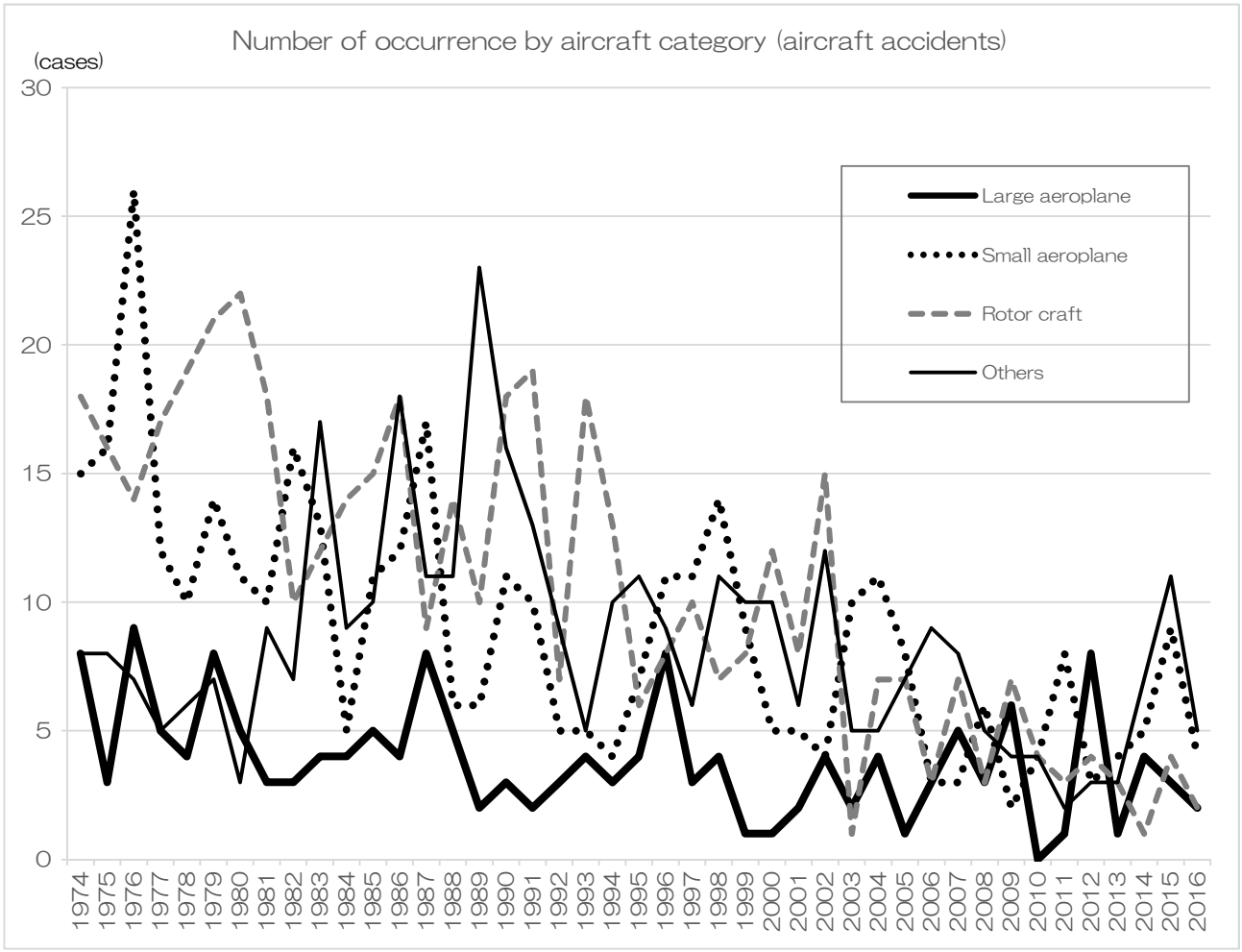
4 Number of occurrence by aircraft category (aircraft accidents)

(Cases)

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
1974	8	15	0	17	1	8	0	49
1975	3	16	0	16	0	8	0	43
1976	9	26	0	14	0	7	0	56
1977	5	12	0	16	1	5	0	39
1978	4	10	0	18	1	6	0	39
1979	8	14	0	20	1	6	1	50
1980	5	11	0	22	0	3	0	41
1981	3	10	1	18	0	8	0	40
1982	3	16	0	9	1	7	0	36
1983	4	13	10	12	0	7	0	46
1984	4	5	6	13	1	3	0	32
1985	5	11	6	15	0	4	0	41
1986	4	12	14	15	3	4	0	52
1987	8	17	8	8	1	3	0	45
1988	5	6	7	12	2	3	1	36
1989	2	6	11	9	1	12	0	41
1990	3	11	9	16	2	7	0	48
1991	2	10	6	19	0	7	0	44
1992	3	5	5	7	0	4	0	24
1993	4	5	3	17	1	2	0	32
1994	3	4	8	13	0	2	0	30
1995	4	7	10	6	0	1	0	28
1996	8	11	5	8	0	4	0	36
1997	3	11	3	8	2	3	0	30
1998	4	14	5	6	1	6	0	36
1999	1	9	5	7	1	5	0	28
2000	1	5	5	11	1	5	0	28
2001	2	5	2	8	0	4	0	21
2002	4	4	5	15	0	7	0	35
2003	2	10	3	1	0	2	0	18
2004	4	11	2	6	1	3	0	27
2005	1	8	0	7	0	7	0	23
2006	3	3	4	2	1	5	0	18

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
2007	5	3	4	7	0	4	0	23
2008	3	6	2	3	0	3	0	17
2009	6	2	1	7	0	3	0	19
2010	0	4	2	4	0	2	0	12
2011	1	8	1	3	0	1	0	14
2012	8	3	2	4	0	1	0	18
2013	1	4	1	3	0	2	0	11
2014	4	5	2	1	0	5	0	17
2015	3	9	3	3	1	8	0	27
2016	2	4	1	2	0	4	0	13
Total	165	381	162	428	24	201	2	1,363

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accident Investigation Commission.
2. Large aeroplanes are aircraft with a maximum take-off weight of more than 5,700kg.
3. Small aeroplanes are aircraft with a maximum take-off weight of 5,700kg or less, excluding Ultralight planes.

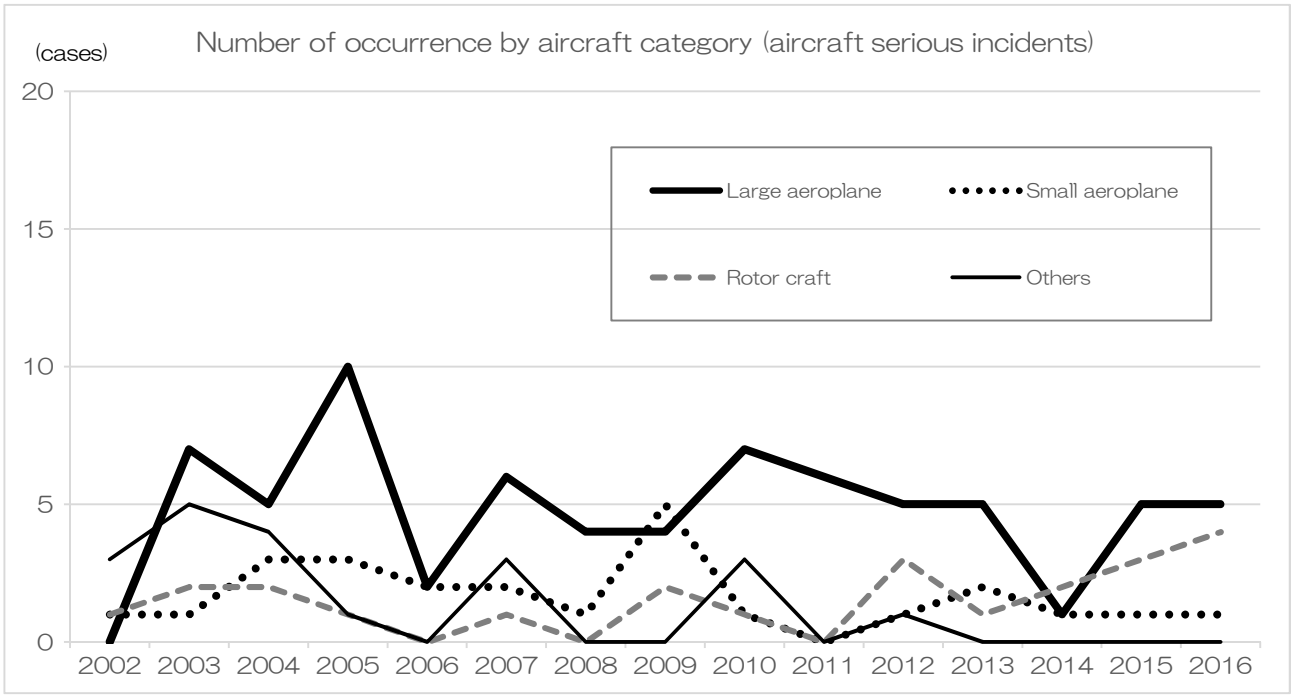


5 Number of occurrence by aircraft category (aircraft serious incidents)

(Cases)

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
2001	3	0	0	0	0	0	0	3
2002	0	1	2	1	0	1	0	5
2003	7	1	4	2	0	1	0	15
2004	5	3	4	2	0	0	0	14
2005	10	3	1	1	0	0	0	15
2006	2	2	0	0	0	0	0	4
2007	6	2	2	1	0	1	0	12
2008	4	1	0	0	0	0	0	5
2009	4	5	0	2	0	0	0	11
2010	7	1	3	1	0	0	0	12
2011	6	0	0	0	0	0	0	6
2012	5	1	0	3	0	1	0	10
2013	5	2	0	1	0	0	0	8
2014	1	1	0	2	0	0	0	4
2015	4	1	0	4	0	0	0	9
2016	5	1	0	4	0	0	0	10
Total	74	25	16	24	0	4	0	143

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accident Investigation Commission.
2. Large aeroplanes are aircraft with a maximum take-off weight of more than 5,700kg.
3. Small aeroplanes are aircraft with a maximum take-off weight of 5,700kg or less, excluding Ultralight planes.
4. The number of cases for 2001 represents those that occurred from October onward.



6 Number of occurrence by type (railway accidents)

(Cases)

Type / Year of occurrence	Railway							Tramway							Total
	Train collision	Train derailment	Train fire	Level crossing accident	Accident against road traffic	Other accidents with casualties	Heavy property loss without casualties	Vehicle collision	Vehicle derailment	Vehicle fire	Level crossing accident	Accident against road traffic	Other accidents with casualties	Heavy property loss without casualties	
2001	0	4	1	0	0	0	0	0	0	0	0	0	0	0	5
2002	1	14	1	2	0	1	1	0	0	0	0	0	0	0	20
2003	1	20	2	0	0	0	0	0	0	0	0	0	0	0	23
2004	0	18	0	1	0	0	0	0	1	0	0	0	0	0	20
2005	2	20	0	0	0	1	0	0	1	0	0	0	0	0	24
2006	1	13	0	1	0	0	0	1	0	0	0	0	0	0	16
2007	0	12	2	3	0	0	0	0	2	0	0	0	0	0	19
2008	0	7	2	2	0	1	1	0	0	0	0	0	0	0	13
2009	0	5	1	2	0	3	0	0	0	0	0	0	0	0	11
2010	0	6	0	0	0	1	0	0	0	0	0	2	0	0	9
2011	0	12	0	1	0	1	0	0	0	0	0	0	0	0	14
2012	0	13	2	0	0	2	0	0	2	0	0	1	0	0	20
2013	0	11	1	1	0	1	0	0	1	0	0	0	0	0	15
2014	1	9	0	4	0	0	0	0	0	0	0	0	0	0	14
2015	1	5	1	4	0	1	0	0	1	0	0	0	0	0	13
2016	0	7	0	15	0	0	0	0	1	0	0	0	0	0	23
Total	7	176	13	36	0	12	2	1	9	0	0	3	0	0	259

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission.
2. The number of cases for 2001 represents those that occurred from October onward.

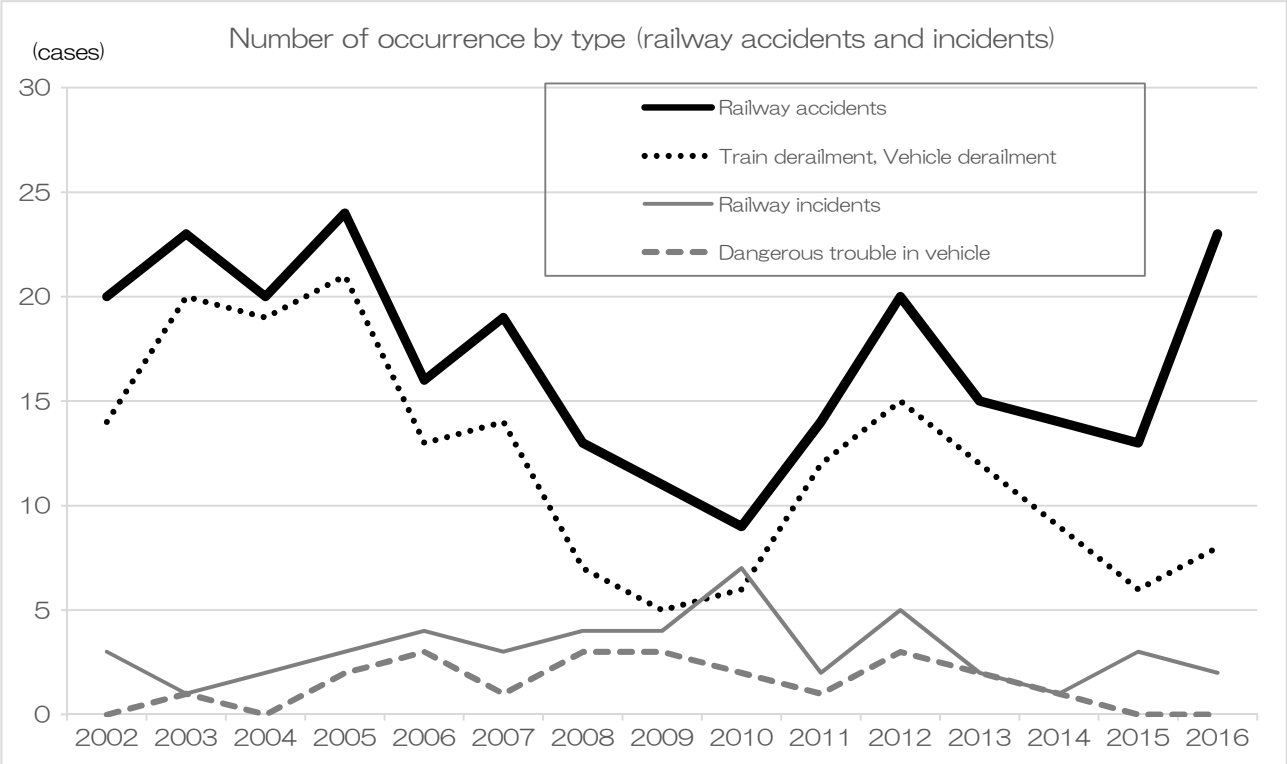
7 Number of occurrence by type (railway serious incidents)

(Cases)

Type / Year of occurrence	Railway										Tramway							Total
	Incorrect management of safety block	Incorrect indication of signal	Violating red signal	Main track overrun	Violating closure section for construction	Vehicle derailment	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	Incorrect management of safety block	Violating red signal	Main track overrun	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	
2001	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2002	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2003	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1

Type / Year of occurrence	Railway										Tramway							Total
	Incorrect management of safety block	Incorrect indication of signal	Violating red signal	Main track overrun	Violating closure section for construction	Vehicle derailment	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	Incorrect management of safety block	Violating red signal	Main track overrun	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	
2004	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
2005	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3
2006	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	4
2007	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3
2008	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	4
2009	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	4
2010	1	0	0	0	1	1	0	2	0	0	1	1	0	0	0	0	0	7
2011	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
2012	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	5
2013	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
2014	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2015	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	3
2016	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2
Total	1	7	0	0	7	2	2	22	0	3	2	1	0	0	0	0	0	47

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission.
2. The number of cases for 2001 represents those that occurred from October onward.



8 Number of accidents and incidents by area (marine accidents and incidents)

(Cases)

Year \ Area	In Japanese waters			Outside Japanese waters	Total
	In ports specified by the Cabinet Order	Within 12 nautical miles	In lakes or rivers		
2007	0	3	0	0	3
2008	227	576	15	55	873
2009	341	1,065	34	82	1,522
2010	308	906	38	82	1,334
2011	239	780	28	79	1,126
2012	227	804	31	53	1,115
2013	215	763	35	69	1,082
2014	193	762	31	44	1,030
2015	154	674	43	39	910
2016	169	584	41	26	820
Total	2,073	6,917	296	529	9,815

(Note) The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2017 (including those carried over from the former Marine Accident Inquiry Agency).

9 Number of accidents and incidents by type (marine accidents and incidents)

Year \ Type	Marine accident											Marine incident				Total
	Collision	Contact	Grounding	Sinking	Flooding	Capsizing	Fire	Explosion	Facility damage	Fatality/Injury	Others	Loss of control	Stranded	Safety obstruction	Navigation obstruction	
2007	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3
2008	181	101	255	12	4	28	15	3	30	61	0	54	34	8	87	873
2009	325	174	431	16	19	58	42	3	38	217	2	105	33	0	59	1,522
2010	356	180	369	15	18	50	35	2	26	146	0	83	16	0	38	1,334
2011	282	145	264	12	18	57	32	1	23	142	1	103	10	1	35	1,126
2012	246	132	264	5	21	55	44	2	34	155	0	113	5	4	35	1,115
2013	265	144	210	10	25	49	33	2	38	163	2	106	7	3	25	1.082
2014	266	115	213	7	11	61	35	1	37	150	3	92	15	0	24	1,030
2015	244	102	202	5	12	56	38	3	20	123	0	85	4	4	12	910
2016	211	88	155	3	21	46	26	2	20	143	0	84	5	4	12	820
Total	2,376	1,182	2,365	85	149	460	300	19	266	1,300	8	825	129	24	327	9,815

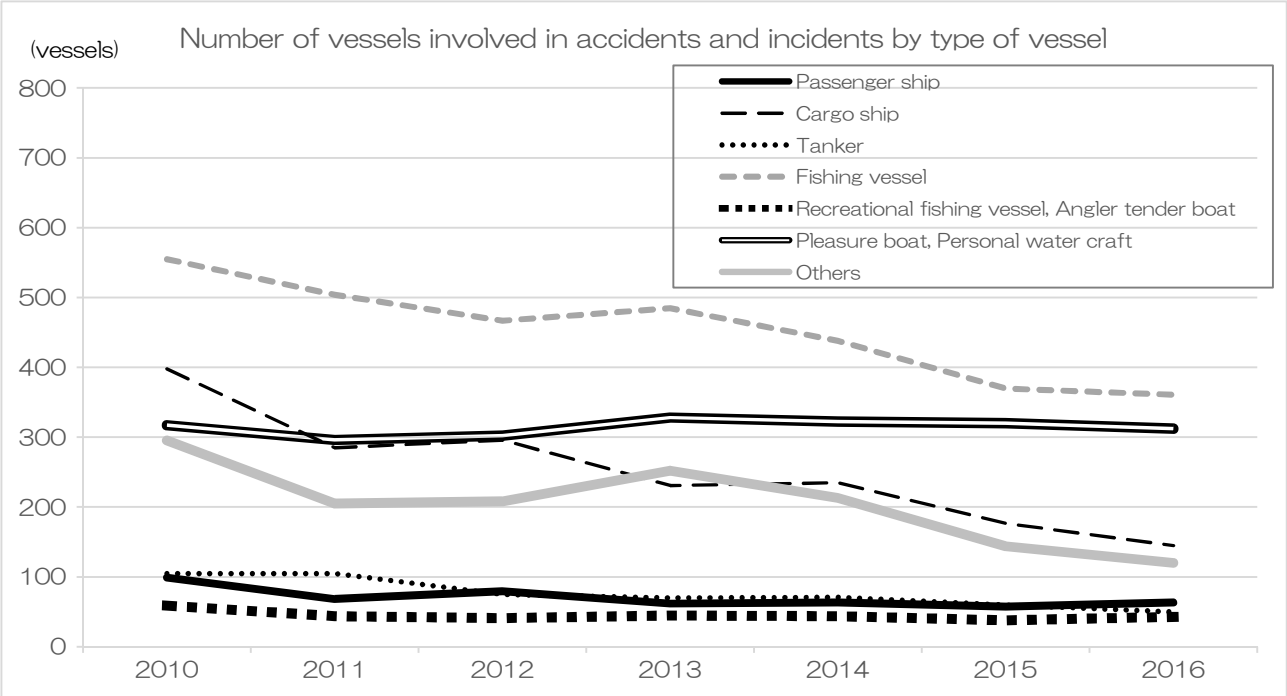
(Note) 1. The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2017 (including those carried over from the former Marine Accident Inquiry Agency).
2. The figures in the column "Fatality/Injury" are the number of cases involving death, death and injury, missing persons, or injury which is not a result from other types of accident.

10 Number of vessels involved in accidents and incidents by type of vessel (marine accidents and incidents)

(Vessels)

Type of Vessel / Year	Passenger ship	Cargo ship	Tanker	Fishing vessel	Tug boat, push boat	Recreational fishing vessel	Angler tender boat	Work vessel	Barge, Lighter	Public-service ship	Pleasure boat	Personal water craft	Others	Total
2007	2	1	0	0	0	0	0	0	0	0	0	0	0	3
2008	55	318	55	307	98	28	6	27	60	11	125	31	7	1,128
2009	103	480	83	605	163	39	6	35	104	41	249	65	21	1,994
2010	99	398	105	555	123	53	6	48	82	25	251	66	17	1,828
2011	68	285	105	504	89	38	6	29	50	16	250	46	21	1,507
2012	79	296	75	467	91	33	8	36	59	14	247	55	8	1,468
2013	62	231	70	485	100	41	4	37	72	24	264	64	19	1,473
2014	63	235	71	438	89	39	5	35	58	17	253	69	14	1,386
2015	57	181	64	397	53	33	7	27	46	13	278	48	12	1,216
2016	63	145	50	361	43	38	5	27	33	11	249	63	6	1,094
Total	651	2,570	678	4,119	849	342	53	301	564	170	2,166	507	127	13,097

(Note) The above table shows the number of vessels involved in accidents and incidents into which the JTSB launched an investigation as of the end of February 2017 (including those carried over from the former Marine Accident Inquiry Agency).



11 Number of vessels involved in accidents and incidents by gross tonnage (marine accidents and incidents)

(Vessels)

Gross tonnage / Year	less than 20 tons	20 to less than 100 tons	100 to less than 200 tons	200 to less than 500 tons	500 to less than 1,600 tons	1,600 to less than 3,000 tons	3,000 to less than 5,000 tons	5,000 to less than 10,000 tons	10,000 to less than 30,000 tons	More than 30,000 tons	Unknown	Total
2007	1	0	0	1	0	0	0	0	0	0	1	3
2008	485	52	138	216	77	24	16	17	10	15	78	1,128
2009	903	89	230	288	116	42	34	49	30	14	199	1,994
2010	900	86	175	260	128	36	37	39	25	24	118	1,828
2011	823	59	142	194	101	39	18	32	21	17	61	1,507
2012	790	53	133	199	78	33	25	38	25	20	74	1,468
2013	881	44	113	142	93	47	27	36	19	17	54	1,473
2014	840	46	86	145	86	38	26	29	17	17	56	1,386
2015	762	43	66	112	65	32	18	27	22	19	50	1,216
2016	674	32	60	102	56	22	15	21	19	10	83	1,094
Total	7,059	504	1,143	1,659	800	313	216	288	188	153	774	13,097

(Note) The above table shows the number of vessels involved in accidents and incidents into which the JTSB launched an investigation as of the end of February 2017 (including those carried over from the former Marine Accident Inquiry Agency).

12 Number of vessels involved in accidents and incidents in 2016 by type of accident/incident and type of vessel (marine accidents and incidents)

(Vessels)

Type of accident/incident / Type of vessel	Marine accident											Marine incident				Total
	Collision	Contact	Grounding	Sinking	Flooding	Capsizing	Fire	Explosion	Facility damage	Fatality/Injury	Others	Loss of control	Stranded	Safety obstruction	Navigation obstruction	
Passenger ship	12	16	8	0	3	0	4	0	1	10	0	2	1	1	5	63
Cargo ship	69	24	24	0	0	0	1	0	5	12	0	8	2	0	0	145
Tanker	23	4	8	0	1	0	2	1	0	8	0	3	0	0	0	50
Fishing vessel	159	11	51	2	11	18	14	1	4	61	0	29	0	0	0	361
Tug boat, push boat	20	3	9	0	0	2	0	0	4	3	0	1	0	0	1	43
Recreational fishing vessel	18	3	6	0	4	0	2	0	1	3	0	1	0	0	0	38
Angler tender boat	1	1	0	0	0	0	0	0	0	3	0	0	0	0	0	5
Work vessel	7	1	3	0	0	4	1	0	0	6	0	1	0	2	2	27
Barge, Lighter	15	3	6	0	0	1	0	0	2	5	0	1	0	0	0	33
Public-service ship	3	2	1	0	0	1	1	0	0	3	0	0	0	0	0	11
Pleasure boat	89	15	43	1	3	25	2	0	8	19	0	38	2	1	3	249
Personal water craft	22	9	5	0	0	0	0	0	0	25	0	1	0	0	1	63
Others	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6
Total	443	92	164	3	22	51	27	2	25	159	0	85	5	4	12	1,094

(Note) 1. The above table shows the number of vessels involved in accidents and incidents into which the JTSB launched an investigation as of the end of February 2017.

2. The figures in the column "Fatality/Injury" are the number of cases involving death, death and injury, missing persons, or injury which is not a result from other types of accident.

~ Japan Transport Safety Board Annual Report 2017 ~

Japan Transport Safety Board
2-1-2, Kasumigaseki, Chiyoda-ku, Tokyo, 100-8918 Japan
Tel: +81-3-5253-8824 Fax: +81-3-5253-1680
E-mail: jtsb_international@mlit.go.jp
URL: http://www.mlit.go.jp/jtsb/english.html

ANNUAL REPORT 2017