Japan Transport Safety Board

Annual Report

2020

July, 2020

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.

For improving transportation safety

It has been a year since I was appointed the chairperson of the Japan Transport Safety Board (JTSB). I deeply feel the great responsibility of JTSB more fully than ever before which plays an important role in Japanese transportation safety from a fair and neutral standpoint to prevent aircraft, railway and marine accidents and incidents and also mitigate the damage caused by them.

Since my appointment, we are given encouragement and expectations for the JTSB by the relevant organizations and news media and so on. To improve our functions, we have set up three goals, "(1) Strengthen analytical capabilities and skills, (2) Enhanced dissemination ability, and (3) Expanded international cooperation". In addition, administrative staff, as well as the Board Members and accident investigators, are working together to "Strengthen the capabilities of organization and individuals" to achieve the three goals. We are moving quickly on what we can.On the other hand, it's also important to promote work style reforms. We would like to share wisdom within the organization, how to carry out efficiently our duties that can be expected maximum result in environment where we can work smart.

Incidentally, the matters of the Act for Establishment of the JTSB, which was amended last year, will be applied on June 18th, this year. To support starting service of the new domestic designed passenger aircraft, the JTSB needs close communication and collaboration with the Civil Aviation Bureau, aircraft operators and the aircraft manufacturer, etc. I would like to prepare well that we can respond quickly and properly for the initial investigation for the accident or incident. In addition, when reporting the process and progress of accident or incident investigations in all three modes (Aircraft, Railway and Marine), we will be able to make recommendations to the Minister of Land, Infrastructure, Transport and Tourism and the parties

relevant to the cause even before the completion of the investigations. We would like to achieve investigations promptly and accurately with the amendment in mind.

From the initial investigation of the time of occurrence of an accident or an incident, Accident Investigators repeat analyses of the accident or the incident through the interview to the people concerned with the accident or the incident and summarizing the factual information. And they prepare the draft report, attend deliberation on the Board, hear opinions from the parties relevant to the cause and publish the final report. They are working energetically with a sense of responsibility in spite of their heavy burden. As the chairperson, I am proud to make it up accident or incident investigation reports that contribute to improving transport safety by studies and discussions detail with the all Board Members.

Although the background and features of accidents or incidents differ for each of the three modes (Aircraft, Railway, and Marine), the purpose of cause investigation and developing safety actions are common, and the directional vector of investigation is almost the same. And as we know, there are many intersections on human factor, structural analysis, failure analysis and digital operation systems, etc. There is no need to mention that it is important to mutually enhance each other acknowledging each advantage, because the unique safety culture cultivated in the three modes is a valuable asset. I would like to contribute to improve Japanese Transportation Safety by facilitation of learning other mode by each mode well.

Your understanding, support and cooperation would be highly appreciated.

TAKEDA Nobuo
Chairperson
Japan Transport Safety Board
July 2020

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Appendices

Major activities in the past year

The Japan Transport Safety Board was established in October 2008, and there were some events that attracted a great deal of social interest. Here, these cases are introduced.

1. Occurrence of the first "Particularly Serious Accident" - Injuries to persons on board the passenger ship GINGA due to collision (with floating objects in the water)

On March 9, 2019, while the passenger ship GINGA was sailing westward off the east of Himesaki, Sado City, Niigata Prefecture, toward Ryotsu Port in the same city, it collided with floating objects in the water, and 108 passengers and one crew members were injured.

As many people were injured, the Japan Transport Safety Board regarded as the first "particularly serious accident." and designated an investigator-in-charge and two other marine accident investigators on the same day, and five marine accident investigators later.

In addition, in April, July, and September, a total of six board members, including the Chairperson, were dispatched to the site to conduct an investigation, and deliberation of the report was carried out by the General Committee, in which board members from various fields participated.

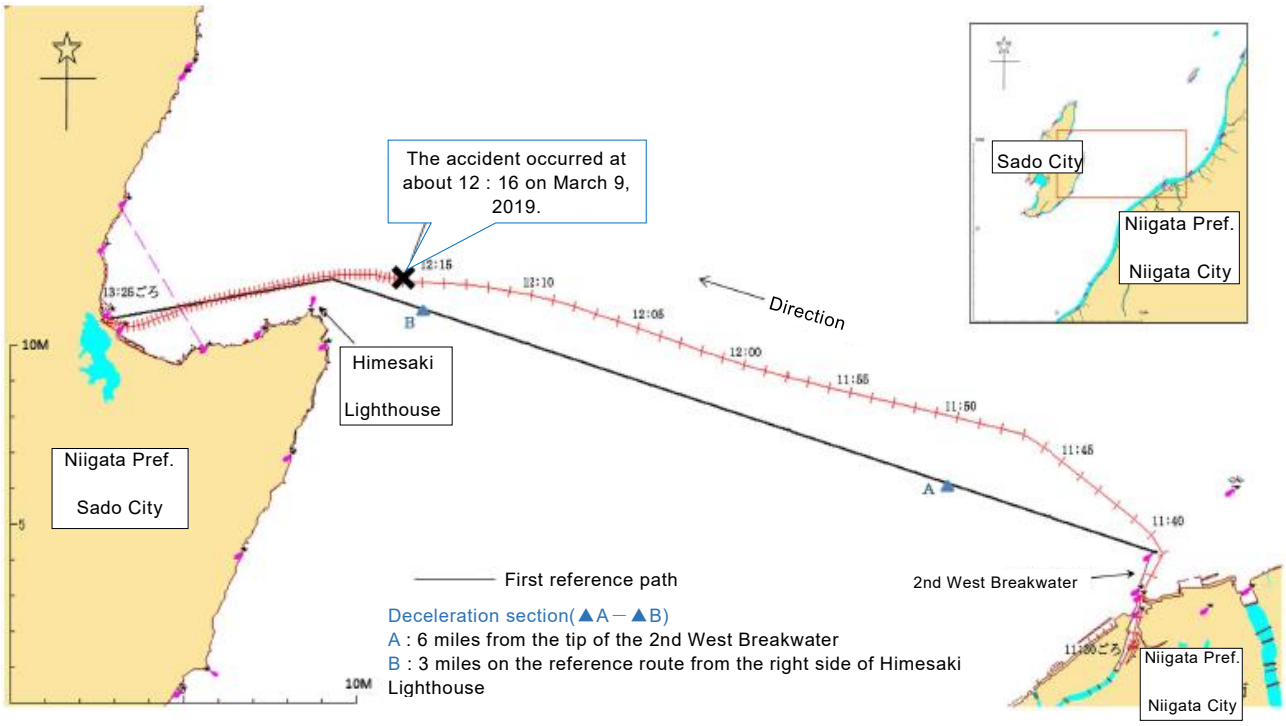
Besides, in order to investigate the cause of the accident based on knowledge in various fields, the Japan Transport Safety Board commissioned analyses to the National Maritime Research Institute of the National Institute of Maritime, Port and Aviation Technology and the National Institute for Materials Science (NIMS), and appointed Expert Advisers from Niigata University to investigate technical matters.

Reflecting these results, the Japan Transport Safety Board compiled a report and made recommendations to the Minister of Land, Infrastructure, Transport and Tourism to prevent a recurrence on March 26, 2020.

(See page 5 of "Feature 1 : Deliberations utilizing knowledge from various fields ")

The passenger ship GINGA

Automatic two point seat belt for the passenger ship GINGA



2. The occurrence of accidents which have had a major social impact during a serious impact during intensifying natural disasters - Oil tanker HOUNMARU collided (with bridge)

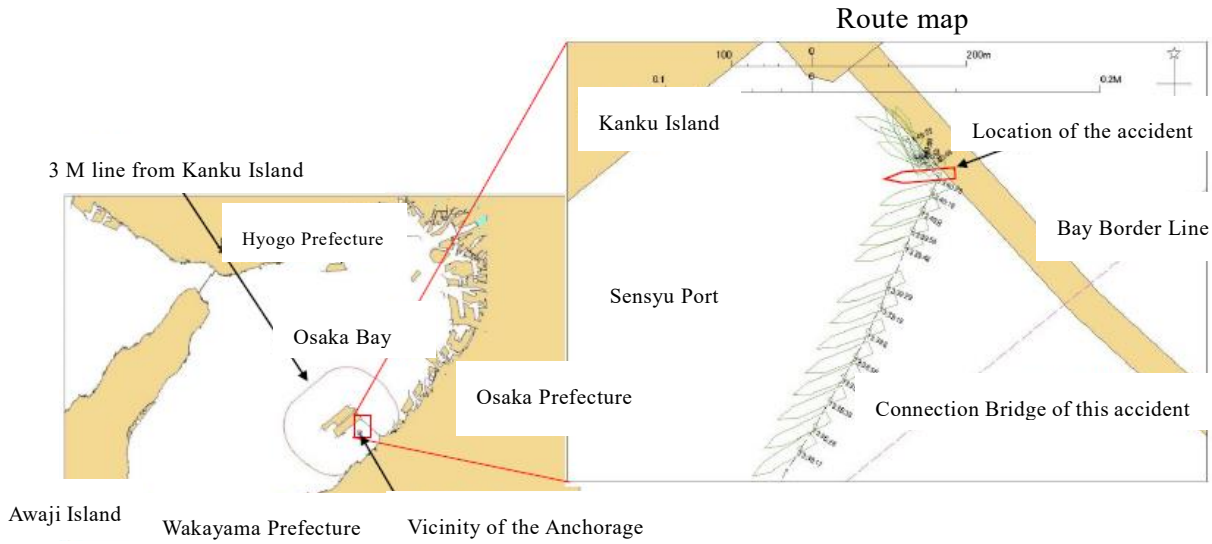
On September 4, 2018, Typhoon No. 21, which was very powerful, was approaching, and a maritime typhoon warning was announced in the Seto Inland Sea including Osaka Bay. Under these circumstances, the oil tanker HOUNMARU was single anchoring off the southeast of Senshu Port and it started to drift to the north dragging the anchor, pushed by the strong winds and waves with the approach of the typhoon. As a result the vessel collided with Kansai International Airport Access Bridge. The bow deck of the ship was crushed, the bridge of the road girder was bent, and the overhead wire column of the railway girder was collapsed.

On the same day, the Japan Transport Safety Board designated an investigator-in-charge and two other marine accident investigators, and later one marine accident investigators. Besides, on-site investigation and interviews commenced on September 6.

In the investigation of this accident, we commissioned the National Maritime Research Institute of the National Institute of Maritime, Port and Aviation Technology to analyze not only the Vessel but also the vessels anchored in Osaka Bay at that time. We analyzed the mooring force and the wind pressure during the anchoring and reflected it in the report.

On April 25, 2019, approximately eight months after the accident, the JTSB issued a report and made recommendations to the parties relevant to the cause of the accident. At the same time, "Measures to Prevent Accidents Caused by Anchor Dragging in the Event of a Very Strong Typhoon" was issued, and information was provided to prepare for the season of Intensifying typhoons. (For details, see Feature on page 8, Chapter 1 on page 21, and Chapter 5 on pages 124 and 150.)

Damage to the bridge at Kansai International Airport Access Bridge



3. Establishment of a system as a "State of Design" with a view of Domestic Passenger Jet in Service - Revision of the establishment law for the first time

When the Mitsubishi Space Jet, the first domestically produced paseenger jet, is in service, Japan will be required to conduct an appropriate accident investigation as the State of Design under the Convention on International Civil Aviation. Therefore, along with the Civil Aeronautics Act, the Act for Establishment of the Japan Transport Safety Board and the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board were revised and came into effect on June 18, 2020.

The main points of this amendment are as follows.

(1) Expansion of the scope of aircraft serious incident (Article 2 paragraph (2) item (2) of the Act for Establishment of the Japan Transport Safety Board and Article 1 item (2) of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board)

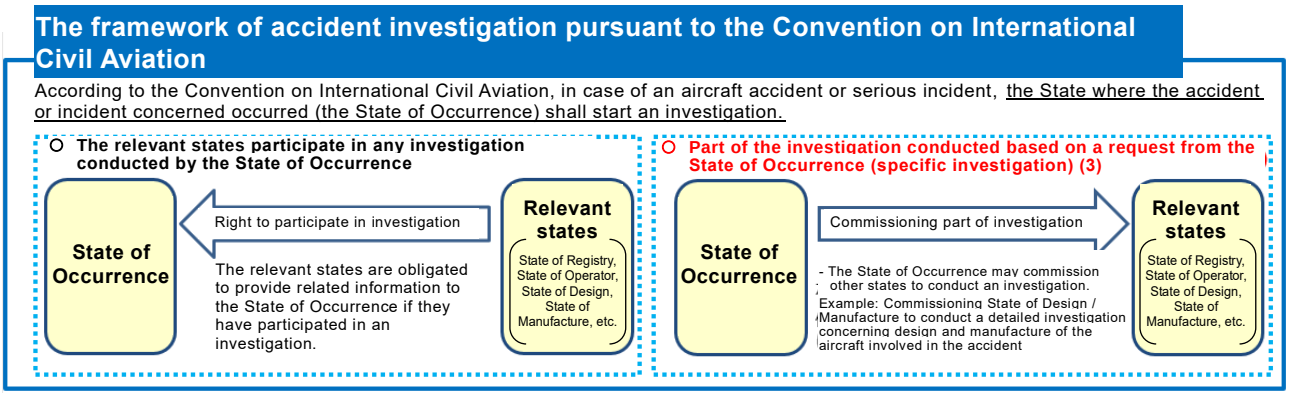
(2) Expansion of coverage of aircraft accidents and serious incident notifications by the Minister of Land, Infrastructure, Transport and Tourism (Article 20 of the Act for Establishment of the Japan Transport

Safety Board)

(3) Implementation of investigation delegated by the State of Occurrence (specific investigation) (Article 25 paragraph (3) of the Act for Establishment of the Japan Transport Safety Board)

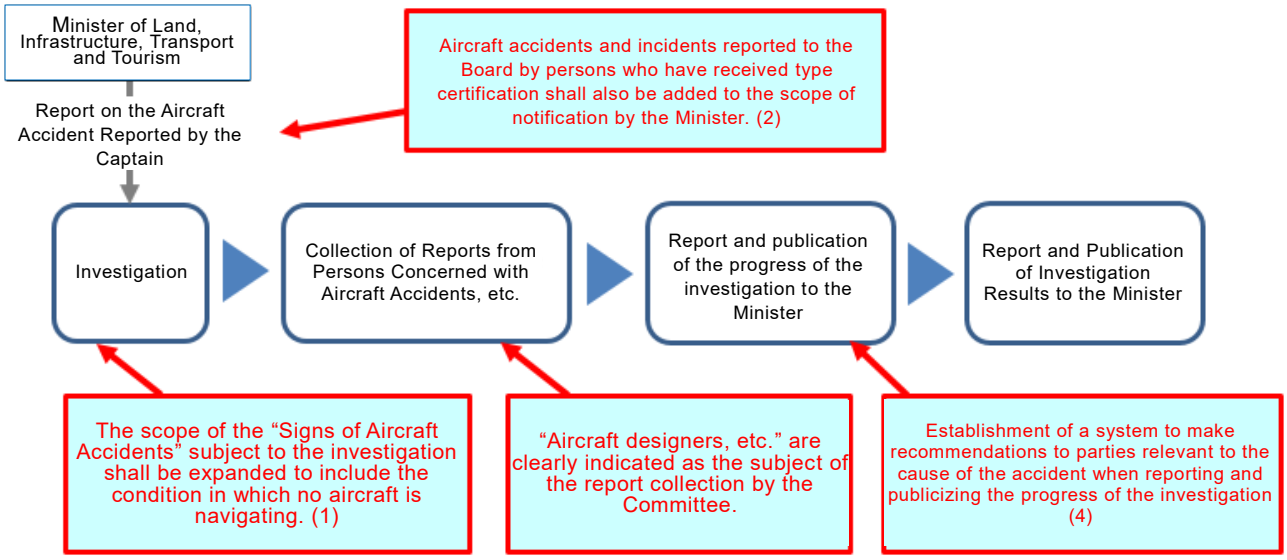
(4) Issuance of recommendations before completion of the investigation (Article 26 paragraph (1) and Article 27 paragraph (1) of the Act for Establishment of the Japan Transport Safety Board) * (4) applies to all accident and serious incidents.

(For details, see " Feature 2 : International cooperation" on page 10.)



Flow of Accident Investigation

* Red letters indicate legal revisions



Feature : Accident investigation activities utilizing domestic and international knowledge at the Japan Transport Safety Board

Since its establishment in October 2008, the Japan Transport Safety Board has been accomplishing appropriate accident and incident investigations which thoroughly unveil the causes of accidents and damages incidental to them, and has also been making efforts to contribute to accident prevention and damage reduction by urging the Minister of Land, Infrastructure, Transport and Tourism or parties relevant to the causes to implement necessary policies and measures based on the results of these investigations.

The investigation of accidents and the preparation of reports are to be chairperson and 12 members (seven full-time members and five part-time members are stipulated by law). Ordinary deliberations are carried out at each committee of the Board by four to five members, mainly members who specialize in their respective fields and the chairperson.

In order to prevent accidents and reduce damage through scientific and fair judgment based on information collected by accident investigators and information provided by accident and other related parties, cooperation with experts from domestic specialized research institutions, universities, etc., and accident investigation organizations in other countries may be essential for investigations.

This feature, the examples of such in Japan and overseas will be introduced.

1. Deliberations utilizing knowledge from various fields

(1) Comprehensive response to serious accidents

～Investigation of Injuries to boarding people caused by the collision of a Hydrofoil and floating objects in the Water.～

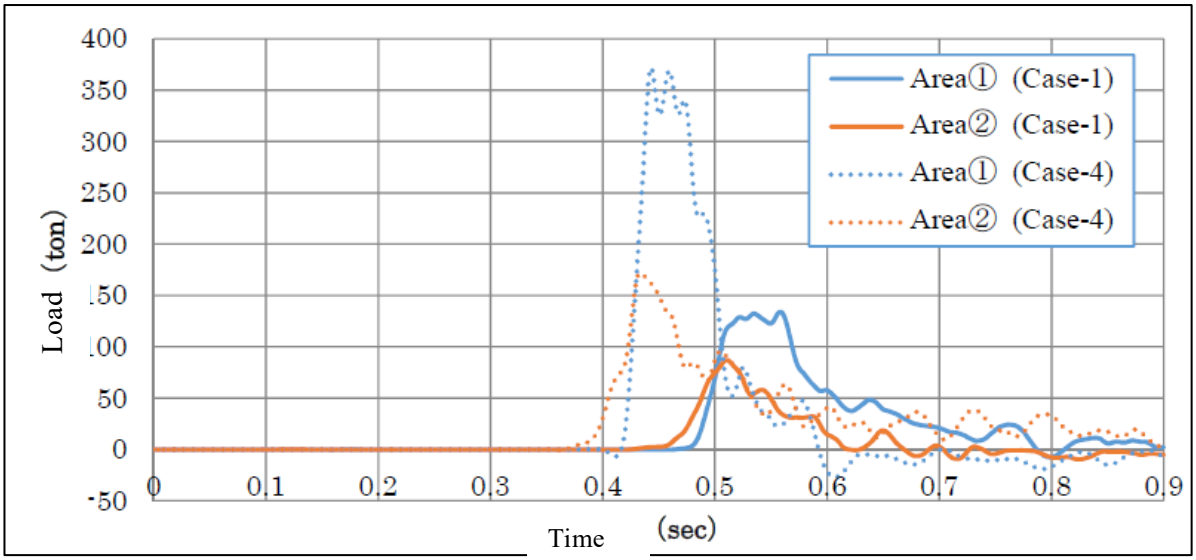
On March 9, 2019, a hydrofoil sailing to Ryotsu Port in Sado City, Niigata Prefecture, collided with floating objects in the water, injuring many people (108 passengers and one crew member).

In accordance with the Rules of Operation of the Japan Transport Safety Board, this accident was designated as a "particularly serious accident" for the first time since the establishment of the Japan Transport Safety Board, and the "General Committee" was held and deliberated by the attendance of not only members in the maritime field but also full-time members in the aviation and railway fields.(See "Major activities in the past year" on page 1 for details.)

In this accident investigation, we analyzed the drive recorder installed on the ship, the structure of the ship, the turning performance, etc., and measured the behavior of the ship, which is a prerequisite for the analysis of the impact accelerations, etc. Then, we commissioned the National Maritime Research Institute (NMRI) of the National Institute of Maritime, Port and Aviation Technology to conduct an analytical investigation on the effects of the impact accelerations when the ship was hit on the sea surface, on passenger injuries, etc. From this analysis, it became clear that a large impact load was acting on the hull at the stern when the hull hit the sea surface,

generating a large upward acceleration.

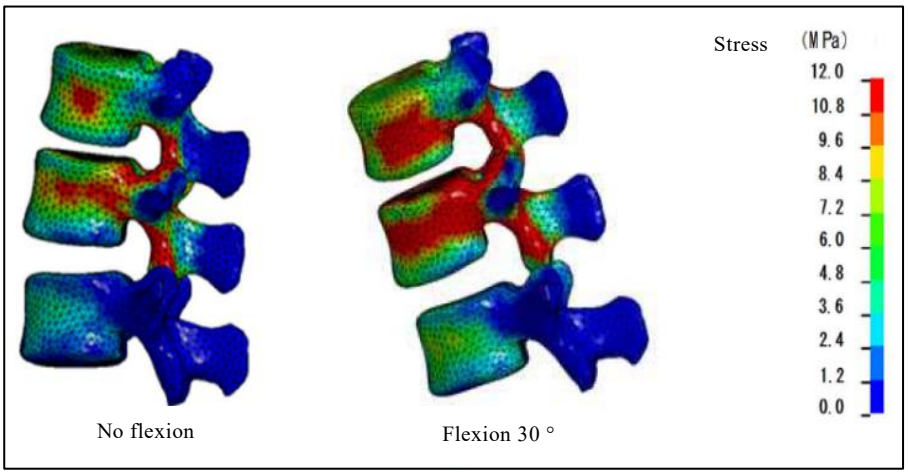
Besides from the viewpoint of confirming the soundness of fuse pins, which are part of the safety devices of the hydrofoil, we commissioned the National Institute for Materials Science (NIMS) to conduct an analysis survey on the fracture surfaces and mutation spots of fuse pins. As a result of the analysis, it was found that the fuse pins were considered to have undergone ductile fracture due to shearing in a sound condition as designed.



Analysis of Time Series of Vertical Impact Force on the bottom of the ship

Moreover, in order to analyze the mechanism leading to lumbar vertebral fracture, Dr. Kei Watanabe, a lecturer at the Department of Orthopedic Surgery, Niigata University Medical & Dental Hospital, participated in the survey as an Expert Adviser, and worked on the analysis of how the load on the lumbar spine differs depending on the posture of passengers.

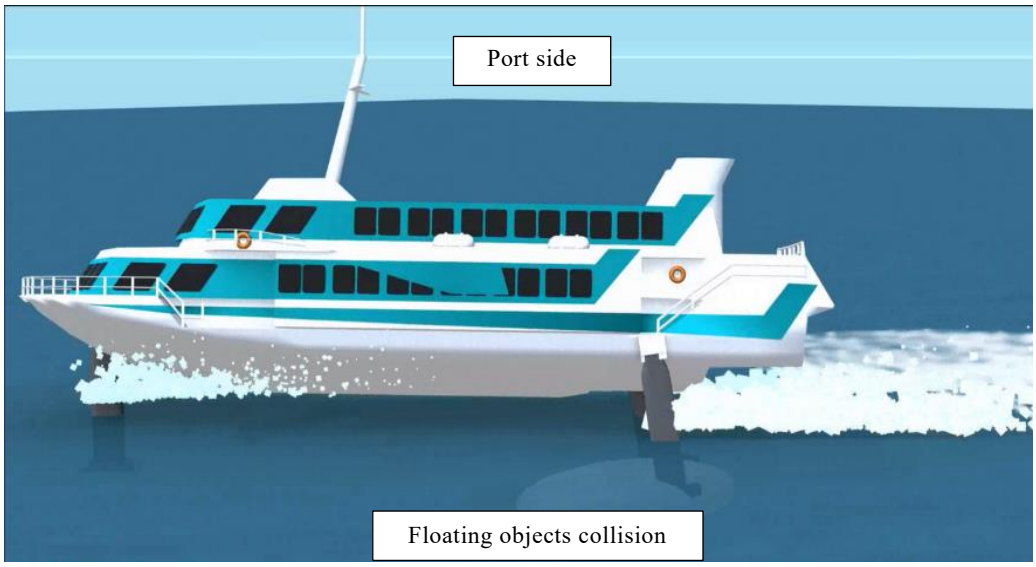
In addition, a comprehensive analysis was carried out, including information on passenger injuries, measures to avoid collisions of whales, situations of ship operation and lookout, responses after the accident, and similar accident cases, taking into account the knowledge in the aviation and railway fields.



Stresses in the vertebral

In response to these analyses, the JTSB collated the cause of the accident, which is probable to be caused by a large number of passengers suffering from lumbar vertebral fracture, etc., due to the collision between the floating objects in the water and the aft foil

(hydrofoil) of the ship, and the recommendation, which recommends the Minister of Land, Infrastructure, Transport and Tourism, which is to instruct the owner of the ship to "take measures such as providing seats and seat cushions which are considered to absorb the impact force sufficiently" and "take measures such as attaching cushioning materials to the back of the seats", and the operator to "guide the elderly people to the seats where the impact of the front part of the cabin is relatively small" and "carry out regular training in case of a large number of injured persons", and the JTSB published the Accident Investigation Report on March 26, 2020.



Computer graphic reproduction of ship behavior at the time of accident
(URL: http://www.mlit.go.jp/jtsb/video/ship/2019tk0008-movie.wmv)

(2) Participation of Expert Advisers in Deliberations

The Japan Transport Safety Board appoints persons with relevant knowledge and experience as Expert Advisers (part-time) to have them participate in analyses and deliberations in order to investigate specialized matters in more detail when conducting individual accident and incident investigations.

In 2019, the JTSB appointed an Expert Adviser to have them analyze medical information on lumbar vertebral fracture, the mechanism and participate in deliberations in the investigation of injuries to passengers caused by the collision of the passenger ship GINGA (floating objects in the water) mentioned above. As a result of the analysis, it was found that the probability of the occurrence of lumbar vertebral fracture when loaded with an impact load is higher when the passenger is seated in a forward-leaning posture than when the passenger is seated in an upright posture, and it was confirmed that the installation of a 3 point seat belt to maintain the upright posture of the seated passenger is effective in reducing the number of injuries and the severity of injuries at the time of the accident.

We have appointed Expert Advisors to investigate accidents and incidents. For example, we have received the cooperation of expert advisors from the following organizations.

○ Japan Aerospace Exploration Agency (JAXA)

- Investigation of airframe structure and motion
- Investigation of lithium-ion batteries

○ National Institute for Materials Science (NIMS)
- Investigation on fracture of turbine blades

○ National Traffic Safety and Environment Laboratory (NTSEL)
- Maintenance of diesel engines and the appropriateness of conditions of use

○ Railway Technical Research Institute (RTRI)
- Mechanism of bridge pier sinking
- Analysis of meteorological disaster prevention, ground disaster prevention, geology, etc.

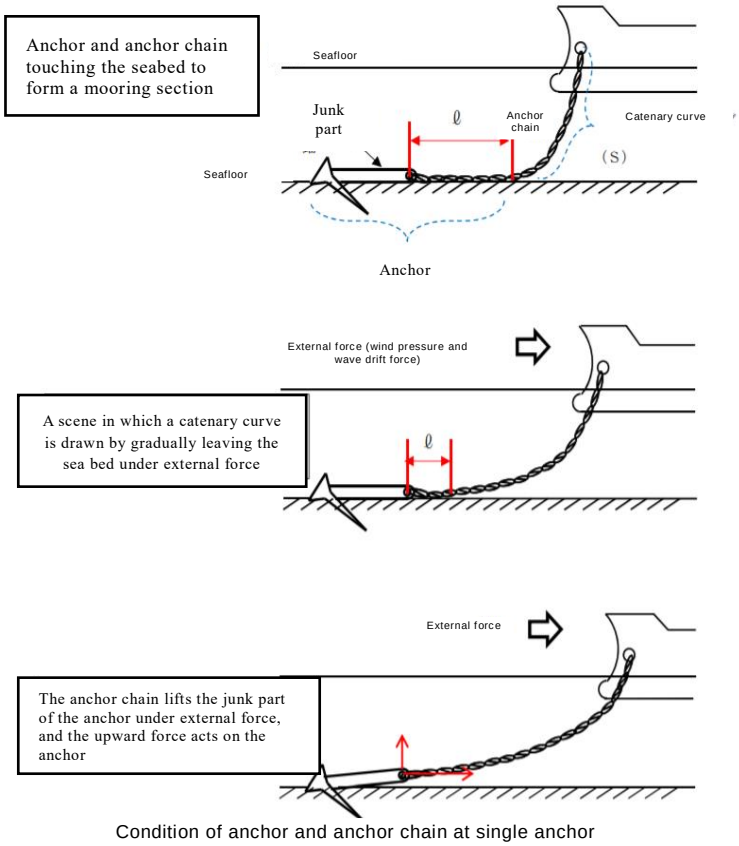
○ The University of Tokyo
- Analysis of effects of earthquake vibration on vehicle behavior, etc.

Besides, the Japan Transport Safety Board has improved equipment and software for analysis necessary for investigating the causes of accidents causes of accidents, etc., and has established a system to conduct investigations efficiently and promptly.Moreover, when advanced analysis or detailed analysis is required for a particular case, we commission analyses to an external specialized research institution.

In 2019, these analyses were commissioned to the National Institute of the National Maritime Research Institute, the National Institute for Materials Science, the Railway Technical Research Institute, and the Japan Electric Cable Technology Center. The following are examples of initiatives that utilize the expertise of specialized research institutions.

(3) Cooperation with domestic research institutes in the field of ships

In the accident investigation (see page 2 of "Major Activities in the Past Year") in which the oil tanker collided with Kansai International Airport Access Bridge, which was published on April 25, 2019, the National Maritime Research Institute (NMRI) of the National Institute of Maritime, Port and Aviation Technology analyzed the mooring power of the concerned oil tanker and the ship anchored in Osaka Bay, as well as the wind pressure during the anchoring, by our request.



Condition of anchor and anchor chain at single anchor

As a result of this analysis, the mechanism of anchor dragging (that the ship is carried away with the anchor thrown) was explained in an easy-to-understand manner. It also led to recommendations for safety measures (see page 21), such as ensuring sufficient mooring power with anchors and anchor chains and using the main engine on a continuous basis, in order to prevent recurrence of similar

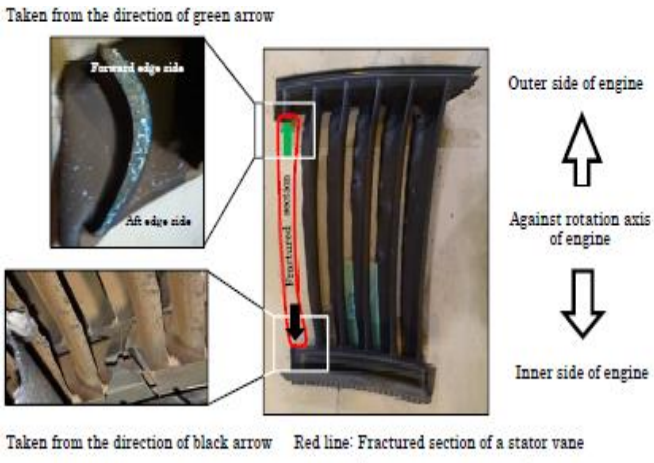
accidents and reduce damage during extremely strong typhoons.

(4) Cooperation with Domestic Research Institutes in the Aviation Field

In the field of aviation, Japan Aerospace Exploration Agency (JAXA) has participated in a number of specialized surveys and analyses, including surveys on the structure and motion of aircraft and lithium-ion batteries.

The Electronic Navigation Research Institute (ENRI) of the National Institute of Maritime, Port and Aviation Technology is participating in specialized surveys and analyses related to air traffic management and aeronautical systems, including those related to the transmission and reception of radio waves.

Besides, in the investigation of the serious incident that the engine of a passenger aircraft (Boeing 777-300ER) was damaged (see page 53), which was published in the report on October 31, 2019, the National Institute for Materials Science (NIMS) analyzed the openings generated in the turbine rear frame, which is a structural member for mounting the engine to the airframe. As a result, it was estimated that the cause of the openings was that some of the fragments of the low pressure turbine blades and blades of the engine collided with the turbine rear frame.



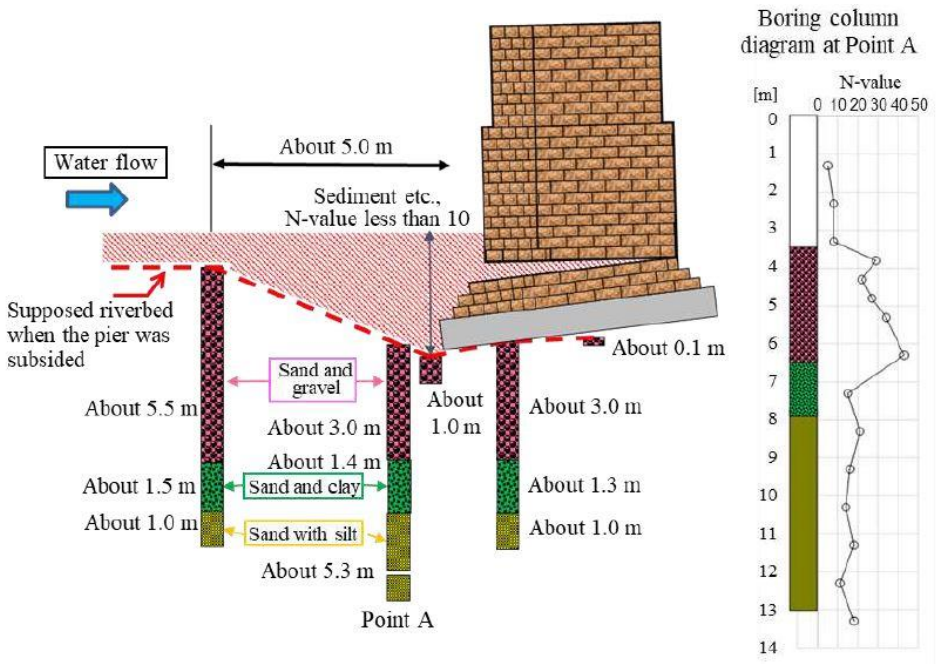
2LPT Missing vane in the fifth stage vane segment

(5) Cooperation with Domestic Research Institutes in the Railway Field

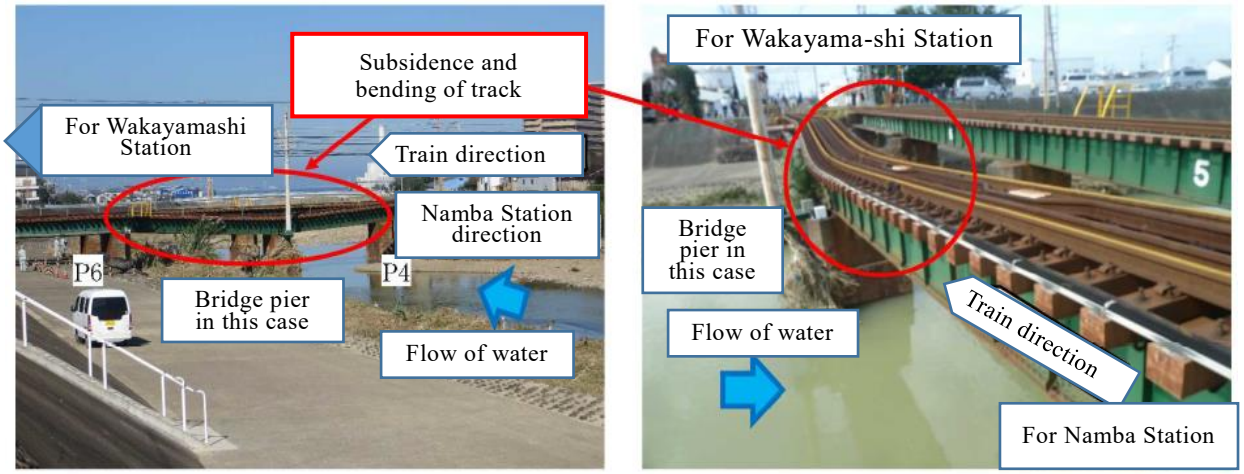
In the investigation of the train derailment accident (see page 84), which is presumed to be caused by the subsidence and inclination of the bridge pier, which was published in the report on January 31, 2019, the Railway Technical Research Institute (RTRI) was commissioned to analyze the effect of the running water on the bridge pier and the mechanism by which the bridge pier sank, and Naoyuki Ota, Director of the Disaster Prevention Technology Research Department of the Institute, participated in the investigation as an expert committee member and worked on the analysis including weather disaster prevention, ground disaster prevention and geology.

These analyses revield that, it was probable that the bridge pier sank and tilted because the protective function of the bridge pier against the scour had been weakened since before the occurrence of the accident, the river water increased at the time of the occurrence of the accident caused the scour in a wide area around the bridge pier, and the support base was greatly reduced.

In addition, based on these analyses, the JTSB discussed necessary measures to prevent recurrence and expressed the opinion to the Minister of Land, Infrastructure, Transport and Tourism (see page 25) on the necessity the Standards for Maintenance and Management of Railway Structures (Structure Section) known to the related railway track operators in order to prevent the same type of scour disaster.



Summary of the results of the boring survey



Situation around the accident site

In this way, the Japan Transport Safety Board is engaged in deliberations that make use of its expertise in a wide range of fields. In order to identify and prevent the causes of accidents that are becoming more diverse and complex, we will continue to carry out investigations in an appropriate manner that brings together Japan's wisdom, such as by actively incorporating outside expertise.

2. International cooperation

(1) Conclusion of memorandum on investigation cooperation between accident investigation authorities

Among the subjects of investigation by the Japan Transport Safety Board, there are many cases in which international cooperation is required for accident and other investigations in the fields of aviation and ships, and cooperation and coordination with the accident investigation authorities of the states concerned are indispensable.

In the aviation field, representatives of the accident investigation authorities of the state where the aircraft body or engine manufacturer belongs (the state of design and manufacture) and the accident investigation authorities of the state where the airline belongs (the state of operator) participate in the investigation.In the area of ships, coastal states and flag states (states where ships are registered) are obliged to report accidents, and relevant states may consult and conduct accident investigations.

Once an aircraft accident occurs, multiple states are involved in the investigation, depending on the states of occurrence, the state of registry, the state of operator, the state of design and manufacture, and the nationality of the person involved in the cause of the accident or the victim.The same is true for marine accidents. In order to investigate the causes of accidents and to prevent similar accidents, it is essential to cooperate and cooperate with other countries beyond the framework of domestic investigations.

The JTSB has concluded agreements with the accident investigation authorities of France, Australia, China, Taiwan, the Republic of Korea, Singapore, Mongolia and Finland on cooperation in accident investigation in order to facilitate such international accident investigation. This is to confirm that the accident investigation authorities of each country will cooperate with each other to contribute to the safety of transportation. It stipulates matters concerning the establishment of emergency contact points and the exchange of know-how on accident investigation so that investigations in the event of accidents, etc. related to both countries can be carried out more speedily and smoothly.

(2) Strengthening Cooperation with Foreign Accident Investigation Organizations in Anticipation of Domestic Passenger Jet in Service

The Civil Aeronautics Act and the Act for the Establishment of the Japan Transport Safety Board have been revised to (1) expand the scope of serious incidents (in the same way as other States of Design and Manufacture, the amendment would allow the Japan Transport Safety Board to investigate serious incidents that occur when aircraft are not in flight too) and (2) carry out specified investigations (when a part of an accident investigation carried out by a foreign accident investigation organization is delegated to the Japan Transport Safety Board (specified investigation)) in order to ensure that Japan's first domestic passenger jet (Mitsubishi Space Jet) put into service. These revisions came into effect on June 18, 2020. (See "Major activities of the past year" on page 3 for details.)

In order to ensure that these revisions can be implemented promptly and smoothly in the event of an unexpected situation, the JTSB has established a system for cooperation and investigation by deepening exchanges with accident investigation authorities in the United States and Canada, in particular.

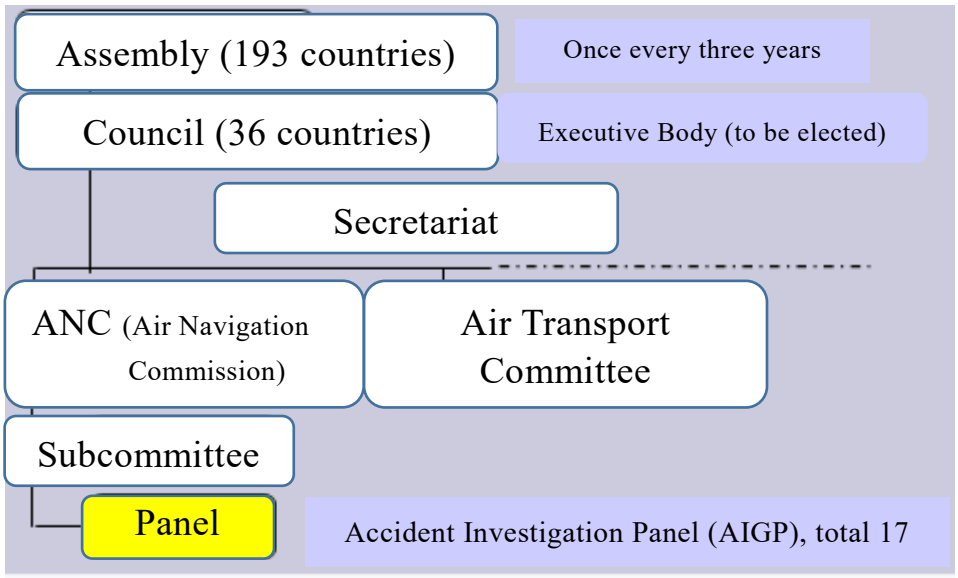
Specifically, in December 2019, 3 investigators were dispatched to the National Transportation Safety Board (NTSB) of the United States and the Transportation Safety Board (TSB) of Canada, where they explained the investigation system for domestic jetliners in Japan and the organization and operation system of the Japan Transport Safety Board. At the same time, they exchanged opinions on the contents of cooperation and contact persons with other countries. Besides, the NTSB and TSB explained their organizations, operational systems, and analysis facilities. Moreover, the JTSB has deepened its knowledge of the roles of the accident investigation authorities of the states of design and manufacture of Boeing and Bombardier aircraft, as well as recent efforts, and working to promote mutual

understanding.

(3) Creation and coordination of rules in international organizations

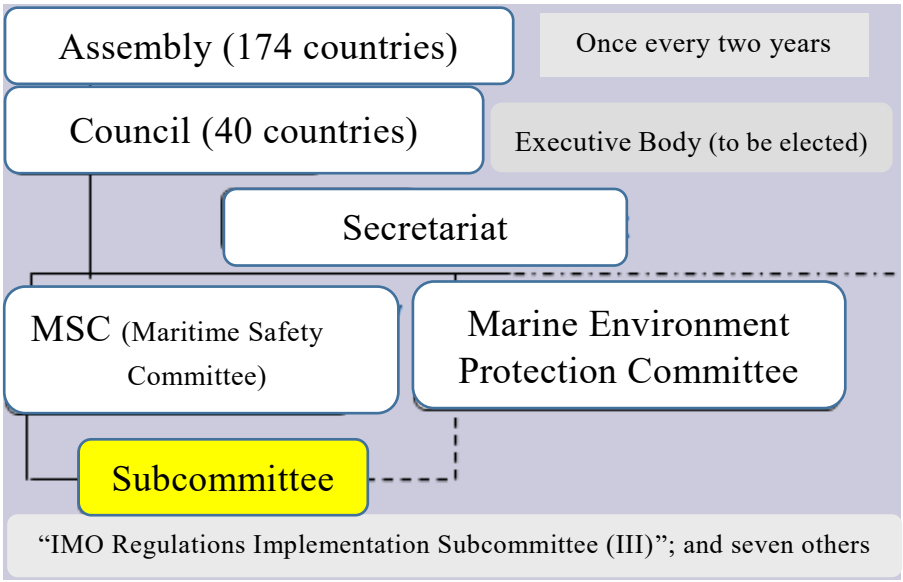
The International Civil Aviation Organization (ICAO), headquartered in Montreal, is a specialized agency of the United Nations under the Convention on International Civil Aviation (commonly known as the Chicago Convention), which has been established for the development of international civil aviation. ICAO has established international standards development of international standards, recommended practices and guidelines for the safety and security of international air transport. International standards for accident and incident investigations are stipulated in Annex 13.

The Japan Transport Safety Board is actively participating in the Expert Meeting (Accident Investigation Panel (AIGP)) to discuss amendments to the Annex, and is contributing to efforts to establish international rules for accident investigations.



Organization chart of the ICAO

The International Maritime Organization (IMO) (Headquarters: London) is a specialized agency of the United Nations to promote international cooperation on maritime issues such as the safety of ships and the prevention of marine pollution from ships. The IMO has a General Assembly, a Board of Directors, and a Committee, among which the IMO Rules Implementation Subcommittee serves as a forum for discussion on how to ensure the responsibility of the flag state, etc., including investigation of marine accidents, etc. The Japan Transport Safety Board participates in this subcommittee meeting and analyzes the marine accident and other investigation reports submitted by various countries to draw out lessons on safety improvement. The Board is continuously engaged in activities to disseminate them internationally through the IMO website. Japanese translations of these survey reports are also posted on the JTSB website to help improve the safety of Japanese vessels.



Organization chart of the IMO

Moreover, the JTSB is deepening cooperation with accident investigation organizations in foreign countries by exchanging opinions at annual meetings of the International Transport Safety Association (ITSA), an international organization with the aim of improving the safety of global Transport Safety, which is headed by the chairman of accident investigation organizations in 17 countries and regions including the United States and France.

In addition, there is a framework for cooperation and collaboration among multilateral accident investigation authorities. For more information, see Chapter 7: International efforts for accident prevention.

(4) Examples of cooperation with foreign accident investigation authorities

The following is an introduction to recent examples of cooperation in investigations of accidents, etc., carried out in cooperation with other countries.

1. Examples of cooperation in the aviation field

In the investigation of the collision of a helicopter (Bell 412 EP) on a mountain slope in Gunma Prefecture on August 10, 2018, a test on the existence of an error code at the factory of the manufacturer of the digital flight control computer was conducted in the presence of an aircraft accident investigator of the United States of America, the State of Design and Manufacture of the helicopter. As a result of the test, an error code was detected during the test run. However, according to the information from the video camera, there was no video showing the error code during the flight during the flight, and there was no information that a problem had occurred on the aircraft. Therefore, it is considered that there was no abnormality with the aircraft. In this way, steady efforts are made to confirm each piece of information that may be related to the cause of the accident through international cooperation.

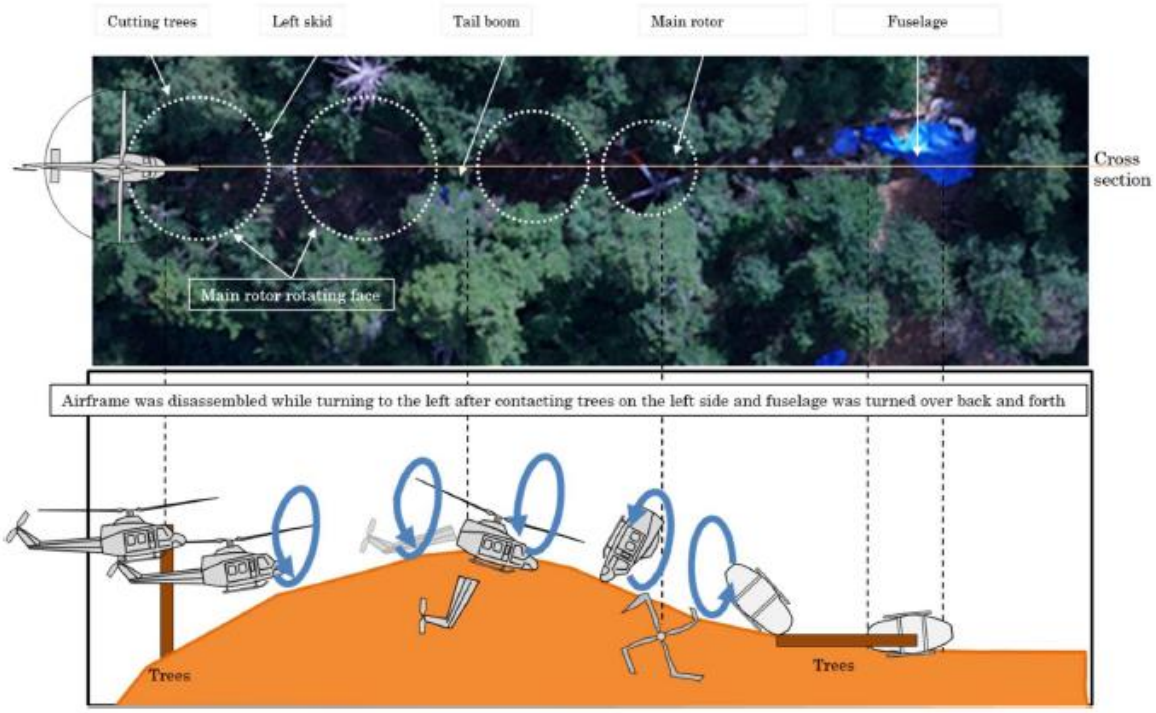
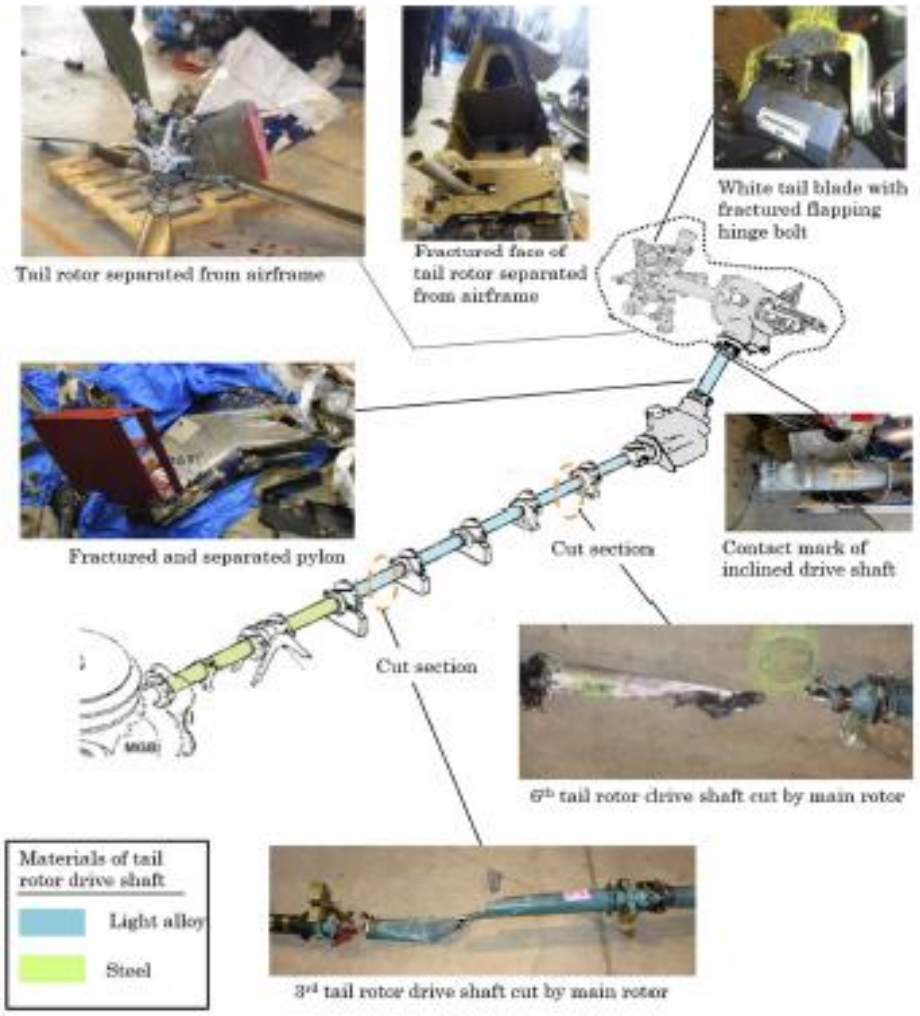


Figure showing inverted airframe when crashed

Besides, in the investigation of the uncontrollable crash of a helicopter (Aerospatiale AS332L) that occurred in Gunma Prefecture on November 8, 2017, the French Bureau of Accident Investigation (BEA) participated in the investigation of the tail rotor system at the manufacturer of the helicopter. As a result of detailed examination of many parts supporting the tail rotor, we were able to estimate that the cause of the crash was the tail rotor separated from the airframe during the flight and became uncontrollable.

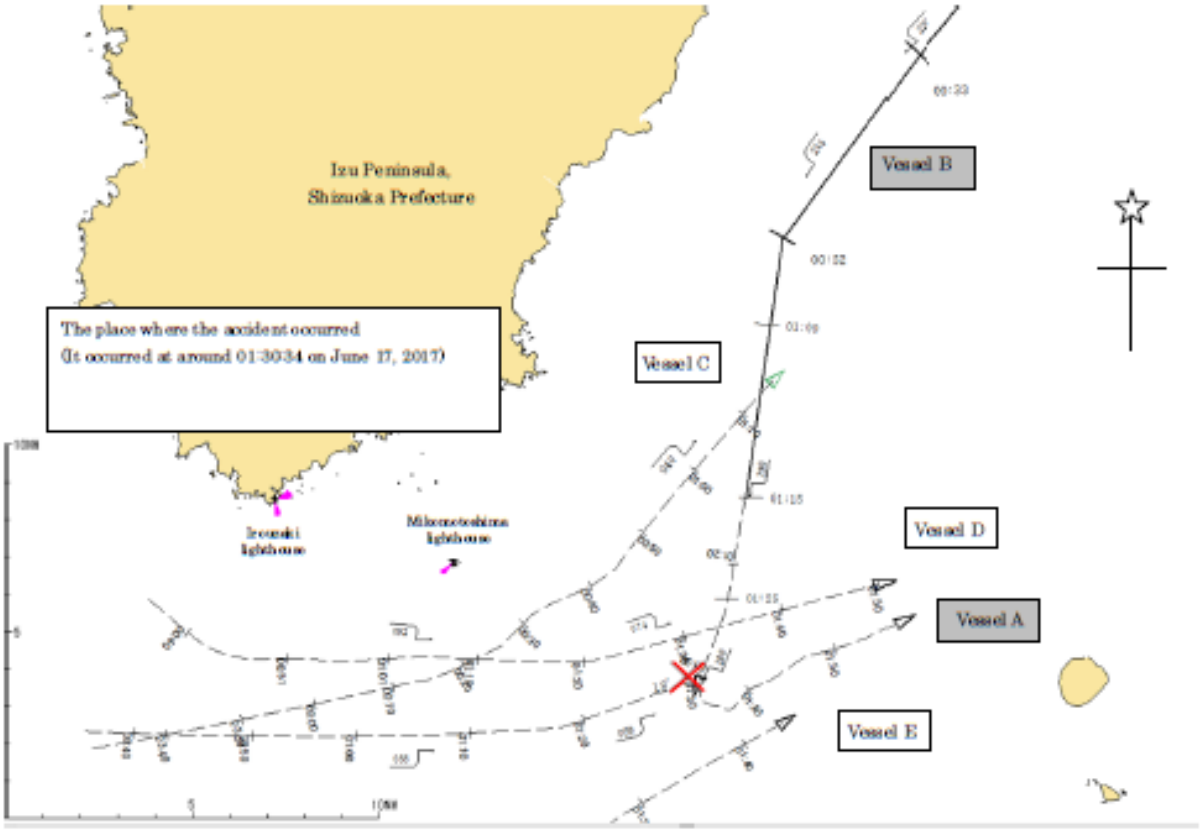


Tail Roter drive shafts had contact marks

2. Examples of cooperation in marine field

The United States Coast Guard, which was commissioned by the Maritime Safety Investigation Authority (NTSB) of the United States of America, provided investigation data for the collision accident investigation of the container ship ACX CRYSTAL (Vessel A) and the missile destroyer USS FITZGERALD (Vessel B), for which the report was published on August 29, 2019. Along with various information collected by the marine accident investigators of the Japan Transport Safety Board and technical advice from research institutes in Japan, the JTSB has been able to organize and analyze factual information and put together the causes and preventive measures. It was the first time the Japan Transport Safety Board had obtained and reflected detailed information on accidents involving U.S. Navy vessels in its report.

Besides, seven of the Marine Accident Investigation Reports that were published in 2019 were sent to the State of the Flag of the Vessel in response to requests from the State of the Flag of the Vessel, and the JTSB is engaged in daily international cooperation by seeking opinions.



Estimated Route Chart of Vessel A and Vessel B

(5) International cooperation －Supports for accident investigation and development

In addition to the cooperation with the foreign accident investigation authorities in the accident investigation, the status of the support for strengthening the accident investigation in foreign countries based on the accident investigation in Japan is introduced.

1. In response to a request from the Government of India, the Japan International Cooperation Agency (JICA) has been carrying out the technical support named “Project for Strengthening Railway Safety” since November 2018. The JTSB has been participating in this project since the start of this project, and has been promoting the significance of accident investigations and necessary systems to many Indian railway safety engineers.

   In particular, in July 2019, 10 people in charge of railway accident investigations, including senior officials of the Indian Railways Ministry, visited Japan and provided 10 days of training, including lectures on the basics of accident investigations (the overall flow of investigations, on-site investigation procedures, how to prepare reports, etc.) and on numerous accident investigation cases that have been conducted in Japan. This is the first time the Japan Transport Safety Board has conducted such training in the railway field.

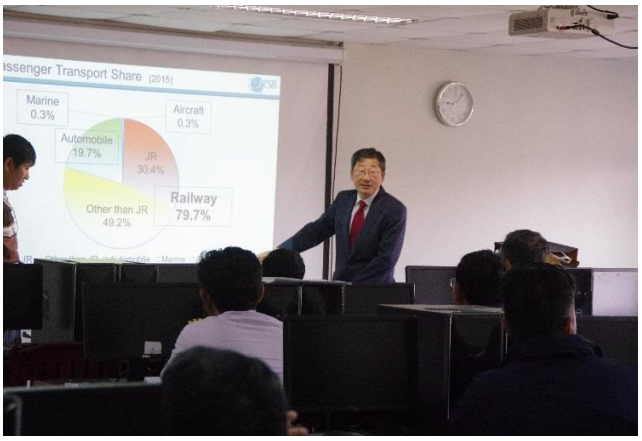
   The trainees enthusiastically learned Japan's railway accident investigation methods and railway safety systems, and on the final day, as a result of their training in Japan, they drew up an action plan

to establish their own railway accident investigation know-how in India. In January 2020, a general meeting was held in India to confirm the status of activities under this Action Plan, and the Director of Railway Committee of the Japan Transport Safety Board, Mr. Okumura, and the Railway Accident Investigators are also working on support to promote activities.

Left: Lecture by Mr. Okumura

Right: Visit by Indian railway accident investigation personnel (trainees) who came to Japan

2. Besides, In Myanmar, where JICA projects such as railway vehicle maintenance, management, and service improvement are in progress, JICA also held seminars to introduce the mechanism of railway accident investigations and recommendations for the prevention of recurrence in Japan as part of support for human resource development in the railway field.



Mr.Okumura explaining at a railway safety seminar

The railway lines in Myanmar are not electrified, and a large number of more than 100 diesel railcars used in Japan have been sent there and help transport passengers. However, due to the lack of knowledge, skills, and replacement parts, such as the maintenance standards for Japanese diesel railcars, it is not possible to maintain and manage the railcars sufficiently, and a considerable number of railcars have failed. Therefore, Japanese experts provide technical guidance on the maintenance and management of railcars.

Against this backdrop, more than 40 people from Myanmar attended the Railway Safety Seminar held on January 31, 2019 in the seminar room of the Railway Technology Center adjacent to the Myanmar Railway Head Office. At the meeting, Mr. Okumura, Director of the Railway Committee of the Japan Transport Safety Board, and Railway accident investigators, explained the outline of Japan's railways, the occurrence of railway accidents, the history of the establishment of the Japan Transport Safety Board, and the outline of the activities of the Board. Based on actual accident investigation cases, they explained the flow of accident investigation, including analysis methods, recommendations for preventing recurrence, and follow-up after the issuance of recommendations. In response to this, lively Q & A sessions were held regarding the accident investigation organization and system, as well

as the difference between the pursuit of responsibility and the investigation of the cause.

In Myanmar, there are about 300 derailment accidents every year, and they are struggling hard to prevent recurrence.

Work on track maintenance

In this way, the Japan Transport Safety Board is advancing various international activities to strengthen cooperation and cooperation systems with other countries. We will continue to strengthen exchanges and cooperation with foreign accident investigation organizations and international cooperation for the implementation of more accurate accident investigations.

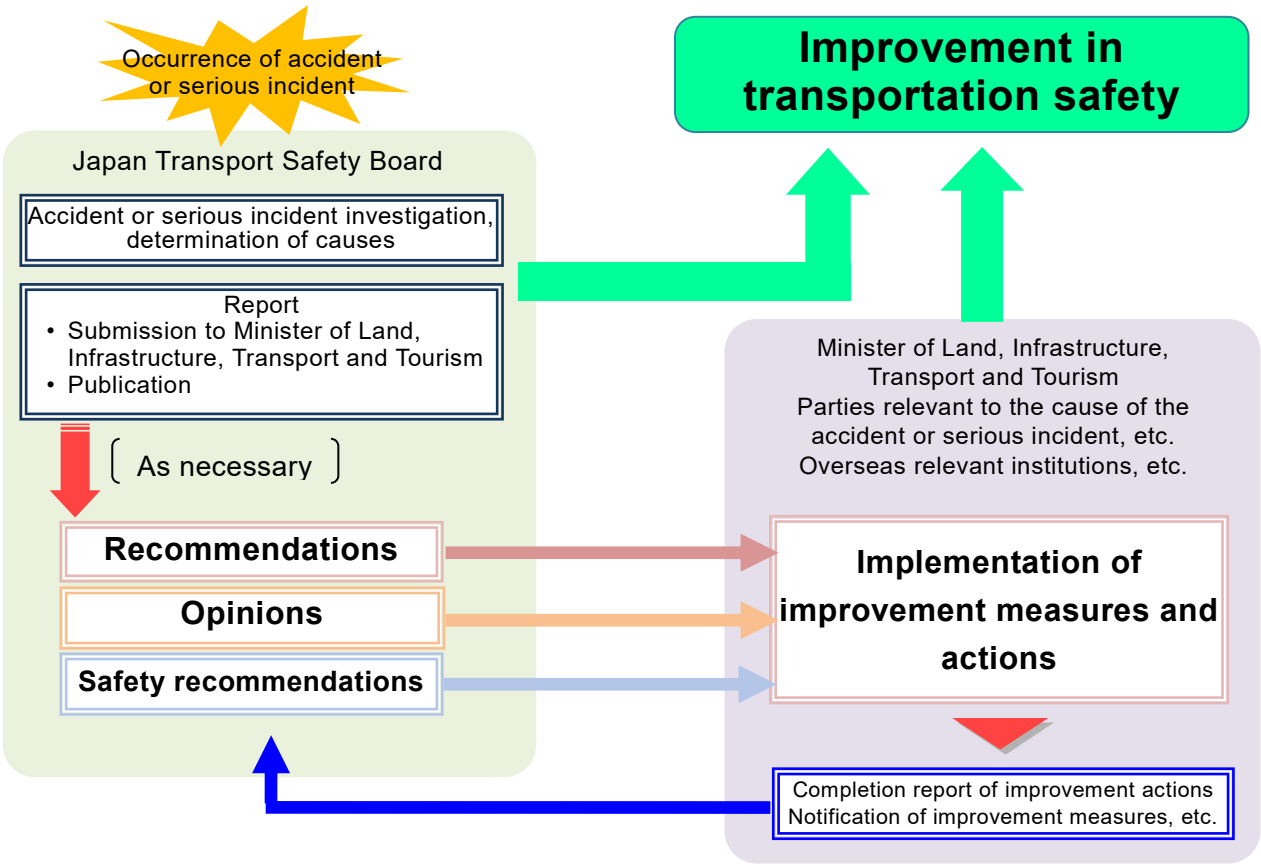
Chapter 1 Summary of recommendations and opinions issued in 2019

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).

The Japan Transport Safety Board has a system of "recommendations" and "opinions" as important systems along with accurate accident investigations in order to fulfill its mission of improving transportation safety. 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 2019 are summarized as follows.

1 Recommendations

(1) Aircraft accident involving a Socata TMB700 (a privately owned aeroplane)

(Recommendations on July 25, 2019)

Summary of the Accident

On Monday, August 14, 2017, a privately owned Socata TBM700, registered N702AV, took off from Yao Airport at 11:57 for the purpose of leisure flight under Instrument Flight Rules (IFR), deviated from the route instructed by an air traffic controller on the way to Fukushima Airport and crashed into a mountain forest in Yamazoe village, Yamabe-gun, Nara Prefecture after the last communication at 12:13, saying that it would return to Yao Airport.

A captain and a passenger were on board the aircraft and both were fatally injured.

The aircraft was destroyed and a fire broke out.

Probable Cause

In the accident, it is highly probable that the Aircraft lost control during flight, nose-dived while turning, and disintegrated in mid-air, resulting in the crash.

It is somewhat likely that the Aircraft lost control during flight, because the captain did not have pilot skills and knowledge necessary for the operation of the Aircraft, and was not able to perform proper flight operations.

Recommendations to the Minister of Land, Infrastructure, Transport and Tourism

In the accident, it is somewhat likely that the Aircraft lost control during flight, because the captain did not have pilot skills and knowledge necessary for the operation of the Aircraft, and was not able to perform proper flight operations. The captain had a valid Japanese competence certificate in this regard, and in case of the competence certificate in Japan, with regard to the aircraft not requiring the type rating, if the aircraft meet each class rating, pilots can be entitled to operate the aircraft within the scope of services in accordance with each qualification, regardless of the characteristics of each aircraft.

Therefore, in view of the identified matters of the accident investigation, in order to ensure the safety of aviation, the Japan Transport Safety Board recommends to implement the following measure pursuant to the provision of Article 26 of the Act for Establishment of the Japan Transport Safety Board to the Ministry of Land, Infrastructure, Transport and Tourism.

In order to prevent pilots from flying without skills and knowledge necessary for operating the respective aircraft, it is necessary for the Civil Aviation Bureau of the Ministry of Land, Infrastructures, Transport and Tourism to instruct the pilots to master the skills and knowledge required for operating the aircraft which the pilots have never flown before, even in case of operating the aircraft not requiring the type rating.

(2) Oil tanker HOUNMARU collision (bridge) accident

(Recommendations on April 25, 2019)

Summary of the Accident

The oil tanker HOUNMARU, with the master and 10 crew members on board, was anchored off the southeast of the Senshu Port under the situation where Typhoon No. 21 was approaching and a maritime typhoon warning was issued in the Seto Inland Sea including Osaka Bay, was struck by the strong winds which increased with the approach of the typhoon, and being drifted to the north dragging the anchor pushed by the strong wind. As a result, HOUNMARU collided with Kansai International Airport Access Bridge at around 13:40 on September 4, 2018.

HOUNMARU caused the deck of the starboard bow to be crushed, and Kansai International Airport Access Bridge caused the bridge of the road girder to be bent, broken, scratched, etc., the railway girder to be collapsed, the rail to be warped, the gas pipe to be broken, etc., but there were no casualties among the crew members.

Probable Causes

In this accident, while Typhoon No. 21 was approaching and a maritime typhoon warning was issued in the Seto Inland Sea including Osaka Bay, HOUNMARU continued single anchoring at the east side of the oil tanker berth (hereinafter referred to as "the Anchorage") located on the southwest side of the Senshu Port, Osaka Prefecture where Kansai International Airport Access Bridge is located about one nautical miles north of the southeast of the Kansai International Airport first Stage Airport Island (Kanku Island), for the purpose of typhoon evacuation. and HOUNMARU started to drift dragging the anchor pushed by the strong winds and waves with the approach of the typhoon.The master tried to stop anchor dragging using the main engine and it seemed the drift was stopped. He thought that he succeeded to stop anchor dragging so he kept the joystick HOVER position. As a result, HOUNMARU was again drifted and collided with Kansai International Airport Access Bridge in a situation where there was no sufficient distance to control HOUNMARU.

It is probable that the reason why HOUNMARU anchored at the Anchorage, which is located about 1 nautical miles north of the southeast of Kanku Island, was that the master thought that Typhoon No. 21 would pass the east side of the Anchorage and the left semicircle of the typhoon would enter the Anchorage, that the typhoon was traveling at a high speed and that strong wind would not blow for a long time, that other ships were anchored at the time of typhoon evacuation because the area was surrounded by the shore that the seabed material was mud and the anchor would be highly effective, that the next loading was planned to be carried out in the Sakai-Senboku Area of the Hanshin Port, and that he did not know the 2011 leaflet "Let's Prevent Anchor Dragging Marine Accidents." and did not recognize to anchor avoiding the sea area within three nautical miles from Kanku Island.

It is probable that the reason why HOUNMARU kept single anchoring at the Anchorage was that the master thought that the double anchoring would become entangled when the wind direction changed, and that he had the experience of using the main engine to cope with the typhoon wind.
It is probable that the master set the joystick in the HOVER position because he thought that the anchor was stopped when the GPS speed over the ground indicated on the radar became zero, and that HOUNMARU would move forward if the joystick was in the forward position.

It is probable that the reason why the HOUNMARU was drifted down again was that, under the situation where the forward thrust was lost due to the dispersion of the propeller thrust while the joystick was kept in the hover HOVER position, the anchor chain moved away from the seabed as the water depth increased due to the high tide, and the wind pressure on the hull and the wave drifting force increased.

It is somewhat likely that Hinode Shipping Co., Ltd. and Tsurumi Sunmarine Co., Ltd. were involved in the occurrence of this accident because they did not provide the master with confirmation of the rough anchoring, information on the typhoon and information on the anchorage, and did not discuss the safe operation.

Recommendations to Parties Relevant to the Cause of the Accident

In this accident, while Typhoon No. 21 was approaching and a maritime typhoon warning was issued in the Seto Inland Sea including Osaka Bay, HOUNMARU continued single anchoring at the east side of the oil tanker berth located on the southwest side of the Senshu Port, Osaka Prefecture where Kansai International Airport Access Bridge is located about one nautical miles north of the southeast of the Kansai International Airport first Stage Airport Island, for the purpose of typhoon evacuation, and HOUNMARU started to drift dragging the anchor pushed by the strong winds and waves with the approach of the typhoon. The master tried to stop anchor dragging using the main engine and it seemed the drift was stopped. He thought that he succeeded to stop anchor dragging so he kept the joystick HOVER position. As a result, HOUNMARU was again drifted and collided with Kansai International Airport Access Bridge in a situation where there was no sufficient distance to control HOUNMARU.It is somewhat likely that Hinode Shipping Co., Ltd. and Tsurumi Sunmarine Co., Ltd. were involved in the occurrence of this accident because they did not provide the master with confirmation of the rough anchoring, information on the typhoon, and information on the anchorage, and did not discuss the safe operation.

Based on the results of this accident investigation, the JTSB makes the following recommendations to Tsurumi Sunmarine Co., Ltd. pursuant to the provision of Paragraph 1, Article 27 of the Act for Establishment of the Japan Transport Safety Board in order to ensure the safety of ships and facilities in a stable manner.

(1) In order to prevent accidents due to anchor dragging during extremely strong typhoons, Tsurumi Sunmarine Co., Ltd. shall make following things thoroughly known to the master.

1. When a vessel is anchored, basically two anchors must be used and all possible measures must be taken to, for example, ensure that anchors and anchor chains provide secure sufficient anchor-holding power with the anchor chains extended as long as possible.
   The method of anchoring and the amount of extension of the anchor chain should be determined according to the situation of the ship (size, shape, type, cargo, etc.) and the environment of the anchor chain (congestion, bottom sediment, water depth, etc.).
2. It must be ensured that with the engine placed in a standby state, the output is appropriately adjusted by continuously using the engine according to rapidly changing wind directions and velocities so that anchor dragging will not be caused.
3. An anchorage must be chosen so that no important facilities will be located on the leeward side of the anchorage and that sufficient distances to other vessels will be secured.
4. Since the wind direction and wind velocity change rapidly when a typhoon passes, the latest weather information, sea state (typhoon) information, etc. have to be obtained to make accurate predictions.

(2) In the event that there is a risk of danger due to abnormal weather or sea conditions, Tsurumi Sunmarine Co., Ltd. shall provide necessary information to the vessels it operates, examine the safety of the vessels, and revise the operation plan as necessary, by establishing a safety support system.

*For details on the activities of the Japan Transport Safety Board, please see "Major activities in the past year 2" on page 2.

2 Opinions

(1) Opinions on the derailment accident at Nankai Electric Railway Co., Ltd Nankai Main Line

(Recommendations on January 31, 2019)

Summary of the Accident

On October 22, 2017, the outbound Local 6867 train, composed of 4 vehicles started from Namba station bound for Wakayamashi station, Nankai Line of Nankai Electric Railway Co. Ltd., departed from Tarui station on schedule at 16:38. While the train was operated in coasting at about 70 km/h on Onosatogawa bridge, the driver of the train noticed that the track about 50 m ahead had sagged, and applied the brake immediately but the train passed the sagged track and stopped after running for about 250 m.

It was found in the investigation implemented after the occurrence of the accident, that the 2nd axle in the rear bogie of the 3rd vehicle of the train derailed to right on Onosatogawa bridge, and restored after that.

In addition, the pier No.5 of the down track of Onosatogawa bridge had been subsided and tilted, and the track had been sagged and wound. There were about 250 passengers and 2 train crews, i.e., the driver and the conductor, onboard the train, among them 5 passengers were injured.

Probable Cause

It is highly probable that the accident occurred as the 2nd axle in the rear bogie of the 3rd vehicle had derailed to right because the train was running on the track on the bridge significantly deformed by the subsided and tilted pier, after that, the derailed axle restored in the level crossing while passed as being derailed.

It is probable that the pier had subsided and tilted because the ground in around the pier was scoured in wide area by the swollen river water at the time of the occurrence of the accident, while the function to protect the piers from scouring had already been deteriorated before the occurrence of the accident, such as the subsided riverbed in around the pier caused by the concentration of the river water due to the change of the water route, damages of the foot protection as the scour protection work, etc.

It is probable that the deterioration of the function to protect scouring was related with that the measures such as the repair, reinforcement, etc., of the foot protection were not implemented, because the evaluation for the unusual status were not implemented sufficiently, even though the unusual status of the foot protection of the pier was recognized in the inspection of the piers.

Opinions to the Minister of Land, Infrastructure, Transport and Tourism

In view of the result of the accident investigation, the Japan Transport Safety Board expresses its

opinions as follows to the Minister of Land, Infrastructure, Transport and Tourism pursuant to Article 28 of the Act for Establishment of the Japan Transport Safety Board in order to contribute the prevention of recurrence of the accidents of the same kind.

Contents

It is highly probable that the vehicle derailed because the train ran on the track significantly deformed due to the subsided and tilted pier by the occurrence of the scouring in around the pier by the swollen river water, in the concerned accident.

The foot protection had been constructed as the scour protection work to the piers, and Nankai Electric Railway Co. Ltd. had been implemented the diagnosis of the piers by the impact vibration test, as already recognized the unusual status of the pier before the occurrence of the concerned accident. To review the occurrence of the concerned accident, the impact vibration test is the effective method to diagnose the healthiness of the pier at that time, but it suggested that there is the possibility to cause the result to overlook the deterioration of the protecting function of the scour protection works by the swollen water in the future, based on only the diagnosis by the impact vibration test.

In order to prevent the same kind of the scour disasters, it is important to study on the measures by implementing the inspection process properly referring the Standards for Management of Maintenance for Railway Structures, etc., Structure Edition, as the guide line, and to implement the precise investigation steadily for the scour protection works in the individual inspection if necessary. As the Standards for Management of Maintenance for Railway Structures, etc., Structure Edition, have been made well known from the Railway Bureau of the MLIT to the railway and tramway operators by the "On the Establishment of the Standards for Management of Maintenance for Railway Structures", notification from the chief of the Railway Bureau issued on January 16, 2007, the following points should be made well known in the railway and tramway operators having the river bridges, considering that the scour disaster may cause the serious accident, based on the occurrence of the concerned accident.

1. When implement the inspection of the bridges, the Standards for Management of Maintenance for Railway Structures, etc., Structure Edition, should be used as the guideline, and refer to the comments of the Standards on the inspection method, the judging method of the healthiness and the measures, etc. When the unusual status of the scour protection works, etc., were found in the general inspection, implement the judgement of the healthiness considering the inspected results for the scour protection works and judge the necessity of the individual inspection. When the individual inspection was judged as needed, implement the precise inspection for the status around the pier and the maintained status of the protecting function for the scour protection works and study the necessity and the urgency of the measures, then implement the measures systematically.

2. In the comments of the Standards for Management of Maintenance for Railway Structures, etc., Structure Edition, the "marking table to pick up bridges scoured easily" was proposed. The marking table is the optional material in order to pick up the bridges having risks to cause the scour disaster, however, implement the judgement of the necessity of the individual inspection properly and steadily referring to the similar marking table.

Measures based on the opinions

The Japan Transport Safety Board stated its opinion to the Minister of Land, Infrastructure, Transport and Tourism on January 31, 2019, and was notified on September 27, 2019 of the measures taken based on the opinion as follows.

○ Measures taken by the Ministry of Land, Infrastructure, Transport and Tourism based on opinions

Regarding the subject matter of the opinions provided in UN-I-SAN No. 165 dated January 31, 2019, this is to provide notification, with associated materials, that the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) issued " Regarding Response to the Opinions of the Japan Transport Safety Board" (KOKU-TETSU-GI No. 137 and KOKU-TETSU-SHI No. 211) and " Regarding Railway Accident Investigation Reports,etc., of the Japan Transport Safety Board (Published in January)" (administrative communication) on January 31, 2020. MLIT made the railway accident investigation reports and the content of the Japan Transport Safety Board's opinions fully known to railway operators. Additionally, with regard to the Opinion, MLIT instructed railway operators to complete the following items.

1) When conducting the inspection of bridges, the Maintenance Standards for Railway Structures and Commentary(Structure Edition) shall be used as a guideline, and the explanation of the standard shall be referred to for the inspection method, soundness judgment method and measures.

2) When judging the soundness of the bridge, if the alteration of the scour protection work, etc. is confirmed in the general inspection, the necessity of the individual inspection shall be judged using the "Grading Table for Extracting Bridges Susceptible to Scour" shown in the explanation of the Maintenance tandard for Railway Structures Commentary (Structure Edition).

3) When an individual inspection is judged to be necessary, a detailed investigation shall be conducted covering the situation around the bridge pier and the maintenance condition of the protective function of the scour protection work, the necessity and urgency of countermeasures shall be examined, the soundness of countermeasures shall be determined, and countermeasures shall be systematically implemented in accordance therewith.

Besides, the above-mentioned notice also stated that a study is under way to make the scoring table easier to use in light of this case and other factors. However, it is also stated that the implementation system has been established and concrete studies are expected to begin.

In order to ensure that efforts to prevent train derailment accidents by scour around bridge piers will take root in the future, the Government of Japan will continue to provide guidance to sub-rail track operators through regional transport bureaus.

* The contents of the notice, including related materials, are posted on the JTSB website.

http://www.mlit.go.jp/jtsb/railkankoku/railway-iken5re-1_20191031.pdf

(2) Opinion on Crew Injury Accident at Fishing vessel SEIRYOMARU No.3

(Opinions on August 29, 2019)

Summary of the Accident

At around 04:30 on September 14, 2018, the Fishing Vessel SEIRYOMARU No. 3, boarded by the chief fisherman, the master and three other crew members, anchored off the west of Oshima Island, Amakusa City, Kumamoto Prefecture, was seriously injured when the chief fisherman was caught in a side roller.

Probable Cause

It is probable that this accident occurred while the SEIRYOMARU No. 3 was anchoring off the west of Oshima Island, Amakusa City at night, hauling the net by adjusting the winding of the net with the bow side and the stern side roller for gathering a school of the fish to the bow side and making the bottom of the net flat, the chief fisherman who wore rubber gloves tried to fix the net to the stern side roller while the stern side roller was rotating, and so that the fingertips of the rubber gloves on the left hand were caught between the hauling net and the stern side roller, and then the left arm was got caught in the stern side roller.

It is probable that the reason why the chief fisherman tried to fix the net to the stern side roller by himself was because the lifting of the net was proceeding by the stern side roller rather than the bow side roller, and because the bow side of the net became heavy due to the uneven distribution of the fish in the net therefore the crew members except the chief fisherman, who were working to lift the net into the ship by pushing the net to the top of the side roller rotating toward the stern side at the most aft work position, had moved toward the net with the bow side roller.

It is probable that the reason why the chief fisherman wore rubber gloves and tried to fix the net to the stern side roller while the stern side roller was rotating was that he was impatient because he wanted to return to the port as soon as possible and secure a pier with good conditions for landing because of good fishing and prolonged operation time, and that he was used to the work.

Contents of Opinions to the Director-General of the Fisheries Agency

The Japan Transport Safety Board, based on the provisions of Article 28 of the Act for Establishment of the Japan Transport Safety Board, expresses its opinions as follows, taking into consideration the status of occurrence of similar accidents.

If any measures are taken in response to this opinion, please notify us of the details.

Contents

The Director-General of the Fisheries Agency, who has formulated the Basic Plan for Fisheries based on the Fisheries Basic Act and is working to strengthen safety measures for fishing operations by fishing vessels, in view of the situation in which similar accidents have repeatedly occurred in round haul net fishing vessels and stick-held dip net fishing vessels that use side rollers during lifting net poeration, should disseminate the following patterns of similar accidents and measures to prevent their recurrence, which have been clarified in the accident investigation by the Japan Transport Safety Board, and strongly encourage the implementation of measures to prevent their recurrence, including the introduction of emergency stop devices for side rollers, to further improve safety in these fishing operations by fishing vessels.

1. Patterns of similar accident

(1) When preparing to take a school of fish in a net into a fish tank, an operator tried to fix the net to the side roller by manually passing a part of the net hauled by the side roller through the gap between the side roller and the bulwark and sandwiching it between the net and the side roller.

(2) When hauling the nets onto the vessel using the side rollers, a part of the nets hauled onto the vessel came out from between the side rollers and the bulwarks to the outside of the vessel, and was caught between the hauling nets and the rotating side rollers (hereinafter referred to as "Sakasamaki").

2 Safety Actions for Similar Accidents

(1) The hem and the cuff of crew members' jackets should be tightened to prevent them from being caught in the side rollers.

(2) A person in charge of operation shall be attached to the operation lever of the side roller, and the person in charge of operation shall be made to constantly monitor the status of the work performed by the side roller so that the side roller can be stopped immediately in the event of an abnormality.

(3) When fixing the net, the side roller shall be stopped once, and the operator who is fixing the net and the operator in charge of operating the operation lever of the side roller shall talk to each other and carry out the work in cooperation.

(4) The operator who fixes the net wearing gloves shall remove the gloves when fixing the net, because the fingertips of the gloves may be caught between the net during the hauling net and the rotating side rollers.

(5) The following measures shall be taken to Sakamaki winding and efforts shall be made to prevent

Sakasamaki.

① The condition of the net shall be carefully observed. If any part of the net is found to be in a condition that Sakasamaki may occur, the side rollers shall be stopped immediately to eliminate the condition.

② The scratches on the rubber part of the side roller surface shall be repaired as appropriate.

③ When a part of the net hauled into the ship is exposed to the wind and a reverse wind could be occured, a sheet for the wind shield shall be spread on the deck.

④ To prevent a part of the net hauled onto the ship from folded on the bulwark.

⑤ If a bundle of nets is wound up with a side roller, a part of the net hauled on board may be twisted to cause Sakamaki. Therefore, the net should be hauled on board while leveling the net on the side roller.

(6) Even if a person in charge of operation is attached to the operating lever of the side roller, it is highly probable that the appropriate operation of the operating lever may not be performed or that the side roller cannot be stopped immediately as follows. Therefore, it is desirable to introduce an emergency stop device for the side roller for further safety improvement.

① When the operator's hand, etc, is caught between the hauling net and the rotating side roller during the hauling operation using the side roller, the operation lever may not be operated properly under the urgent condition.

②Since Sakasamaki can occur in various situations, it is difficult to predict or prevent all of them. If Sakasamaki occurs suddenly and the hand of an operator who hauls the net onto the ship using the side roller is caught between the net being hauled and the rotating side roller, it is not easy to stop the side roller immediately with the operation lever.

(7) In round haul net fishing vessels that use side rollers for hauling nets, it is desirable to introduce equipment exclusively for fixing nets as an alternative to fixing nets to side rollers.

(8) A side roller, an emergency stop device for a side roller, or dedicated equipment for fixing a net shall be used in accordance with the handling specified by the manufacturer of each equipment.

3. Safety Recommendations

(1) Cargo vessel ERIK Crew fatality

(Safety Recommendations on February 28,2019)

Summary of the Accident

At around 17:26 on September 18, 2018, while the cargo vessel ERIK was moored at the Mitsubishi Naoshima wharf, with the master and 14 crew members on board, 4 crew members were performing the cleaning work of the upper hatch coaming of the cargo holds after unloading cargo, and an able seaman fell from the upper deck to the bottom floor of the cargo hold. The able seaman was pronounced dead after being conveyed from the cargo hold.

Probable Causes

It is considered probable that this accident at around 17:26 on September 18 when Crew Member A fell forward and fell from the upper deck to the bottom of the cargo hold bottom occurred because Crew Member A was working while being in an unstable posture on the Ladder when the vessel was doing the cleaning work while the vessel was moored at Mitsubishi Naoshima wharf. It is considered probable that the vessel carried out the cleaning work by the methods that differed from the Ladder guidelines of the CSWP, and that because there was nothing to support his upper body on the Ladder, Crew Member A was performing the cleaning work while being in an unstable posture on the Ladder. It is somewhat likely that Company A was insufficient in monitoring that the crew members clearly understood the Ladder guidelines of the CSWP and then applied and performed the Ladder guidelines in the cleaning work, because the vessel carried out the working methods being different from the Ladder guidelines in everyday work.

Safety Recommendations

In view of the results of this accident investigation, the Japan Transport Safety Board recommends that Krey Schiffahrts GmbH Co. KG, which is the Management company of the cargo vessel ERIK, takes the following measures for the purpose of preventing the occurrence of a similar accident and reducing damage.

1. Krey Schiffahrts GmbH & Co. KG should have the master of the ERIK supervise the crew members to certainly take preventive measures for fall accident in “the cleaning work of the upper hatch coaming of the cargo holds on the upper deck”.
2. The master of the ERIK and Designated Person Ashore of Krey Schiffahrts GmbH & Co. KG should implement the risk assessment of “the cleaning work of the upper hatch coaming of the cargo holds on the upper deck” on an individual work basis, and Krey Schiffahrts GmbH & Co. KG should take the necessary measures for the ERIK to prevent fall accidents by using a safety harness, etc. based on this assessment.
3. Krey Schiffahrts GmbH & Co. KG should have all the vessels operated by the Company observe the portable ladder guidelines in the chapter “WORK AT HEIGHT” of the “Code of Safe Working Practices for Merchant Seafarers”. On the other hand, Krey Schiffahrts GmbH & Co. KG should take other safety measures for all the vessels operated by the Company including changing the use of the portable ladder if it seems that it is difficult to conform to the portable ladder guidelines in the cleaning work.

4. Krey Schiffahrts GmbH & Co. KG should enhance monitoring of safety education that covers such as appropriately wearing a helmet in all the vessels operated by the Company.

(2) Chemical Tanker GOLDEN SUNNY HANA: Explosion (Cargo oil tank) Accident

(Safety Recommendations on March 28, 2019)

Summary of the Accident

At around 10:05 on April 8, 2018, as the chemical tanker GOLDEN SUNNY HANA, with a master and 14 crew members on board, was proceeding southeast off to the southeast of Kunisaki Port, Oita Prefecture, while conducting cleaning work in a cargo oil tank, an explosion occurred in the cargo oil tank. Two of GOLDEN SUNNY HANA's ordinary seamen were injured and her cargo oil tanks had holes and other damage. At around 10:05 on April 8, 2018, as the chemical tanker GOLDEN SUNNY HANA, with a master and 14 crew members on board, was proceeding southeast off to the southeast of Kunisaki Port, Oita Prefecture, while conducting cleaning work in a cargo oil tank, an explosion occurred in the cargo oil tank. Two of GOLDEN SUNNY HANA's ordinary seamen were injured and her cargo oil tanks had holes and other damage.

Probable Cause

It is probable that the accident occurred when, as the Vessel was conducting the Circulation Work in the No. 2 port cargo oil tank and the No. 2 starboard cargo oil tank during cargo oil tank cleaning work while off to the southeast of Kunisaki Port, Oita Prefecture, an explosion occurred in the No. 2 port cargo oil tank because steam was injected into the No. 2 port cargo oil tank under conditions in which a combustible gas mixture of vaporized pyrolysis gasoline and air in the explosive range was present.

It is probable that the presence of the combustible gas mixture of vaporized pyrolysis gasoline and air in the No. 2 port cargo oil tank was not noticed because the gas concentration in the No. 2 port cargo oil tank was not measured prior to cleaning of the cargo oil tanks. It is somewhat likely that the combustible gas mixture was within the explosive range because flushing of the cargo lines and cargo oil tank bottoms was conducted under conditions in which ventilation and other measures were not implemented even though the gas concentration measurement taken after unloading was within the explosive range and approximately 30 liters of pyrolysis gasoline subsequently remained in both the No. 2 port cargo oil tank and the No. 2 starboard cargo oil tank, and the vaporized pyrolysis gasoline was not expelled outside, its gas concentration increased further with the passage of time, and it became mixed with air. It is probable that steam was injected into the No. 2 port cargo oil tank with the intention of raising the temperature of the seawater used in the work of repeatedly pumping up liquid collected on the cargo oil tank's bottom with a pump installed in the cargo oil tank and then spraying the liquid with the cleaning machine.

Safety Recommendations

It is probable that an explosion occurred in the No. 2 port cargo oil tank when the chemical tanker GOLDEN SUNNY HANA was conducting circulation work in the No. 2 port cargo oil tank and the

No. 2 starboard cargo oil tank during cargo oil tank cleaning work while off to the southeast of Kunisaki Port, Oita Prefecture. It is somewhat likely that the explosion occurred in the No. 2 port cargo oil tank because, under conditions in which a combustible gas mixture of vaporized pyrolysis gasoline and air in the explosive range was present in the No. 2 port cargo oil tank and measurements of gas concentration and ventilation with ventilation equipment were not being conducted, electrically-charged steam was injected into the No. 2 port cargo oil tank and discharged, a spark was generated, and ignited the combustible gas mixture.

In view of the result of this accident investigation, the Japan Transport Safety Board recommends that HNCC Co., Ltd., which is the owner of GOLDEN SUNNY HANA, take the following measures for the purpose of preventing the occurrence of a similar accident: HNCC Co., Ltd., should instruct crew members on chemical tankers on which combustible gas mixtures are present in cargo oil tanks to consistently execute the following.

(1) Sufficiently provide ventilation with ventilation equipment after the flushing of cargo lines and cargo oil tank bottoms.
(2) Measure gas concentration before cleaning work and during cleaning work, cease work immediately when a measurement is in the explosive range, and continue work after providing ventilation with ventilation equipment or introducing inert gas and then confirming safety.
(3) Consider the danger of static electricity present in cargo oil tanks and do not inject steam if safety cannot be confirmed.

(3) Collision (Bridge) Accident of Cargo ship ERNA OLDENDORFF

(Safety Recommendation on October 31, 2019)

Summary of the Accident

At around 00:27 on October 22, 2018, the cargo ship ERNA OLDENDORFF was proceeding east in Obatake Seto toward a privately-operated berth in Etajima City, Hiroshima Prefecture, with a master, a second officer and 19 other crewmembers aboard when she collided with Oshima Bridge. ERNA OLDENDORFF received dents and other damage to three of her four cranes as well as a bent damage to her aft mast; however, there were no fatalities or injuries on the Vessel. Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under its girders was broken and fell, and a water pipe was severed, causing a water outage that lasted for forty days affecting almost all of Suo-Oshima Town, Yamaguchi Prefecture; power cables, communication cables and others were severed as well.

Probable Causes

It is probable that the accident occurred when, while ERNA OLDENDORFF was proceeding east in Obatake Seto at night, she collided with Oshima Bridge because she proceeded under a bridge that she was unable to pass through at ‘the heights above the water line at the time of the accident to the top of each cargo crane and the aft mast’ (hereinafter referred to as “the height of crane and mast”).

It is probable that ERNA OLDENDORFF proceeded under Oshima Bridge which she was unable to pass through at the height of her cranes and mast because the Master of ERNA OLDENDORFF

approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge, and the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge. It is probable that the Master approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge because the Master did not check the details of the route assuming that the former master had already checked it.

It is probable that the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge because he waited for a report from the Second Officer after the Master ordered the Second Officer to check the height of the bridge, and the Master was concerned that ERNA OLDENDORFF would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after she turned to starboard off the west of Kasasa Shima. It is somewhat likely that although the OLDENDORFF Carriers GmbH & Co.KG specified the procedures of voyage planning, etc. in the Safety Management Manual,etc., the Master and the Second Officer were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.

Safety Recommendation

It is probable that ERNAOLDENDORFF proceeded under Oshima Bridge, which she was unable to pass through at the height of her cranes and mast, because the Master approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge, and the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge. It is somewhat likely that although the OLDENDORFF Carriers GmbH & Co.KG specified the procedures of voyage planning, etc. in the Safety Management Manual,etc., the Master and the Second Officer of ERNA OLDENDORFF were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.

Therefore, based on the result of the accident investigation, the Japan Transport Safety Board recommends to the OLDENDORFF Carriers GmbH & Co.KG and the authorities of Republic of Malta as follows.

(1) The OLDENDORFF Carriers GmbH & Co.KG is recommended to thoroughly conduct education and training for masters and other crewmembers to ensure voyage planning and implementing in compliance with the Safety Management Manuals revised after the accident.

(2) The authorities of the Republic of Malta are recommended to instruct the OLDENDORFF Carriers GmbH & Co.KG to ensure proper and continuous implementation of above (1).

(4) Collision (Seawall) Accident of Cargo ship, MARINA

(Safety Recommendations on December 19, 2019)

Summary of the Accident

Under the situation where Typhoon No. 24 was approaching, while being anchored at an anchorage in Yokohama section, Keihin Port, acargo ship, MARINA, with 12 crew members, including the master, dragged the anchor and drifted toward to the northeast, and collided with the seawall at Ogishima, Kawasaki section. MARINA suffered dents, etc. to her starboard stern. The seawall suffered collision damage, etc.

Probable Causes

It is probable that in the accident, while being anchored in ballast at Anchorage Y1 at the Keihin Port for the purpose of evacuating from the typhoon under the situation where, during nighttime, Typhoon No. 24 was approaching and a typhoon warning had been announced for the northern part of the waters of the Kanto District, including Tokyo Bay, the vessel dragged anchor when wind waves caused by the typhoon increased because she continued riding at single anchor and that the master set the main engine to full ahead but the vessel could not achieve sufficient forward thrust and drifted toward and collided with the seawall.

Safety Recommendations

In view of the results of this accident investigatiFon, the Japan Transport Safety Board makes the following recommendations to CREDIT OCEAN SHIPPING CO., LTD, which is the management company of the cargo ship, MARINA, for the purpose of contribution to prevention of the recurrence of similar casualties and alleviation of damages:

CREDIT OCEAN SHIPPING CO., LTD shall inform all the vessels it manages of the following safety actions and instruct them to implement those actions without failure:

1. Ensure sufficient holding power with the anchor and chain cable by extending the chain cable to the extent possible during anchoring and let go the anchor on the other side as needed during riding at single anchor to utilize it as an "anti-swinging anchor"
2. Place the main engine on standby in advance, continuously use the main engine and rudder in response to the wind direction and velocity that rapidly change, and maneuver the vessel to have the bow face the wind to restrain swinging motion.
3. Conduct accurate prediction by obtaining the latest weather information, sea condition (typhoon) information, etc. as wind direction and velocity rapidly change at the time of passage of a typhoon.

Chapter 2 Summary of major investigation activities in 2019

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.

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.

1 Major accidents and serious incidents occurred in 2019 for which investigations commenced

The accidents and serious incidents also occurred in 2019. The primary investigations which the JTSB commenced are listed below:

(1) Aviation mode

- **An accident to privately owned TL-2000 STING carbon (ultralight airplane) near Shinji, Kasumigaura City, Ibaraki Prefecture <Occurred on October 20>**
- **An accident to Boeing 787-8 (large aircraft) operated by All Nippon Airways Co., Ltd., at an altitude of about 5,500 meters, about 140 kilometers northeast of Beijing, which two passengers were injured due to the shaking <Occurred on August 15>**
- **An accident to Aerospatiale AS350B helicopter (rotorcraft), operated by S.G.C Saga Aviation Co., Ltd., in a paddy field in Kuchido, Chikusei City, Ibaraki Prefecture, during pesticide spraying work <Occurred on July 29>**
- **A serious incident that an Air Self-Defense Force aircraft (JASDF) entered the runway of Misawa Airfield despite an instruction to hold short of runway; when an aircraft (large aircraft) operated by J-Air Co.,Ltd., was approaching the runway at an altitude of about 190 meters, about 2.8 kilometers west of the threshold of the runway < Occurred on October 3>**
- **A serious incident to Embraer ERJ170-200STD (large aircraft), operated by Fuji Dream Airlines Co., Ltd., deviated from the runway of Yamagata Airport during take-off roll < Occurred on April 23>**

In 2019, 12 aircraft accidents were subject to investigation, with investigations into the causes of 29 accidents conducted, including 17 ongoing accident investigations from the previous year. Further, 17 aircraft serious incidents were subject to investigation, with investigations into the causes of 32 serious incidents conducted, including 15 ongoing serious incident investigations from the previous year.

(2) Railway mode

- **Level crossing obstruction accident at Yamanone Level Crossing (Class 4), East Japan Railway Co., Ltd., Zushi Station (Zushi City, Kanagawa) <Occurred on March 21>**
- **Yokohama Seaside Line Co., Ltd., on the premises of Shin-Sugita Station, Kanazawa Seaside Line (Yokohama City, Kanagawa Prefecture), Other accident with casualties < Occurred on June 1>**
- **Transportation Bureau City of Yokohama Line 1 (Blue Line) between Shimoiida Station and Tateba Station (Yokohama City, Kanagawa Prefecture) Train derailment accident <Occurred on June 6>**
- **Nankai Electric Railway Co., Ltd. Suminoe Inspection Depot (Osaka City, Osaka Prefecture) Serious Incident of Vehicle Failure <Occurred on August 24>**
- **Keihin Kyuko Co., Ltd. between Kanagawa-shimmachi Station and Nakakido Station (Yokohama City, Kanagawa Prefecture) Kanagawa-shimmachi Daiichi Level Crossing (Class 1) Train derailment accident <Occurred on September 5>**

In 2019, 17 railway accidents were subject to investigation, with investigations into the causes of 28 accidents conducted, including 11 ongoing accident investigations from the previous year. Further, two railway serious incidents were subject to investigation, with investigations into the causes of 5 serious incidents conducted, including 3 ongoing serious incident investigation from the previous year.

(3) Marine mode

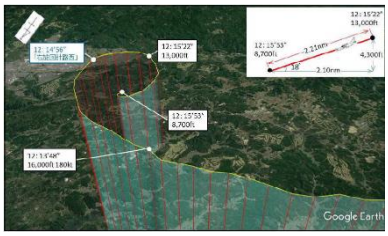
- **Collision of Passenger ship GINGA (Underwater Floaters) (off the east northeast of Himezaki Lighthouse, Sado City, Niigata Prefecture) <Occurred on March 9>**
- **Cargo ship SENSHOMARU and Cargo ship SUMIHOMARU Collision (off the south of Inubosaki Lighthouse, Choshi City, Chiba Prefecture) <Occurred on May 26>**
- **Capsizing of Fishing vessel KEIEI MARU No. 65 (off the east of Cape Nosappu-Misaki, Nemuro City, Hokkaido Prefecture) <Occurred on September 17>**
- **Cargo ship BUNGO PRINCESS collision (bridge) accident (Minamihonmoku Hama Road, Yokohama Area, Keihin Port) <Occurred on September 9>**
- **Passenger injury accident on Passenger ship NANKYU No. 10 (off the northwest of Minamiosumi Town, Nejime Port, Kagoshima Pref.) <Occurred on December 2>**

In 2019, 845 marine accidents were subject to investigation, with investigations into the causes of 1,434 accidents conducted, including 599 ongoing accident investigations from the previous year (excluding 10 incidents deemed to not be an accident as a result of investigations). Further, 230 marine incidents were subject to investigation, with investigations into the causes of 307 (excluding 10 incidents deemed to not be an incident as a result of investigations) incidents conducted, including 87 ongoing incident investigations from the previous year.

2 Major accidents and serious incidents for which investigation reports were published in 2019

Completed investigation into the causes of accidents, etc. undergo committee (subcommittee) review/resolution, investigation reports are submitted to the Minister of Land, Infrastructure and Transport, and published on the Japan Transport Safety Board website. Major accidents, etc. published on the Japan Transport Safety Board website are as follows.

(1) Aviation mode



- **Rotorcraft accident, damage to airframe due to hard landing at Sendai Airport, Miyagi Prefecture, operated by Japan Coast Guard Miyagi Branch <Occurred on February 27, 2019>**
- **A serious incident involving Japan Airlines Aircraft. Damage to engine at Tokyo International Airport <Occurred on September 5, 2017>**
- **A serious incident involving a Korean Air Aircraft runway 06L at Narita International Airport, disabled to continue taxiing due to fractured landing gear when landing <Occurred on June 29, 2018>**
- **Privately owned Aircraft Crash accident due to loss of control during flight to Yamazoe Village, Yamabe-gun, Nara Prefecture <Occurred on August 14, 2017>**
- **Polar Air Cargo Aircraft serious incident,case equivalent to the overrun of runway 16L at Narita International Airport <Occurred on July 15, 2017>**

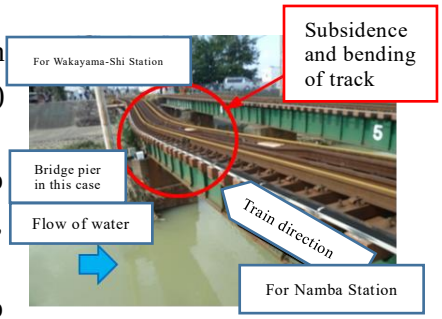
(For more details, see pages 67~71 of “Chapter 3, 8 Summaries of major aircraft accident and serious incident investigation reports (case studies)”

Completed investigation reports into 15 aircraft accidents and 11 serious aircraft incidents have been published.

Of the investigation reports published, the Japan Transport Safety Board gave its recommendations on July 25 to the Minister of Land, Infrastructure and Transport concerning the “Accident involving privately owned Socata TBM700”.

(For more details, see page 20 of “Chapter 1 Summary of recommendations and opinions issued in 2019”)

(2) Railway mode



- Nankai Electric Railway Co., Ltd. Nankai Main Line between Tarui Station and Ozaki Station (Hannan City, Osaka Prefecture) Train derailment accident <Occurred on October 22, 2017>
- Serious incident on the premises of Nagoya Station on the Tokaido Shinkansen line of West Japan Railway Company (Nagoya City, Aichi Prefecture) <Occurred on December 11, 2017>
- Derailment accident on the premises of Tomamu Station, Sekisho Line, Japan Freight Railway Co., Ltd. (Shimukappu Village, Yufutsu-gun, Hokkaido Prefecture) <Occurred on February 24, 2018>

- Level Crossing Accident on the Fukuen Line between Michinoue Station and Managura Station of West Japan Railway Company (Fukuyama City, Hiroshima Prefecture). < Occurred on September 27,2018>
- Hokkaido Railway Co., Ltd. Shin-Sapporo Station, Chitose Line (Sapporo City, Hokkaido Prefecture) Facility Damage Railway Serious Incident <Occurred on November 9, 2018>

(For more details, see pages 100~105 of "Chapter 4, 9 Summaries of major railway accident and serious incident investigation reports (case studies)"

Completed investigation reports into 13 railway accidents and three serious railway incidents have been published.

Of the investigation reports published, the Japan Transport Safety Board presented its opinion to the Minister of Land, Infrastructure and Transport on January 31.

(For more details, see pages 25~28 of "Chapter 1 Summary of recommendations and opinions issued in 2019")

(3) Marine mode

- Chemical tanker GOLDEN SUNNY HANA explosion <Occurred on April 8, 2018>
- Oil tanker HOUUNMARU bridge collision accident <Occurred on September 4, 2018>
- Fishing vessel SEIRYOMARU No. 3 Injury accident <Occurred on September 14, 2018>
- Fatal accident of cargo ship ERIK crew <Occurred on September 18, 2018>
- Cargo ship ERNA OLDENDORFF bridge collision accident <Occurred on October 22, 2018>

(For more details, see pages 153~157 of "Chapter 5, 11 Summaries of major marine accident investigation reports (case studies)"

Completed investigation reports into 838 marine accidents and 162 incidents have been published.

Of the investigation reports published, the Japan Transport Safety Board gave recommendations to Tsurumi Sunmarine Co., Ltd. on April 25 concerning the "Oil tanker HOUUN MARU collision (bridge) accident".

Besides,safety recommendations were also made to Krey Schiffahrts GmbH & Co. KG on February 28 concerning the Fatal accident of cargo ship ERIK crew, to HNCC CO., LTD. on March 28 concerning Chemical tanker GOLDEN SUNNY HANA explosion, to OLDENDORFF Carriers GmbH & KG and Authorities of Malta on October 31 concerning the Cargo Ship ERANA OLDENDORFF Collision (Bridge) Accident , and to CREDIT OCEAN SHIPPING CO., LTD. on December 19,concerning Cargo Ship MARINA Collision (Seawall) Accident.

In addition, on August 29, the Japan Transport Safety Board expressed its opinion to the Director-General of the Fisheries Agency regarding the accident of injury to the crew of the fishing vessel SEIRYOMARU No. 3.

(For more details, see pages 21~35 of "Chapter 1 Summary of recommendations and opinions issued

in 2019")

3 Accidents and serious incidents for which progress reports were published in 2019

Accident progress reports are made to the Minister of Land, Infrastructure and Transport, and published on the Japan Transport Safety Board website where deemed necessary during accident investigations, etc. to prevent a recurrence of such accidents. Progress reports of accidents, etc. published on the Japan Transport Safety Board website are as follows.

(1) Marine mode

Cargo ship ERNA OLDENDORFF collision (bridge) accident <Occurred on October 22, 2018>

Regarding the cargo ship ERNA OLDENDORFF collision (bridge) accident that occurred at the Oshima Bridge on the Obatake Seto between Yanai City Yamaguchi Prefecture and Suooshima Town on October 22, 2018, the JTSB has been conducting a thorough investigation since the accident occurred. However, it was expected to take time to compile a final report. Therefore, from the viewpoint of preventing the occurrence of the same type of accident the JTSB has made public the outline of the accident, the progress of the investigation, and the factual information that has been confirmed at the present time, after submitting an interim report to the Minister of Land, Infrastructure and Transport on March 28, 2019. (The Investigation report has been published on October 22, 2019. For details, see page 157 of "Chapter 5 11 Summaries of major marine accident investigation reports (case studies)".)

*This progress report has been published on the Japan Transport Safety Board website.
http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/keika20190328-0_2018tk0020.pdf

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

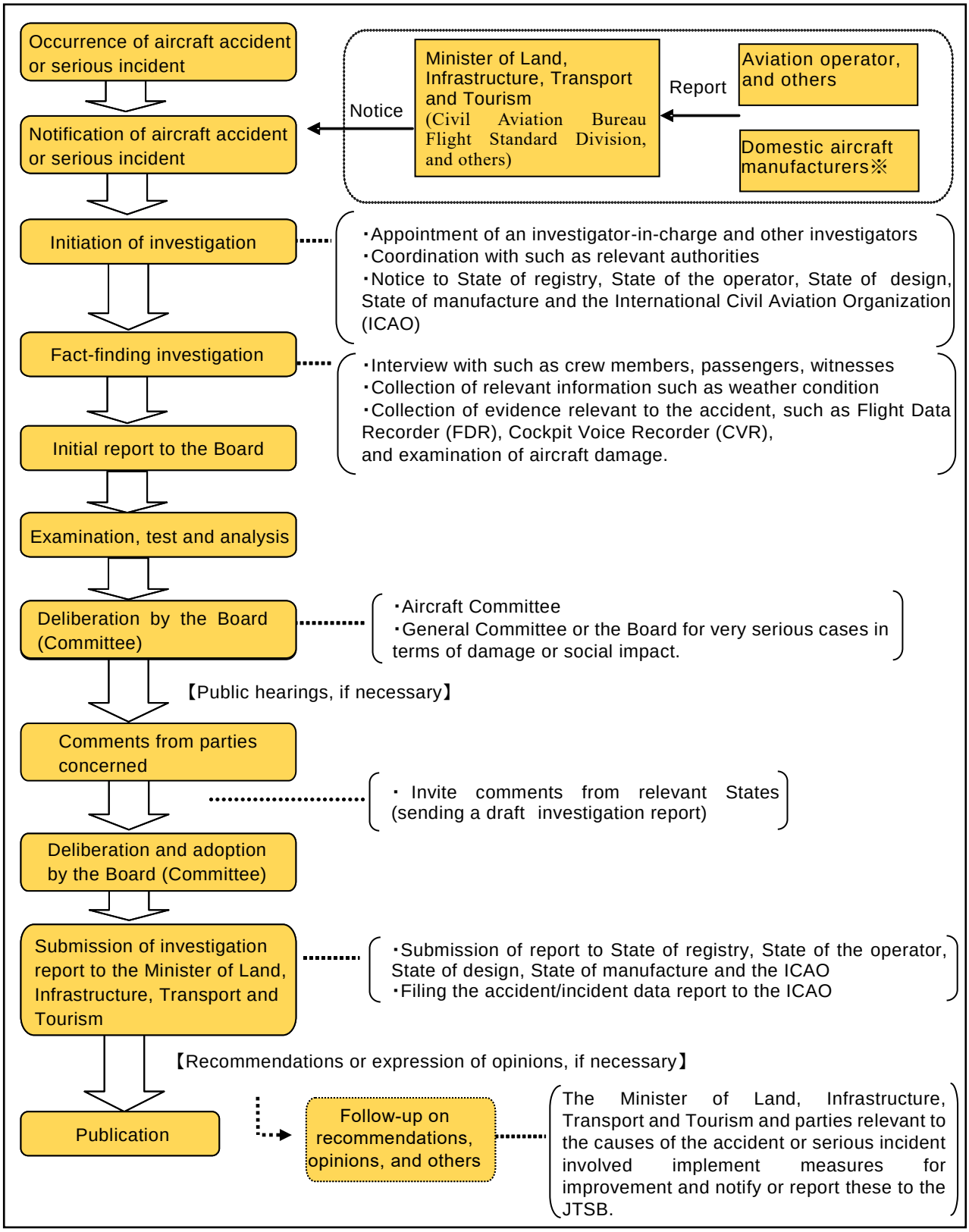
・When the pilot in command has recognized during flight that there was a danger of collision or contact with any other aircraft.

・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/serious incident investigation



* Provisions of the Act for Establishment of the Japan Transport Safety Board after its enforcement in June 2020

3 Statistics of investigations of aircraft accidents and serious incidents

The JTSB carried out investigations of aircraft accidents and serious incidentsas follows:

In 2019, 17 accident investigations had been carried over from 2018, and 12 accident investigations were newly launched. Besides, 15 investigation reports were published, and thereby 14 accident investigations were carried over to 2020.

Moreover, 15 serious incident investigations had been carried over from 2018, and 17 serious incident investigations were newly launched in 2019. Furthermore, 11 investigation reports were published in 2019, and thereby 21 serious incident investigations were carried over to 2020.

Among the 26 investigation reports published in 2019, one was issued with recommendations and none was issued with opinions.

Investigations of aircraft accidents and serious incidents in 2019

(Cases)

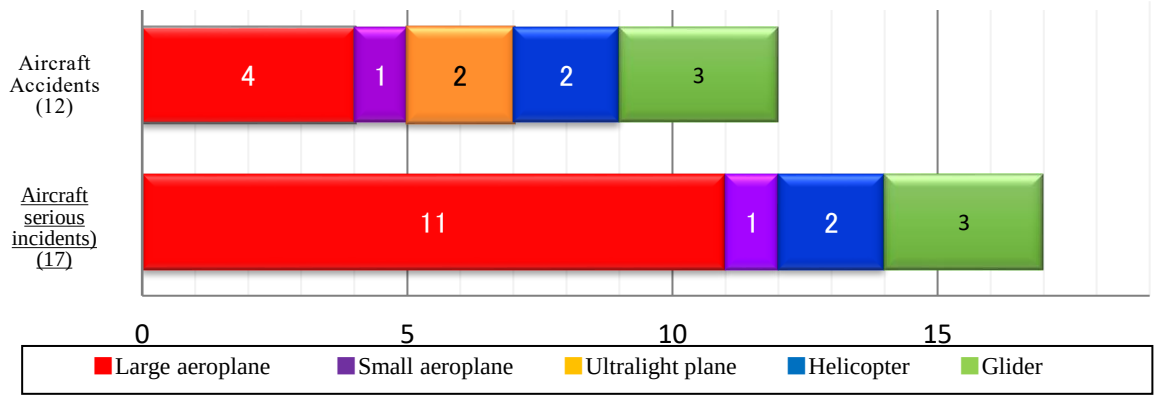
Category	Carried over from 2018	Launched in 2019	Total	Published investigation reports	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2020	(Interim report)
Aircraft accident	17	12	29	15	(1)	(0)	(0)	14	(0)
Aircraft serious incident	15	17	32	11	(0)	(0)	(0)	21	(0)

4 Statistics of investigations launched in 2019

The aircraft accidents and serious incidents that were newly investigated in 2019 consisted of 12 aircraft accidents, down two from 14 for the previous year, and 17 aircraft serious incidents, increased five from 12 for the previous year.

By aircraft category, the aircraft accidents included four cases involving large aeroplanes, one case involving small aeroplane, two cases involving ultralight planes, two cases involving helicopters, and three cases involving gliders. The aircraft serious incidents included 11 cases involving large aeroplanes, one case involving small aeroplane, two cases involving helicopters, and three cases involving glider.

Number of investigated aircraft accidents and serious incidents by aircraft category in 2019



* 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.
* Ultralightplanes include self - made aircraft in the form of ultralightplanes.

In the 12 aircraft accidents, the number of injuries was 12, consisting of one fatal injury and 11 serious/minor injuries.

Statistics of number of injuries (aircraft accident)

(Persons)

2019							
Aircraft category	Fatal Injuries		Missing		Serious/Minor Injuries		Total
	Crew	Passengers and others	Crew	Passengers and others	Crew	Passengers and others	
Large aeroplane	0	0	0	0	0	9	9
Small aeroplane	0	0	0	0	0	0	0
Helicopter	0	0	0	0	1	0	1
Ultralight plane	0	0	0	0	1	0	1
Experimental aircraft	1	0	0	0	0	0	1
Glider	0	0	0	0	0	0	0
Total	1	0	0	0	2	9	12
	1		0		11		

*The above statistics include incidents under investigation so may change depending on the status of the investigation and deliberation. In addition, for the number listed as “passengers” on the website in the number of injuries of an aircraft accident currently under investigation, the minimum number of pilots required to fly the aircraft are counted as “crew”.

5 Summaries of aircraft accidents and serious incidents which occurred in 2019

The aircraft accidents and serious incidents which occurred in 2019 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	Operator	Aircraft registration number and aircraft type
	Feb 27, 2019 Near a helipad in Sendai Airport, Miyagi Prefecture	Japan Coast Guard	JA184A Bell 505 (Rotorcraft)
	Summary	See "6. Publication of investigation reports" (page 56, No. 13)	
2	Date and location	Operator	Aircraft registration number and aircraft type
	April 29, 2019 Near Iwami Airport Runway, Shimane Prefecture	Privately Owned	JA2500 Glazer Dirks DG-500M (Motor glider)

	Summary	The aircraft, took off from Iwami Airport landed on the grass area short of the runway at Iwami Airport as its landing approach was made without its landing gear extended, and which caused damage to the airframe. There were no injuries.

3	Date and location	Operator	Aircraft registration number and aircraft type
	May 2, 2019 About 115 km north of Narita International Airport	T'way Air Co., Ltd.	HL8021 Boeing 737-800 (Large aeroplane)
	Summary	The aircraft took off from Seoul (Incheon) and was descending for Narita International Airport. The aircraft was shaken in the vicinity of the place mentioned above, and one cabin crew member was injured. The aircraft continued its flight and landed at the Airport. As a result, one cabin crew member was seriously injured.	

4	Date and location	Operator	Aircraft registration number and aircraft type
	May 2, 2019 Mountain (near Mt.Yakedake) in Matsumoto City, Nagano Prefecture	Privately Owned	JA505G Glaser-Dirks DG-500 Elan Orion (Glider)
	Summary	The glider took off from Hida Air Park and made a forced landing near the above-mentioned place during the flight, damaging the airframe. There were no injuries.	

5	Date and location	Operator	Aircraft registration number and aircraft type
	June 2, 2019 Kasumigaura (near Miho Village, Inashiki-gun, Ibaraki Prefecture)	Privately Owned	JR1102 Birdman Chinook Plus R582LS (Ultralight Plane)
	Summary	The ultralight plane left Kasumigaura, lost its altitude when it tried to turn right during the flight, and landed on the water in the vicinity of the above place. A captain was seriously injured.	

6	Date and location	Operator	Aircraft registration number and aircraft type
	July 29, 2019 Paddy field in Kuchido, Chikusei City, Ibaraki Prefecture	S・G・C Saga Aviation Co., Ltd.	JA9252 Aerospatiale AS350B(Rotorcraft)
	Summary	The aircraft took off from a temporary helipad in Chikusei City, Ibaraki Prefecture, and crashed in the vicinity of the above-mentioned place during pesticide spraying work. A captain was slightly injured.	

7	Date and location	Operator	Aircraft registration number and aircraft type
	August 15, 2019 About 140 km northeast of Beijing, at an altitude of about 5,500 m	All Nippon Airways Co., Ltd.	JA808A Boeing 787-8 (Large aeroplane)
	Summary	The aircraft took off from Tokyo International Airport. When the aircraft was shaken in the vicinity of the above-mentioned location during the flight, two cabin crew members and two passengers were injured. The aircraft continued its flight and landed in Beijing. As a result, two passengers were seriously injured and two cabin crew members were slightly injured.	

8	Date and location	Operator	Aircraft registration number and aircraft type
	August 27, 2019 Riverbed of Yahagi River in Shikinocho, Nishio City, Aichi Prefecture	Privately Owned	JA2529 Scheibe SF25C Falke (Moter glider)
	Summary	The motor glider stopped on a grass field in the riverbed of the Yahagi River in Shikinocho, Nishio City, Aichi Prefecture, during a take-off roll.	

9	Date and location	Operator	Aircraft registration number and aircraft type
	October 12, 2019	Japan Air	JA01JC

	About 65 km north-northwest of Tanegashima Airport, at an altitude of about 3,200m	Commuter Co., Ltd.	ATR 42-500 (Large aeroplane)
	Summary	The aircraft took off from Kagoshima Airport, and when the aircraft was shaken in the vicinity of the above-mentioned place during descent, the cabin As one crew member was injured, they returned to the Airport after requesting priority in air traffic control and landed there. As a result, one cabin crew member was seriously injured.	
10	Date and location	Operator	Aircraft registration number and aircraft type
	October 20, 2019 Around Niiharu, Kasumigaura City, Ibaraki Prefecture	Privately Owned	None TL-2000 STING carbon (Amateur built aircraft)
	Summary	After taking off from the temporary airfield, the aircraft crashed in the vicinity of the above-mentioned place during flight, the airframe was damaged, a fire occurred, and the captain died.	
11	Date and location	Operator	Aircraft registration number and aircraft type
	December 18, 2019 On the runway of Ryugasaki Airfield	New Central Airservice Co., Ltd.	JA3962 Cessna 172P (Small aeroplane)
	Summary	The aircraft took off from Ryugasaki Airfield, collided with a bird during continuous touch-and-go training at the Airfield, and sustained its flight and landed at the Airfield.	
12	Date and location	Operator	Aircraft registration number and aircraft type
	December 25, 2019 About 100 km north - northeast of Miyazaki Airport, at an altitude of about 9,100 m	Tigerair Taiwan	B50001 Airbus A320 232 (Large aeroplane)
	Summary	The aircraft took off from Hakodate Airport. When the aircraft was shaken in the vicinity of the above-mentioned location during the flight, one passengers and two cabin crew members were injured. The aircraft continued the flight and landed at Taoyuan. As a result, one cabin crew member was seriously injured, and one passenger and one cabin crew member were slightly injured.	

(Aircraft serious incidents)

1	Date and location	Operator	Aircraft registration number and aircraft type
	March.29, 2019 About 90 km southwest of Kansai International Airport, at an altitude of about 3,600 m	Jetstar Airways Pty Ltd.	VHVKJ Boeing 787-8 (Large Aircraft)
	Summary	The aircraft took off from Cairns and the right engine instrument display became unstable during the descent at an altitude of about 4,900m to Kansai International Airport. After that had the left engine temporarily fall below idle at the place mentioned above followed by the right engine temporarily falling below idle as well. The aircraft landed at the Airport.	
2	Date and location	Operator	Aircraft registration number and aircraft type
	April.23, 2019 Around Yamagata Airport runway	Fuji Dream Airlines Co., Ltd.	JA11FJ Embraer ERJ170-200STD (Large aeroplane)
	Summary	During the take-off rolling from Yamagata Airport, the aircraft run off the side of the runway and came to a stop in the grass area on the east side of the runway.	
3	Date and location	Operator	Aircraft registration number and aircraft type
	May 4, 2019 Around Oshima Airport runway	Privately Owned	JA121C Piper PA-46-350P (Small aeroplane)

	Summary	The aircraft took off from Yao Airport. When landing at Oshima Airport at 10:08, it overran the runway and stopped in the grass area near the runway.		
4	Date and location		Operator	Aircraft registration number and aircraft type
	June.1, 2019 About 580 km northeast of Narita International Airport, at an altitude of about 13,000 m		All Nippon Airways Co., Ltd.	JA828A Boeing 787-8 (Large aeroplane)
	Summary	The aircraft, took off San Jose International Airport, declared an emergency, made an emergency descent until an altitude of about 3,000 m because both of the two air conditioning systems became inoperative. After that, the aircraft canceled the declaration and continued the flight and landed at Narita International Airport.		
5	Date and location		Operator	Aircraft registration number and aircraft type
	June 15, 2019 About five km short of the southeast end of Runway A of Tokyo International Airport, at an altitude of about 300m, and on Runway A of Tokyo International Airport		Skymark Airlines Inc. (Aircraft A)	JA73AB Boeing 737-800 (Large aeroplane)
			All Nippon Airways Co., Ltd. (Aircraft B)	JA885A Boeing 787-9 (Large aeroplane)
	Summary	While Aeroplane A was approaching Runway A of Tokyo International Airport after receiving a landing clearance from the controller, Aeroplane B entered the runway after receiving a clearance to cross the runway. Aeroplane A landed on the runway after Aeroplane B crossed the runway.		
6	Date and location		Operator	Aircraft registration number and aircraft type
	June 19, 2019 At an altitude of about 640m, Aikawa-machi, Aiko-gun, Kanagawa Prefecture		Toho Air Service Co., Ltd.	JA6697 Aerospatiale AS355F2 (Rotorcraft)
	Summary	The rotorcraft took off from Tokyo Heliport and landed on the riverbed of the Nakatsugawa River in Aikawa Town, Aiko-gun, Kanagawa Prefecture at 18: 01 because the No. 1 (left) engine stopped at the place mentioned above during the flight.		
7	Date and location		Operator	Aircraft registration number and aircraft type
	July 7, 2019 At an altitude of about 900m, Kitami City, Hokkaido		Privately Owned (Aircraft A)	JA2288 Alexander Schleicher ASK21 (Glider)
			Privately Owned (Aircraft B)	JA4027 Avions Pierre Robin DR400-180R (Small aeroplane)
	Summary	While the Aircraft B was towing the Aircraft A over the vicinity of Kitami City after took off from a temporary Airfield in Kitami City, Hokkaido the towline connecting the two aircraft was severed. As the captain of the Aircraft A pulled the release device, part of the towline left by the Aircraft A fell down at the mentioned location. After that, the two aircraft landed on the temporary Airfield.		
8	Date and location		Operator	Aircraft registration number and aircraft type
	July 16, 2019 At an altitude of about 120 - 150m above Ikenojomachi, Komatsu City, Ishikawa Prefecture		Nakanihon Air Service Co., Ltd.	JA9478 Fuji Bell 204B-2 (Rotorcraft)
	Summary	While the rotorcraft was transporting materials by suspending them after took off from a temporary helipad in Komatsu City, Ishikawa Prefecture, a curing material (weight: about 1.8 kg) in the materials fell down near the above place.		
9	Date and location		Operator	Aircraft registration number

			and aircraft type
	July 21, 2019 On the runway of Naha Airport and about 3.7 km north of the runway threshold of Naha Airport, at an altitude of about 180m	Asiana Airlines Co., Ltd. (Aircraft A)	HL8256 Airbus A321-231 (Large aeroplane)
		Japan Transocean Air Co.,Ltd. (Aircraft B)	JA01RK Boeing 737-800 (Large aeroplane)
	Summary	The Aircraft A, which had been instructed by the controller to hold short of the runway at Naha Airport, entered the runway, therefore, the Aircraft B, which was approaching the runway after receiving a landing clearance, made a go-around under the controller's instructions.	
10	Date and location	Operator	Aircraft registration number and aircraft type
	August 22, 2019 Near the east side runway of Hyakuri Airfield	Eastar Jet	HL8052 Boeing 737-800 (Large aeroplane)
	Summary	When the aircraft took off from Incheon International Airport and landed at Hyakuri Airport, it attempted to land on the east side runway where the vehicle were located, not on the west side runway as instructed by the controller. After that, the aircraft made a go-around and landed on the runway on the west side of the airport.	
11	Date and location	Operator	Aircraft registration number and aircraft type
	September 16, 2019 At an altitude of about 150m, Komatsu Airfield	Privately Owned	JA01KY Diamond Aircraft HK36TTC Super Dimona (Motor Glider)
		Privately Owned	JA2471 Alexander Schleicher ASK21 (Glider)
	Summary	The object (towing rope) equipped with externally fell unintentionally from the aircraft.	
12	Date and location	Operator	Aircraft registration number and aircraft type
	October 3, 2019 On the runway of Misawa Airfield and about 2.8 km west of the threshold of Misawa Airfield at an altitude of about 190 m	Air Self - Defense Force (Aircraft A)	None F-2A (Large aeroplane)
		J-Air Co. Ltd. (Aircraft B)	JA216J Embraer ERJ170-100STD (Large aeroplane)
	Summary	As the Aircraft A, which had been instructed to hold short of the runway by the controller, entered the runway, the Aircraft B, which was approaching the runway after receiving a landing clearance, made a go-around under the controller's instruction.	
13	Date and location	Operator	Aircraft registration number and aircraft type
	October 30, 2019 About 20 km southwest of Miho Airport, at an altitude of about 10,400 m	Ibex Airlines Co., Ltd.	JA11RJ Bombardier CL-600-2C10 (Large aeroplane)
	Summary	While the aircraft was flying after taking off from Sendai Airport, the Pilot in Command found something like cracks in a cockpit windshield on his side at around the mentioned place. When the Pilot in Command was dealing with the situation according to the check list to be followed at the time of occurrence of damage to the windshield, the instrument indicated cabin decompression, therefore, he made an emergency descent to about 3,000m. In an emergency descent, the oxygen masks in the cabin were automatically deployed. The aircraft kept on flying and landed at Fukuoka Airport	

14	Date and location	Operator	Aircraft registration number and aircraft type
	November 30, 2019 At a point about 2 km or less south - southeast of Tokyo International Airport Runway A or on the same runway	Peach Aviation Co., Ltd.	JA806P Airbus A320-214 (Large aeroplane)
	Summary	The aircraft took off from Incheon International Airport, and when it entered or landed on Runway A of Tokyo International Airport after receiving a landing clearance from the controller, a work vehicle that had not received a crossing clearance entered the runway.	
15	Date and location	Operator	Aircraft registration number and aircraft type
	December 21, 2019 Matsuyama Airport	Privately Owned	JA36HK Diamond Aircraft HK36R Super Dimona (Motor Glider)
	Summary	Immediately after taking off from Matsuyama Airport, the aircraft returned to the airport due to reduced engine power and landed there.	
16	Date and location	Operator	Aircraft registration number and aircraft type
	December 21, 2019 About18 km west - southwest from Saga Airport	Privately Owned (Aircraft A)	JA3815 Beechcraft A36 (Small aeroplane)
		Spring Airlines Co., Ltd. (Aircraft B)	B-9940 Airbus A320-214 (Large aeroplane)
	Summary	The Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism received a report from the Aircraft B that while flying toward Fukue Airport, the Aircraft B passed over Saga Airport at an altitude of about 1,350 meters and abnormally approached the Aircraft A about 18 kilometers west-southwest of Saga Airport.	
17	Date and location	Operator	Aircraft registration number and aircraft type
	December 23, 2019 Near New Chitose Airport	Privately Owned	B3203 Embraer ERJ190-100ECJ (Large aeroplane)
	Summary	While the aircraft was approaching New Chitose Airport after taking off from Hong Kong, a series of problems occurred in the generators installed in the left and right engines, and all the displays in the cockpit disappeared. The aircraft continued its flight and landed at the airport.	

6 Publication of investigation reports

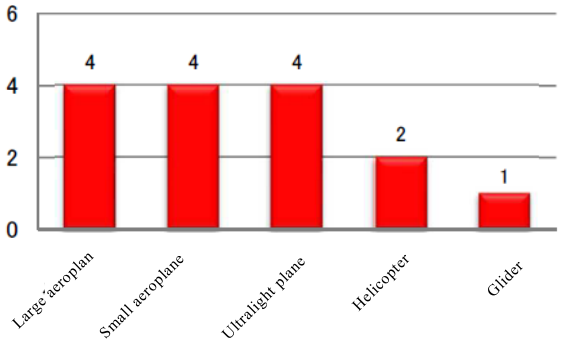
The number of investigation reports of aircraft accidents and serious incidents published in 2019 was 26, consisting of 15 aircraft accidents and 11 aircraft serious incidents.

Breaking them down by aircraft category, the aircraft accidents involved four large aeroplanes, four small aeroplanes, four ultralight planes, two helicopters, and one glider. The aircraft serious incidents involved four large aeroplanes, one small aeroplane, and four helicopters and two gliders.

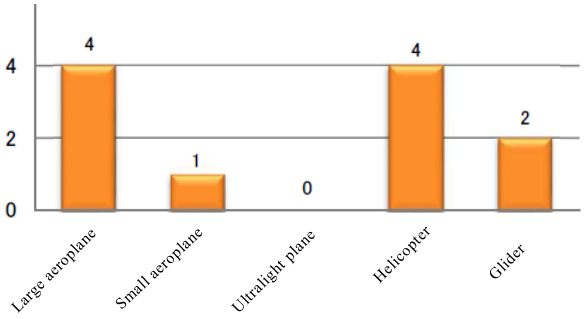
Note: In Aircraft accidents and serious incidents, two or more aircraft are sometimes involved in a single case. See page 51 to 62 for details.

In the 15 accidents, the number of injuries was 12, consisting of one fatal injury, and 11serious/minor injuries.

Number of published aircraft accident reports (15 cases) by aircraft category in 2019



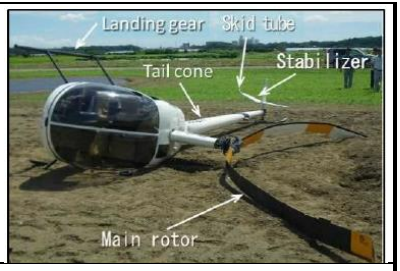
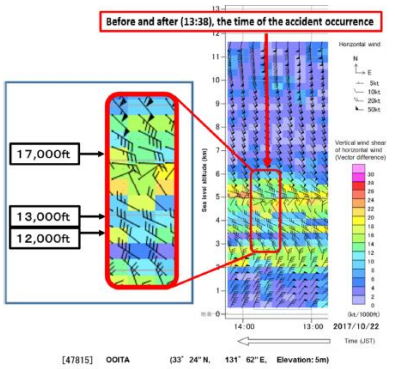
Number of published aircraft serious incident reports (11 cases) by aircraft category in 2019



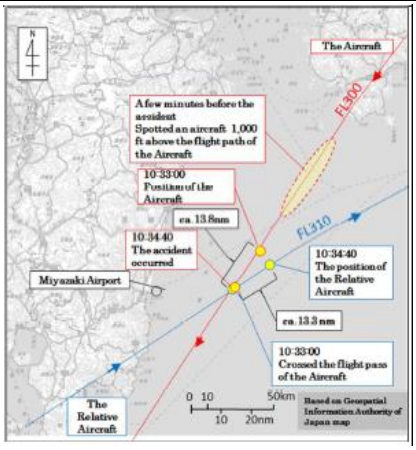
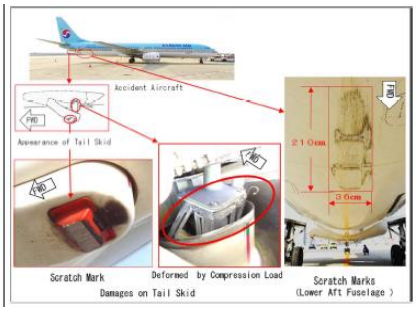
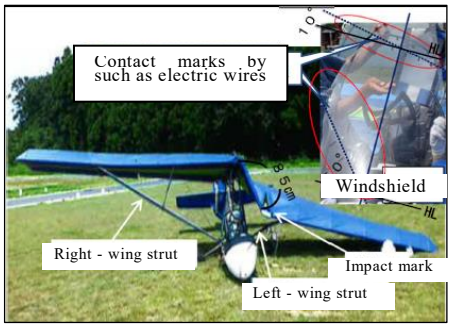
The aircraft accidents and serious incidents which occurred in 2019 are summarized as follows.

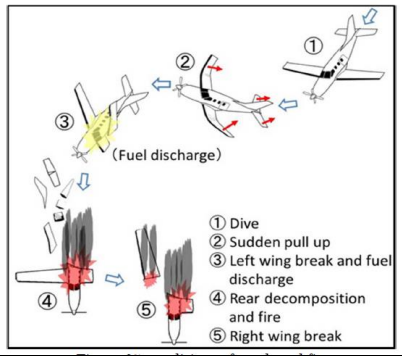
Aircraft accident investigation reports published in 2019

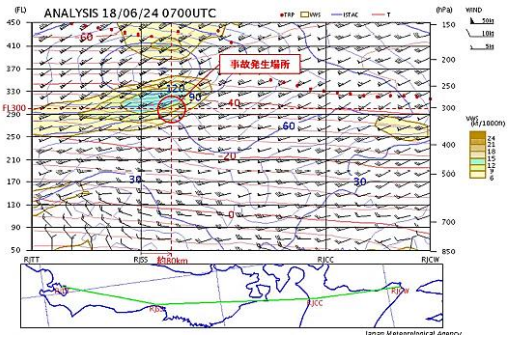
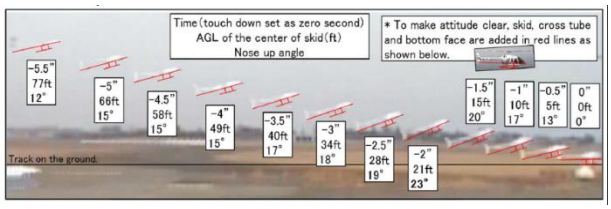
1	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	January 31, 2019	October 8, 2017 SemineTemporary Airfield in Kurihara City, Miyagi Prefecture.	Privately Owned	JA3447 BEECHCRAFT E33 (Small aeroplane)
	Summary	The aircraft overran the runway after rejecting the take-off at Semine Temporary Airfield in Kurihara City, Miyagi Prefecture. It rolled over to a paddy field and suffered damage to its airframe. One passenger was seriously injured. 		
	Probable Causes	It is highly probable that in this accident, the aircraft overran the runway after rejecting the take-off, rolled over to a paddy field, and suffered damage to its airframe. It is also highly probable that the reason why the aircraft overran the runway was because the weight of the aircraft exceeded the weight with which the aircraft would be able to safely take off within the range of the runway length at the airfield, and the remained distance to the runway end was reduced, leading to a delay in making a decision of rejecting the take-off.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA3447.pdf		
2	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	January 31, 2019	July 8, 2018 Near Fuseshita, Kashiwa-City, Chiba Prefecture	Privately Owned	JA7980 ROBINSON R22 BETA (ROTOR-CRAFT)
	Summary	The aircraft with two persons, a captain and passenger, on board, at a temporary helipad in Kashiwa-City, Chiba Prefecture rolled over during air-taxing and damaged the airframe.		

	Probable Causes	In this accident, it is somewhat likely that the helicopter rolled over while greatly changing the attitude because the captain was unable to perform an appropriate corrective action when the helicopter veered to the right during air-taxing due to a strong weathercock stability effect caused by a gust of wind from the right. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA7980.pdf		
3	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	March 28, 2019	July 11, 2017, Yano Town, Aioi City, Hyogo Prefecture	Privately Owned	G-BYLP HALES CS RAND KR-2 (Amateur-built aircraft, two-seater)
	Summary	The aircraft suffered damage to the aircraft during the forced landing on the golf course in Yano Town, Aioi City, Hyogo Prefecture.		
	Probable Causes	It is highly probable that this accident occurred because the aircraft collided with the stepped slope during the forced landing on the rough surface after the engine stopped due to the fuel exhaustion during flight, causing damage to the aircraft. It is somewhat likely that the engine stopped due to the fuel exhaustion during flight, because a fuel leakage occurred. However, it was impossible to identify the location and cause of the fuel leakage. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/G-BYLP.pdf		
4	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	March 28, 2019	October 22, 2017, Over Aso City, Kumamoto Prefecture	Spring Airlines Japan Co., Ltd.,	JA03GR, Boeing 737-800, (Large aeroplane)
	Summary	The aircraft took off from Narita International Airport with 134 people on board, consisting of the Pilot in Command, five other flight crew members and 128 passengers. The aircraft was shaken while it was flying toward Saga Airport, and one cabin attendant was injured		
	Probable Causes	It is highly probable that in this accident, because during descent, the aircraft encountered the turbulence caused by a radical change in wind speed and direction and was shaken badly, one cabin attendant, who was seated in the rear facing attendant seat at the left side aft cabin after fastening her seat belt, hit her lower back hard, resulting in a lumbar compression fracture. It is somewhat likely that the reason why one cabin attendant suffered a lumbar compression fracture at the time of the shaking of the aircraft despite her fastening seat belt firmly was that she was seated with her head bent forward and her back off the seat back, in addition to the fact that she hit her lower back hard due to the strong shaking, leading to the increase of the stress on her lumbar spine. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA03GR.pdf		
5	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	March 28, 2019	July.25, 2018 Near Kohnan Aerodorome,	Okayama Air Service Co.,	JA10AZ Cessna 172R

		Okayama City, Okayama Prefecture	Ltd.	(Small aeroplane)
	Summary	The aircraft collided with a bird while approaching the Aerodrome for training and sustained damage to the aircraft. There were three persons on board, consisting of the captain and two trainees, but there were no injuries.		
	Probable Causes	In this accident, is certain that because the aircraft collided with a bird, while making a right turn to the Aerodrome during the power-off accuracy approach training, it suffered damage.  		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA10AZ_Final Report.pdf		
6	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	April 25, 2019	November 11,2018 Ubuyama temporary airfield, Ubuyama Village, Aso-gun, Kumamoto Prefecture	Privately Owned	JR7366 BOGDOLA JANSON Type BB-02SERPA BENCE/R-R503 (Ultralight Plane, Two- seater)
	Summary	The aircraft crashed while flying near the Ubuyama temporary airfield in Ubuyama Village, Aso-gun, Kumamoto Prefecture after taking off from Ubuyama temporary airfield for leisure. The aircraft was destroyed and a pilot died.		
	Probable Causes	In this accident, it is somewhat likely that the aircraft stalled while it was repeatedly going up, down and turning at a low AGL altitude, and it could not recover, so it collided with the ground with the nose down attitude and crashed. 		
	Report	http://www.mlit.go.jp/jtsb/aircraft/rep-acci/AA2019-3-1-JR7366.pdf		
7	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	May 30, 2019	August 27, 2018 An altitude of about 9,100 m (FL300) over the sea about 45 km east of Miyazaki Airport	Vanilla Air Inc.,	JA14VA Airbus A320-214, (Large aerolane)
	Summary	The aircraft took off from Kansai International Airport and was flying to Amami Airport, when the aircraft was shaken in flight, a flight attendant fell down and got injured.		

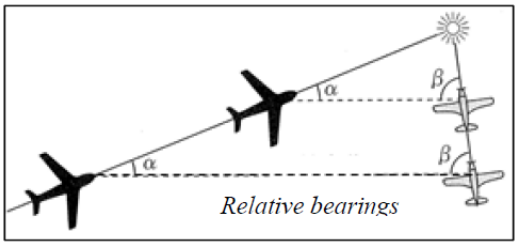
	Probable Causes	In this accident, it is probable that because the aircraft was shaken during cruising, a flight attendant fell down and got injured. It is probable that the aircraft was shaken, because wake turbulence from another aircraft still remained along the flight path of the aircraft. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA14VA.pdf		
8	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	June 27, 2019	April 9, 2018, On runway 06L at Kansai International Airport	Korean Air Lines Co., Ltd.,	HL7725 Boeing 737-900, (Large aeroplane)
	Summary	The aircraft suffered damage on the lower aft fuselage when making a go-around after a bounced landing on runway06L at Kansai International Airport at around 21:33 JST. There were 99 people in total on board, consisting of the PIC, seven other crew members, and 91 passengers. No one was injured		
	Probable Causes	In this accident, it is highly probable that the lower aft fuselage of the aircraft was damaged with contacting the runway because its pitch angle became too high during the go-around following the bounce at the time of the landing. Regarding the pitch angle became too high, it is somewhat likely that because the Captain, who thought the impact after the bounce would become hard and tried to avoid the second touchdown, performed large nose up maneuver. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/HL7725.pdf		
9	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	June 27, 2019	July 14, 2018 Motoishikawa Town, Mito City, Ibaraki Prefecture	Privately Owned	JR1118 Quiksilver, Inc. GT400S-R447L (Ultralight plane, Single - seat)
	Summary	The aircraft took off from Morito temporary airfield (9 m above sea level) in Morito Town, Mito City, Ibaraki Prefecture for a familiarization flight. While flying near the temporary airfield, the aircraft hit electric wires and overhead ground wires and crashed into a residential land. The aircraft was destroyed and the pilot was fatally injured. 		

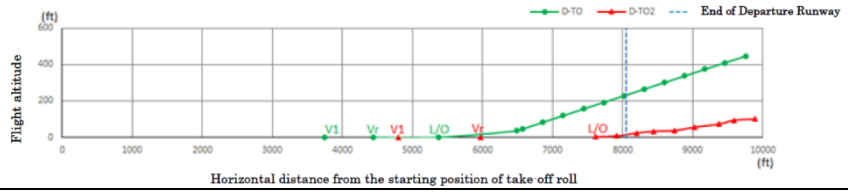
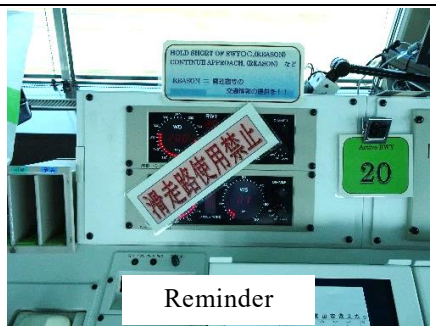
	Probable Causes	In this accident, it is highly probable that the aircraft crashed because it flew at a low altitude and touched such as electric wires. It is somewhat likely that the aircraft contacted with such as the electric wires, because the pilot could not visually recognize such as the electric wires, or could not avoid the visually recognized such as the electric wires. The reason why the aircraft flew at a low altitude could not be clarified because the pilot was fatally injured.		
	Report	http://www.mlit.go.jp/jtsb/aircraft/rep-acci/AA2019-5-2-JR1118.pdf		
10	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 25, 2019	August 14, 2017 Yamazoe Village, Yamabe-gun, Nara Prefecture	Privately Owned	N702AV Socata TBM700 (Small aeroplane)
	Summary	The aircraft took off from Yao Airport for the purpose of leisure flight under Instrument Flight Rules (IFR), deviated from the route instructed by an air traffic controller on the way to Fukushima Airport and crashed into a mountain forest in Yamazoe village, Yamabe-gun, Nara Prefecture after the last communication saying that it would return to Yao Airport. A captain and a passenger were on board the aircraft and both were fatally injured. The aircraft was destroyed and a fire broke out.		
	Probable Causes	In the accident, it is highly probable that the aircraft lost control during flight, nose-dived while turning, and disintegrated in mid-air, resulting in the crash. It is somewhat likely that the aircraft lost control during flight, because the captain did not have pilot skills and knowledge necessary for the operation of the aircraft, and was not able to perform proper flight operations. 		
	Report	http://www.mlit.go.jp/jtsb/aircraft/rep-acci/AA2019-6-1-N702AV.pdf http://www.mlit.go.jp/jtsb/aircraft/p-pdf/AA2019-6-1-p.pdf (Explanatory Material)		
11	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	August 29, 2019	December 9, 2018 Menuma Gliding Field Kumagaya City, Saitama Prefecture	Gakushuin School Corporation	JA2152, Alexander Schleicher ASK13 (Glider, Two Seater)
	Summary	The aircraft with a flight trainee alone on board for a flight training of soaring club activities, experienced hard landing when it aborted launching with winch launching after lifting off from Menuma Gliding Field, and consequently, the airframe was damaged and the flight trainee on board was seriously injured. 		
	Probable Causes	In this accident, it is highly probable that the glider experienced a hard landing and damage to the airframe, and the Trainee was seriously injured, because it was unsuccessful shift to normal climb attitude during the launching with winch launching, excessive nose down attitude at a low altitude when the glider aborted launching. Regarding the failure of the glider to shift to normal climb attitude during launching of the aircraft and excessive nose down attitude at a lower altitude, it is probable that because the maneuvering of pushing down of the control stick immediately after lift-off was excessive, and effect to limit the nose up attitude was largely acting.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA2152.pdf		

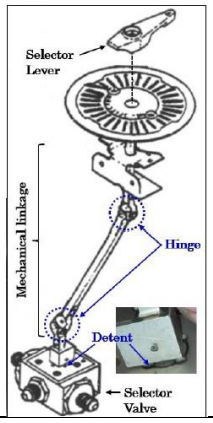
12	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	September 26, 2019	June 24, 2018, At FL300 over Kurihara City, Miyagi Prefecture	Japan Airlines Co., Ltd.,	JA8944 Boeing 777-300, (Large aeroplane)
	Summary	The aircraft as a scheduled flight 514, experienced a fierce shaking in-flight from New Chitose Airport to Tokyo International Airport, and a cabin attendant fell down and was injured.		
	Probable Causes	In this accident, it is highly probable that the aircraft encountered clear air turbulence while it was passing through the side edge of the jet stream, and because of that the aircraft was so fiercely shaken that the cabin attendant who was on the aft aisle of the aircraft fell down and was injured. With regard to the encountering of the aircraft with clear air turbulence, it is probable that the existence of VWS region on the flight route of the aircraft, which was stronger than the forecast confirmed prior to the flight, was attributable to the encountering. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA8944.pdf		
13	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	September 26, 2019	February 27, 2019, Sendai Airport	Japan Coast Guard School Miyagi Branch,	JA184A Bell 505 (Rotorcraft)
	Summary	The aircraft, with an instructor as a captain and two trainees on board, experienced hard landing while conducting autorotation full landing on the west helipad at Sendai airport and suffered damage to the airframe. 		
	Probable Causes	In this accident, it is highly probable that the helicopter experienced hard landing without stopping its descent speed and damaged the air frame, when the helicopter was executing autorotation Full Landing, because of the delayed commencement of deceleration and improperly subsequent maneuvering.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA184A.pdf		
	Reference	Case Studies (page 68)		
14	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 31, 2019	August 21, 2018, Chitose Airfield	Japan Coast Guard	JA395A Textron Aviation 172S (Small aeroplane)
	Summary	The aircraft suffered damage to the airframe by the Touch down accompanying a severe impact when landed at Chitose airfield. There were two passengers on board other than the examinee (captain) and no one was injured. 		
	Probable Causes	In this accident, it is highly probable that the aircraft suffered damages because it entered porpoise condition after the bounce at the first touchdown, and touched down hard on the nose gear in pitch down attitude at the third touchdown.		

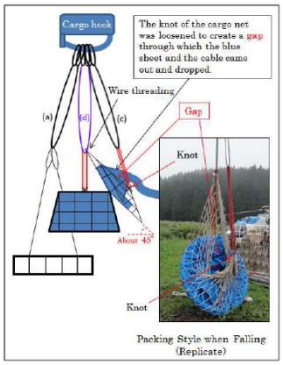
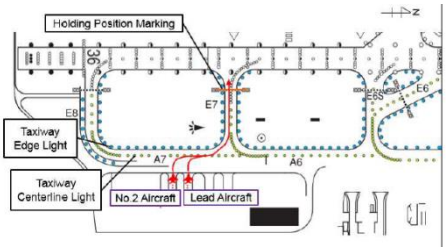
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA395A.pdf		
15	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 31, 2019	November 3,2018 Namegata City, Ibaraki Prefecture	Privately Owned	JR1749 KITFOX Model IV -1050 (Amateur built aircraft,Two-seater)
	Summary	While approaching the Kitaura temporary airfield in Namegata City, Ibaraki Prefecture, the aircraft hit trees and crashed. One pilot and one passenger were slightly injured.		
	Probable Causes	In this accident, it is probable that because the pilot could not see the top of the trees on the approach course and made a mistake in measuring the distance with his eyes, the right wing contacted the trees during the approach and crashed into the thicket and was destroyed. It is probable that the reason why the pilot could not see the top of the trees on the approach course and made a mistake in measuring the distance with his eyes that he tried to approach by descending while making a steep turn. 		
	Report	http://www.mlit.go.jp/jtsb/aircraft/rep-acci/AA2019-9-2-JR1749.pdf		

Aircraft serious incident reports published in 2019

1	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	Feburary 28, 2019	November 11, 2017, Akashi City in Hyogo Prefecture	Privately Owned (Aircraft A)	JA274J Robinson R44 II (Rotorcraft)
			Academic Corporte Body Hiratagakuen (Aircraft B)	JA831H Eurocopter EC135P2+ (Rotorcraft)
	Summary	Aircraft A took off from Yao Airport and was flying toward Taishi Temporary Helipad in Hyogo Prefecture. Meanwhile, Aircraft B took off from Hyogo Prefectural Kakogawa Medical Center Temporary Helipadand was flying toward JA Hyogo Minami-Uozumi Rice Center. Then, Aircraft A and Aircraft B were closely approaching each other over Akashi City in Hyogo Prefecture, and the pilot of Aircraft A took evasive actions as having recognized the risk of collision. 		
	Probable Causes	It is highly probable that in this serious incident, Aircraft A and Aircraft B approached each other because the PICs of both aircraft were not able to recognize each other until just before they came closer to each other. It is probable that both aircraft were not able to recognize each other until just before they came closer to each other because both aircraft were flying on a collision course, resulting in delay in visually identifying each other.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA274J_JA831H.pdf		
2	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type

	March 28, 2019	July 15, 2017, Runway 16L at Narita International Airport	Polar Air Cargo Worldwide Inc.	N852GT Boeing 747-8F (Large aeroplane)
	Summary	The aircrft as the company's scheduled flight 213, lifted off after performing its take-off roll all the way of the vicinity of the end of runway when taking off from runway 16L at Narita International Airport, resulting in a case equivalent to runway overrun. The captain and the first officer (FO) were on board the aircraft, but nobody suffered injuries and the aircraft had no damage.		
	Probable Causes	It is probable that in this serious incident, the aircraft commenced a take-off roll by using the take-off thrust lower than the thrust required for the aircraft to take off, causing it to take a longer take-off roll distance to lift off; and its lifting off in the vicinity of the end of departure runway resulted in a case equivalent to runway overrun. It is probable that the aircraft commenced a take-off roll by using the take-off thrust lower than the thrust required for the aircraft to take off, because the captain did not correctly change the FMC settings for the take-off thrust at the time of take-off from the runway different from what the captain and the FO had assumed, the captain did not correctly change the FMC settings for the take-off thrust, in addition, the captain and the FO did not ensure to verify the take-off thrust by the time when they commenced the take-off.  		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/N852GT.pdf		
	Reference	Case Studies (page 69)		
3	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	March 28, 2019	July 9, 2018 On runway at Toyama Airport	Aero Asahi Corporation	JA9690 Aerospatiale AS332L (Rotocraft)
	Summary	The aircraft (Aircraft A) landed on a runway being used by a vehicle (Vehicle B) for a runway inspection at Toyama Airport.		
	Probable Causes	It is highly probable that the serious incident occurred as the Aircraft A landed on the runway where there was the Vehicle B, because the Tower Controller issued a landing clearance to the Aircraft A on the runway, while forgetting about the presence the Vehicle B engaging in the runway inspection, in addition, the pilot of the Aircraft A did not recognize the Vehicle B on the runway. It is probable that the tower controller issued a landing clearance to the Aircraft A on the runway, while forgetting about the presence of the Vehicle B engaging in the runway inspection, because the tower controller did not scan the full length of the runway appropriately when issuingthe landing clearance, and besides, it was related to the fact that she did not use the reminder that should be used when a work vehicle enter the runway for a runway inspection. It is probable that the Pilot of the Aircraft A did not recognize the Vehicle B on the runway, because the visual scanning of the Pilot tended to concentrate on the range from the runway threshold to around the landing point.  Reminder		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA9690_180709.pdf		
4	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	March 28, 2019	September 26, 2018 A grassy field about 3 km southwest of Noto Airport	Academic Corporate Body Japan Aviation	JA2451 Valentin Taifun 17EII (Motor Glider, Two-seater)

			Academy	
	Summary	The aircraft took off from Noto Airport in order to make a test flight before the airworthiness inspection. During the flight, as causing trouble in its electric system, the aircraft tried to return to Noto Airport by gliding, but made a forced landing on a grassy field about 3 km short of Noto Airport, and sustained damage to the landing gear, therefore, the operation of the aircraft could not be continued.		
	Probable Causes	In this serious incident, it is somewhat likely that because at the time of the forced landingon a grassy field, the aircraft slowed down rapidly while its nose veered to the left due to singlesided braking of left side and stopped with its nose facing to the left abeam relative to the approach direction, its right main landing gear and the nose landing gear were damaged, therefore, the operation of the aircraft could not be continued. It is probable that the aircraft made a forced landing on a grassy field, because the Pilot judged that it would be impossible to reach the runway, though he shut down the engine to commence gliding, since fumes were felt and a thin white smoke was seen on the way back to the Airport due to the electric power loss. Regarding fumes and a white smoke recognized by the Pilot, it is probable that because the battery was not properly installed in the aircraft and the defect in the coating of the battery wiring was not detected during the preflight inspection, the core wire of the feeder cable contacted with the mounting bracket of the battery, which caused an electrical short circuit, generating fumes and a white smoke. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA2451.pdf		
5	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	April 25, 2019	October 6, 2017 An altitude of about 1,500 ft (about 500 m) over Ishikari City Hokkaido,	Privately Owned	JA3500 Cessna 172K (small aeroplane)
	Summary	The aircraft took off from Sapporo Airfield in order to make a familiarization flight for the passenger, but its engine stopped at about 18:50 while flying over Ishikari City, therefore it made a forced landing on the sands of Ishikari Beach.		
	Probable Causes	It is probable that in this serious incident, the engine stopped during the flight, because the fuel in the right fuel tank was exhausted due to the one-sided reduction in fuel between tanks that might allow air to enter the fuel system, which resulted in not allowing the fuel to reach the engine. It is also somewhat likely that an one-sided reduction in fuel between tanks occurred, because the selector lever was not set in a normal detent position of the BOTH and the fuel flow from the left fuel tank was restricted. It is probable that the fact that the captain and the passenger did not fully monitor the fuel quantity indicators during the flight contributed to the engine stop due to drying up of the fuel in the right fuel tank.  		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA3500.pdf		
6	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	May 30, 2019	August 21, 2018 Fukushima-town, Matsumae-gun, Hokkaido Prefecture	Nakanihon Air Service Co., LTD.	JA9660 Aèrospatiale AS332L (Rotorcraft)

	Summary	The aircraft dropped the blue sheet and the cable from the cargo net that was slung external to the aircraft, while flying over a mountain forest in Fukushima-town, Matsumae-gun, Hokkaido Prefecture		
	Probable Causes	In this serious incident, it is highly probable that because the knot of one of the cargos net was loosened to create a gap during the multiple external cargos sling flight, the blue sheet and the cable came out through the gap and dropped on the ground. Regarding why the knot of cargo net was loosened to create a gap, the wire was threaded through the other cargo net wrapping the cable; moreover, it is somewhat likely that because the aircraft flew with the cargo net tilted as the part of the Wire Threading was pulled up, since the total length of the sling wire for the tools' cargo was short rather than the planned length. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA9660_180821.pdf		
7	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	July 25, 2019	June 14, 2018 Naha Airport	Japan Air Self-Defense Force (JASDF) (Aircraft A)	52-8850, F-15J (Large aeroplane)
			Japan Air Self-Defense Force (JASDF) (Aircraft B)	32-8818, F-15J (Large aeroplane)
			Ryukyu Air Commuter Co., Ltd., (Aircraft C)	JA84RC, Bombardier DHC-8-402 (Large aeroplane)
	Summary	Aircraft A and Aircraft B made incursionson runway 36 at Naha Airport without obtaining ATC clearance when Aircraft C was on the final approach to the runway after obtaining landing clearance.		
	Probable Causes	In this serious incident, it is highly probable that two scramble aircraft in formation misinterpreted the instruction of the air traffic controller; thus, they entered the runway where the Aircraft A was approaching for landing after obtaining landing clearance. It is probable that the misinterpretation of the instruction of the air traffic controller by the scramble aircraft was contributed by the fact that the Formation Leader and the Wingman, who were temporarily working at the Naha Air Base, were paying a great deal of attention to their taxiing under time pressure, that they were not familiarized with the environment at Naha airport such as lighting facilities, and so on., and that they had not completely acquired the operations implemented at the Naha Air Base such as radiocommunications, and so on. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/52-8850_32-8818_JA84RC.pdf		
8	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	September 26, 2019	June 29, 2018 Narita international airport	Korean Airlines Co., Ltd.	HL7573 Boeing 777-300 (Large aeroplane)
	Summary	The aircraft had the right main landing gear aft axle fractured when landing at Narita international airport. Consequently, the aircraft was forced to halt and was unable to continue taxiing on the taxiway.		

	Probable Causes	It is certain that the aircraft had the right main landing gear aft axle fractured when landing in the serious incident, and subsequently, it was forced to halt on taxiway and could not continue taxiing. It is highly probable that the fractured axle was attributed to the SCC originated from the corrosion generating on the pivot bore and ongoing operations of the aircraft thereafter with cracking occurred. It is highly probable that the corrosion generated on the pivot bore was contributed by water penetration caused by the torn fillet seal due to rotation of the bushings and corrosion inhibitor that was not applied. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/HL7573.pdf https://www.mlit.go.jp/jtsb/aircraft/p-pdf/AI2019-6-1-p.pdf (Explanatory Materials)		
	Reference	Case Studies (page 70)		
9	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 31, 2019	September 5, 2017 Tokyo International Airport	Japan Airlines Co., Ltd	JA743J Boeing 777-300 ER (Large aeroplane)
	Summary	On Tuesday, September 5, 2017, a Boeing 777-300 ER, registered JA743J, operated by Japan Airlines Co., Ltd., had noise generating from the No. 1 engine (the left engine) along with indication of occurrence of engine failure illuminated on instruments immediately after take-off from runway 34R at Tokyo International Airport, and consequently, shut down the engine and returned to the airport for landing after obtaining a priority from air traffic control. The inspection conducted after landing revealed that multiple stages of stator vanes and turbine blades in low pressure turbine (LPT) of the engine were damaged and a hole was confirmed to have been generated in turbine rear frame.		
	Probable Causes	It is highly probable that the serious incident was caused by collisions of some of fragments with turbine rear frame (TRF), which led to generating the hole due to damage to multiple stages of stator vanes and turbine blades of low pressure turbine (LPT) of No. 1 (left side) engineimmediately after take-off.  Damaged condition of LPT fifth stage disk and blades (left) and sixth stage disk and blades (right) It is highly probable that damage to multiple stages of stator vanes and turbine blades of low pressure turbine was contributed by the fracture of one of LPT fifth stage stator vanes. It is highly probable that the fracture of one of LPT fifth stage stator vanes was contributed by the crack generated by stress concentration caused by arch-binding, which progressed to the fracture by repetitive stress associated with engine operation.		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA743J.pdf http://www.mlit.go.jp/jtsb/aircraft/p-pdf/AI2019-7-1-p.pdf (Explanatory Materials)		
	Reference	Feature 1 (4) (page 9), Case Studies (page 71)		
10	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	October 31, 2019	October 20, 2018 Otoyo Town, Nagaoka Gun Kochi Prefecture	Nishi Nippon Airlines Co., Ltd.	JA003W Bell 412 EP (Rotorcraft)

	Summary	The aircraft dropped the fresh concrete from the bucket that was slung external to the aircraft while flying over the mountain forest in Otoyo Town, Nagaoka County, Kochi Prefecture. There was no damage to the ground.		
	Probable Causes	In the serious incident, it is highly probable that the fresh concrete dropped on the ground by unintended opening of the shutter while the aircraft was flying with loading the fresh concrete in the bucket. It is probable that the unintended opening of the shutter was caused by the increased load imposed on the shutter when the helicopter was shaken due to rough air condition and was flying in the situation that the locking by the over center mechanism of the shutter was not properly working. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA003W.pdf		
11	Date of Publication	Date and location	Operator	Aircraft registration number and aircraft type
	November 28, 2019	July 7, 2019 Kitami City, Hokkaido	Non-Profit Organization Aero Sports KITAMI	JA4027(Aircraft A): Avions Pierre Robin DR400/180R, (Rotercraft) JA2288(Aircraft B): Alexander Schleicher ASK21(Rotercraft)
	Summary	When Aircraft B was flying at an altitude of about 3,000 ft after taking off from Sky-port KITAMI (temporary airfield) towed by Aircraft A, a tow rope connecting both aircraft was fractured. Immediately thereafter, the tow rope that remained in Aircraft B dropped on the ground. There were no injury and damage to the aircraft and the ground.		
	Probable Causes	In this serious incident, it is highly probable that, when the tow rope was fractured while Aircraft A was towing Aircraft B, the captain of Aircraft B, who did not recognize the rope break and judged that it was dangerous to follow Aircraft A by seeing it making descending turn to the left, operated the tow rope release lever, that caused the tow rope remaining in Aircraft B to drop. 		
	Report	https://www.mlit.go.jp/jtsb/eng-air_report/JA4027_JA2288.pdf		

7 Actions taken in response to recommendations in 2019

Actions taken in response to recommendations were reported with regard to three aircraft accidents and one aircraft serious incident in 2019. Summaries of these reports are as follows.

(1) Aircraft accident involving Cessna 172P JA3989, operated by New Central Airlines Co., Ltd.

(Safety recommendations on August 30, 2019)

On August 30, 2018, the Japan Transport Safety Board (JTSB) released the investigation report and made a recommendation to the Minister, the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) regarding the accident of Cessna 172P, registered JA3989, operated by New Central Airlines Co., Ltd., which occurred in the viinity of the top of Mt. Shishi-dake in the Tateyama

Mountain Range on June 3, 2017. On June 13, 2019, the JTSB received the following notification regarding the status of measures taken in response to the recommendation from the company.

○Summary of the Accident

On Saturday, June 3, 2017, a Cessna 172P, registered JA3989, operated by New Central Airservice Co.,Ltd., took off from Toyama Airport, while flying to Matsumoto Airport, at around 14:50

Live Camera at Murodo

Japan Standard Time (JST: UTC+9 hours, unless otherwise stated all times are indicated in JST), it crashed into the vicinity of the top of Mt. Shishi-dake (elevation about 2,700 m) in the Tateyama Mountain Range.

There were four people on board the aircraft consisting of a PIC, a pilot and two passengers and all of them were fatally injured.

The aircraft was destroyed but there was no outbreak of fire.

○Probable causes

It is probable that as the aircraft got into clouds during VFR flight over the mountain region, it became difficult for the PIC and the pilot to grasp its own position and surroundings by confirming visually the terrain, then, the aircraft approached the vicinity of the mountaintop and crashed into it.

It is somewhat likely that the aircraft approached the vicinity of the mountaintop and crashed into it due to loss of visual contacts making the crash unavoidable, or due to failure to maintain minimum safe altitude caused by the aircraft icing or stalled condition, or due to encountering a severe turbulence. However, it could not be determined, since the PIC and all members on board were fatally injured.

Concerning the fact that the aircraft came to fly into clouds, it is probable that the PIC and the pilot had not confirmed thoroughly the weather forecast for the mountainous region before departure and they delayed in making a decision to turn back during flight.

○Recommendations to the Minister of Land, Infrastructure, Transport and Tourism

In this accident, it is probable that as the aircraft got into clouds during VFR flight over the mountain region, it became difficult for the aircraft to grasp its own position and the surroundings by confirming visually the terrain, then, the aircraft approached the vicinity of the mountaintop and crashed into it.

It is somewhat likely that the aircraft approached the vicinity of the mountaintop and crashed into it due to loss of visual contacts making the crash unavoidable, or due to failure to maintain minimum safe altitude caused by the aircraft icing or stalled condition, or due to encountering a severe turbulence. Concerning the fact that the aircraft came to fly into clouds, it is probable that the PIC and the pilot had not confirmed thoroughly the weather forecast for the mountainous region before departure and they delayed in making a decision to turn back during flight.

In view of the result of this accident investigation, the Japan Transport Safety Board recommends pursuant to the provision of Article 26 of the Act for Establishment of the Japan Transport Safety

Board that the Minister of Land, Infrastructure, Transport and Tourism should take the following measures in order to prevent the aircraft accidents and reduce damage from those when they occur.

(1) Make it known to pilots that the icing conditions are extremely hazardous for the aircraft not certificated for flight in icing conditions and those aircraft should definitely avoid flying in icing conditions.

(2) Encourage pilots for small airplanes to fasten their seat belts and shoulder harnesses and instruct them to ask their passengers to fasten their seat belts.

(3) Provide small aircraft users with the information on the appropriate installation and operation of the ELTs.

(4) Request relevant organizations to ensure that each search and rescue (SAR) aircraft during SAR operation shall be able to precisely listen on the distress frequencies.

○Safety Actions taken in response to the recommendations

In light of the occurrence of accidents involving small aircraft including this accident, the Ministry of Land, Infrastructure, Transport and Tourism has been taking measures to prevent the recurrence of such accidents, such as re-publicizing leaflets on the danger of flying in clouds, making and distributing safety awareness videos, and widely publicizing the importance of confirming meteorological conditions and complying with the flight manual. In response to the above recommendations, the Ministry has taken the following additional actions.

1. Promoting understanding and strengthening of guidances for pilots of small aircraft

(1) About the recommendations on such as flights under icing conditions, wearing of seat belts, proper installation and operation of ELTs

(a) On August 30, 2018, a notice was issued to operators of small aircraft and related organizations. (Attachment 1 and Attachment 2)

(b) Based on the opinions of experts and relevant organizations at the fifth Small Aircraft Safety Promotion Committee held on October 3, 2018, the following measures were taken :

① On October 24, 2018, a leaflet based on the recommendations was made and distributed with the cooperation of the relevant organizations and the Board, and a pilot competency assessor was requested to use the leaflet to promote understanding and confirm knowledge at Specific Pilot Competence Review. (Attachment 3)

② On October 24, 2018, a document was issued to operators of small aircrafts and related organizations, and they requested them to make the contents of the leaflet known and to promote understanding. (Attachment 4)

③ On March 29, 2019, the Specific Pilot Competence Review Oral Guidance was revised, and the contents of the leaflet were added to the examination items.(Attachment 5)

(c) The leaflets were posted on the website of the Ministry of Land, Infrastructure, Transport and Tourism, and the "Safe Operation Seminars" held at major airports throughout Japan from October 26 to November 21, 2018 were also conducted to raise awareness and awareness.

(2) Recommendations on proper installation and operation of ELTs

ELTs installation, on board and operation methods are being verified through airworthiness inspections and other opportunities since September 2018.

2. Request to relevant organizations for search and rescue of aircraft

(1) On August 30, 2018, a document was issued to the relevant organizations (National Police Agency, Fire and Disaster Management Agency, Japan Coast Guard, the Japan Coast Guard, and the Ministry of Defense) involved in the search and rescue of aircraft, requesting them to take actions based on the recommendations. (Attachment 6)

(2) On September 18, 2018, the Civil Aviation Bureau held a meeting of persons in charge with the relevant organizations and requested them to take actions based on the recommendations.

*The original text of the notification from the Minister of Land, Infrastructure, Transport and Tourism can be found on the JTSB website.

http://www.mlit.go.jp/jtsb/airkankoku/kankoku11re_010627.pdf

Column

AIR-meeting 2019

Aircraft Accident Investigator

AIR for AIR-meeting is an abbreviation of "Accident Investigator Recorders." It is composed of persons in charge of analysis of flight recorders (commonly known as black boxes) from various countries. The persons in charge of analysis share their experiences gained from such as research work, and discus new flight recorders and trends in the revision of regulations of ICAO. It was held for the first time at NTSB (U.S.A.) in 2004. Eleven countries and regions including the U.S.A., Canada, and France, which have major aircraft design and manufacturing companies, participated, and it has been held every year since then.

Japan participated in this meeting for the first time in 2006, and since 2008, it has always participated. Japan became the first host country, and this meeting was held in Tokyo for three days from Tuesday, September 10 to Thursday, September 12, 2019, with 33 participants from 19 organizations from 15 countries and regions.

The AIR-meeting consists of two parts: an update presentation and a technical presentation. The first part introduces each organization's analysis LAB and recent efforts, and provides knowledge about the equipment and equipment necessary for performing analysis work. The second part introduces new analysis techniques and experiences in accident analysis, and improves the analysis capability of each accident investigation organization by sharing analysis techniques and knowledge. It also discusses the problems with flight recorders and regulations that analysts face.

In recent years, electronic devices such as GPS receivers, smartphones, and digital cameras have rapidly developed and become familiar to us. As a result, there have been many

cases in which accident conditions have been recorded in these devices. However, in aircraft accidents and similar incidents, devices that have been brought into the aircraft may be severely damaged, and data cannot be retrieved from such damaged devices in the usual way (for details, see Column 2019 of the Japan Transport Safety Board Annual Report). AIR-meeting includes information about the equipment and techniques needed to retrieve data from such damaged devices and how to analyze the retrieved data.

At first, Japan did not have any opportunities to experience the state-of-the-art analytical techniques of the design and manufacturing countries or the standard analytical methods adopted by many countries.However, by participating in this meeting and obtaining a lot of information, I was able to learn analysis methods and techniques, and as an accident investigation agency in the country of design and manufacture of Mitsubishi Space Jet (MSJ), I was able to develop the necessary environment and know-how one after another.
In the future, we will continue to collect information to further improve our analysis technology. Furthermore, in order to improve our analysis level on a global scale, we will further strengthen our cooperative relationships with research institutions in various countries, aiming to cooperate with research institutions that seek know - how from now on, as we learned methods and technologies at this AIR-meeting.

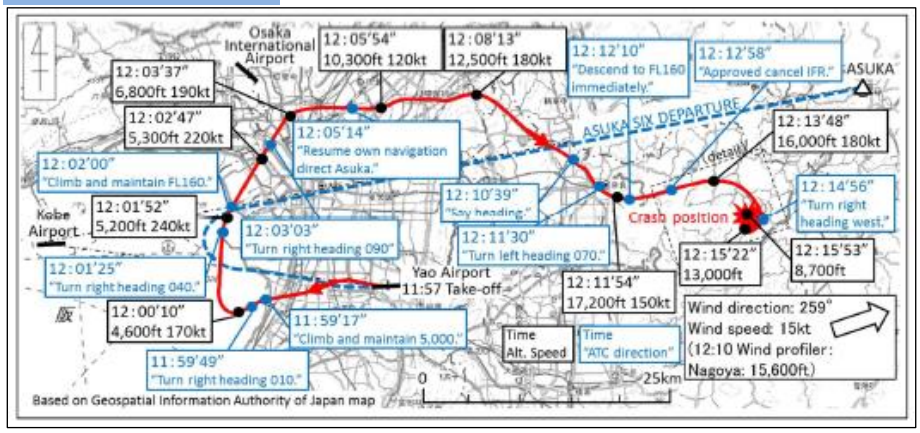
8 Summaries of major aircraft accident and serious incident investigation reports (case studies)

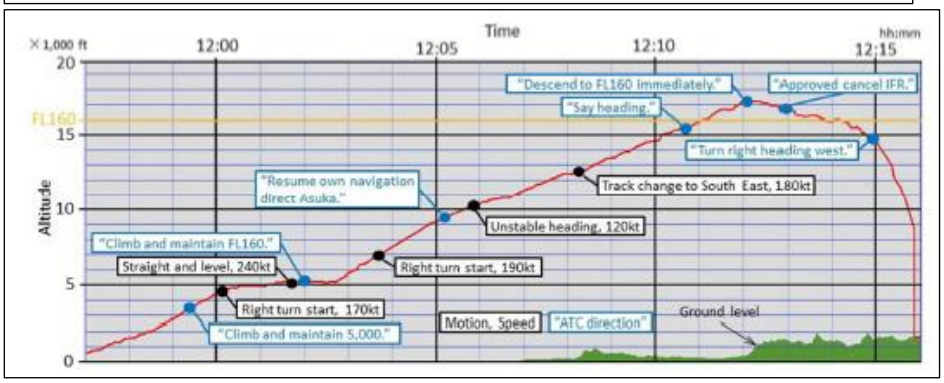
Crash due to loss of control during flight
Privately owned Socata TBM700, N702AV

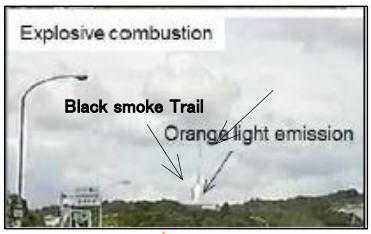
Summary of the accident：On Monday, August 14, 2017, a privately owned Socata TBM700, registered N702AV,took off from Yao Airport at 11:57 Japan Standard Time (JST: UTC + 9 hours; all times are indicated in JST on a 24-hour clock), for the purpose of leisure flight under Instrument Flight Rules (IFR), deviated from the route instructed by an air traffic controller on the way to Fukushima Airport and crashed into a mountain forest in Yamazoe village, Yamabe-gun, Nara Prefecture after the last communication at 12:13, saying that it would return to Yao Airport. A captain and a passenger were on board the aircraft and both were fatally injured. The aircraft was destroyed and a fire broke out.

Findings

History of the flight







Nose-dive（Loss of control）

It is somewhat likely that because the airspeed exceeded a maneuvering speed due to nose-diving, the captain rapidly pulled up in order to make a turnaround of the situation, resulting in mid-air breakup as exceeding the ultimate flight load factor limits.

the left wing was broken→the fuel was discharged（ignited）→the right wing was broken →crashed

It is highly probable that the captain had suffered diseases that might affect the performance of aviation and the medical and pharmaceutical products were prescribed to him.

The captain did not declare his medical history and prescribed medical products in the submitted application form

The captain should not have engaged in the performance of aviation duties until the conformity to the standards for medical examinations was confirmed.

Further instructions due to failure to properly deal with control instructions

○neglected the responses in air traffic control, deviated from the instructed altitude
○delayed in read-back
○not able to fly IFR in accordance with the instruction from the controller about the heading and the altitude.

（ ▭ is the point the captain couldn't follow ATC instructions）

The captain did not have the pilot competence to fly IFR.

The captain was not able to control the Aircraft.

He forgot to return the position of the yaw trim from the take-off position.
→He did not realize he had forgotten and did not return the position of the yaw trim to the end.

He often conducted an unusual flight as he forgot to return the position of the yaw trim many times before; it is somewhat likely that this is because the captain did not understand the influence from the yaw trim placed in the wrong position

There was no record indicating that the captain received classroom lectures and training by an appropriate instructor.

The captain did not have pilot skills and knowledge necessary for the operation of the Aircraft

Probable Causes: In the accident, it is highly probable that the Aircraft lost control during flight, nose-dived while turning, and disintegrated in mid-air, resulting in the crash.
It is somewhat likely that the aircraft lost control during flight, because the captain did not have pilot skills and knowledge necessary for the operation of the Aircraft, and was not able to perform proper flight operations.

For details, please refer to the accident investigation report. (Published on July 25, 2019)
http://www.mlit.go.jp/jtsb/eng-air-report/N702AV.pdf

The Japan Transport Safety Board has stated recommendations to the Ministry of Land, Infrastructure, Transport and Tourism.
For details, please refer to "Chapter 1: Summary of recommendations and opinions issued in 2019 (page 46).

Damage to airframe due to hard landing

Japan Coast Guard School Miyagi Branch, Bell 505, JA184A (Rotorcraft)

Summary of the accident: On Wednesday, February 27, 2019, a Bell 505, registered JA184A, belonging to Japan Coast Guard School Miyagi Branch, with an instructor as a captain and two trainees on board, experienced hard landing while conducting autorotation full landing on the west helipad at Sendai airport and suffered damage to the airframe

Findings

Situation before performing the autorotation full landing

The instructor presumed from the wind situation and so on that the condition was suitable for the opportunity to conduct demonstration flight of Full Landing, which each trainee is obliged to conduct once or more in the basic operation stage.

There are two different types of the training for "autorotation landing" assuming the case that the engine stops in the airspace; "Power Recovery" that is to approach by autorotation setting the engine idle and then to transfer to hovering setting the engine back to normal flight status when descending to near the ground, and "autorotation full landing (hereinafter referred to as "Full Landing")" that is to touch down setting the engine idle as it is.

History of the flight

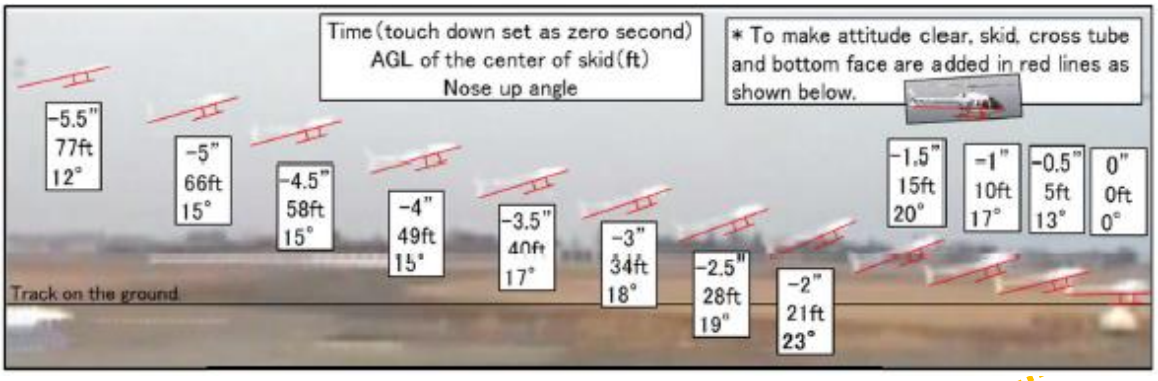
Trainee A conducted six times touch and go training. The fifth and sixth trainings were autorotation power recovery.

Though the instructor intended to commence deceleration during the descent at 150 ft above the ground level (AGL) where "MINIMUM" automatically sounds, and the instructor was sure to manage to land by normal maneuvering although the helicopter was around 100 ft AGL due to a slight delay

The instructor maneuvered to moderate flare maneuvering (nose up maneuver to mitigate the descent rate and the speed at touchdown) so that the helicopter did not touch down short of the paved area by reducing the speed too excessively, and then, the helicopter was coming close to the ground before a sufficient deceleration had been obtained.

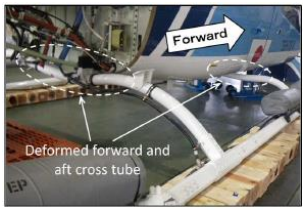
The instructor presumed that the helicopter could not touch down if nose up attitude was kept unchanged,and accordingly, set the nose to horizontal attitude.

At the same timing, the helicopter touched down accompanied by a strong impact, slid to the left and finally came to a halt slightly pointing to the right.

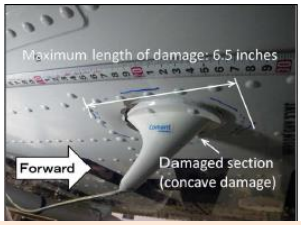


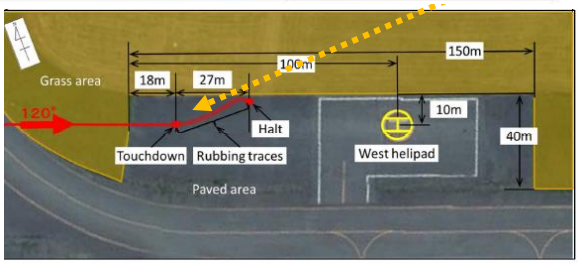
Damage to Aircraft

Deformed cross tube



Damaged antenna mounting





The situation of the accident (From three crews)

The instructor should cancel the autorotation when the instructor recognized the deceleration could not be commenced at an altitude according to the prescribed procedure.

Probable causes: In this accident, it is highly probable that the helicopter experienced hard landing without stopping its descent speed and damaged the air frame, when the helicopter was executing autorotation Full Landing, because of the delayed commencement of deceleration and improperly subsequent maneuvering.

For details, please refer to the accident investigation report. (Published on September 26, 2019)
https://www.mlit.go.jp/jtsb/eng-air_report/JA184A.pdf

Case equivalent to runway overrun (lift off in the vicinity of the end of departure runway)

Polar Air Cargo Worldwide Inc, Boeing 787-8F, N852GT

Summary of serious incident: On Saturday, July 15, 2017, at 22:41 JST, a Boeing 747-8F, registered N852GT, operated by the Polar Air Cargo Worldwide Inc. as the company's scheduled flight 213, li fted off after performing its take off roll all the way of the vicinity of the end of runway when taking off from runway 16L at Narita International Airport, resulting in a case equivalent to runway overrun. The captain and the first officer were on board the aircraft, but nobody suffered injuries and the aircraft had no damage.

Findings

History of the Flight (JST)

○The captain knew runway operation procedure during the hour from 21:00 to 23:00

○The captain had been often taken off from runway 16R in the past an d the spot 207 was closer to runway 16R

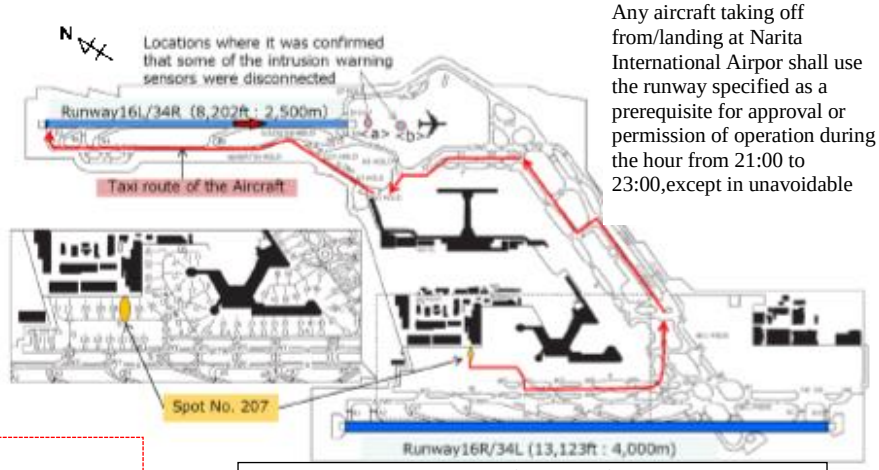
The captain assumed that the Aircraft would be able to take off from runway 16R.

21:53:07 The Narita Deliver y issued a clearance with r unway 16L

The captain changed FMC take off data settings.

○The captain instructed the FO as the PM to verify that there was no discrepancy of the take off data between FDP and FMC after completing the changes of the take off data settings

○After changing the necessary FMC settings, he did not brief on the verification of the take off data by using CDU.



Any aircraft taking off from/landing at Narita International Airpor shall use the runway specified as a prerequisite for approval or permission of operation during the hour from 21:00 to 23:00,except in unavoidable

22:40:16 The thrust levers of the aircraft were advanced forward and t he aircraft commenced take off from r unway 16L

22:41:07 The aircraft passed the departure end of r unway 16L at the radio altitude of about 16 ft.

※1 "Flight Management Computer (FMC)" is a flight ma nagement computer that constitutes FMS.
※2 "Flight Management System (FMS)" supports flight crew members with regard to navigation , performance, fuel monitoring, and display in the cockpit

Take off data

The flight crew members of the company obtain the FDP data which required for take-off.

➤The dispatchers provided the crew members with the TLR putting runway 16R, which had been set as the default in performance calculation for the airport, as its PRWY.
➤The flight crew members verify the content s of the FDP data and input the FMC data by ref erring to the FDP data.

Runway	Maximum take-off weight (x 1,000 kg)	Flaps	Assumed Temperature (℃)	Take-off thrust	N1 values (%)	V1※12 (kt)	VR※13 (kt)	V2※14 (kt)
16R	369.2	10	40	D-TO2	88.4	159	168	178
16L	369.2	20	38	D-TO	97.2	137	150	165

Take off Thrust

➤Rated Takeoff Thrust : TO, De-rated Takeoff Thrust: 10%reduction of TO(TO1), 20%reduction of TO(TO2)
➤Assumed Temperature Method (ATM): ATM which is lower than Rated Take off Thrust obtain ing by FMC calculation using an assumed temperature higher than the actual ambient temperature. (D-TO, D-TO1, D-TO2)
※In this report, when combined with the ATM, take-off thrust is expressed with Assumedtemperature (in case of38℃) such as D-TO (38) and D-TO2 (38).

FMC setting

Before ATC Clearance (FDP)
16R
F10/D-TO2(40), N1:88.4%

After ATC Clearance (FDP)
16L
F20/D-TO(38), N1:97.2%

Take off
16L
F20/D-TO2(38), N1:88.8%

Cross checking by the crew members did not function well when they changed FMC settings due to runway change

QAR Records and the Estimated Values by the Manufacturer

	Horizontal distance from the starting position of take-off roll to the position of lifting off	Flight attitude at the end of departure runway
QAR Records	7,720ft	16ft
Estimated Values by the Manufacturer	5,370ft	230ft

Probable causes (excerpt): It is probable that in this serious incident, the aircraft commenced a take off roll by using the take off thrust lower than the thrust required for the aircraft to take off, causing it to take a longer take off roll distance to lift off; and its lifting off in the vicinity of the end of departure runway resulted in a case equivalent to runway overrun.

For details, please refer to the serious incident investigation report. (Published on March 28, 2019)
https://www.mlit.go.jp/jtsb/eng-air_report/N852GT.pdf

Aircraft disable to continue taxiing due to fractured landing gear axle

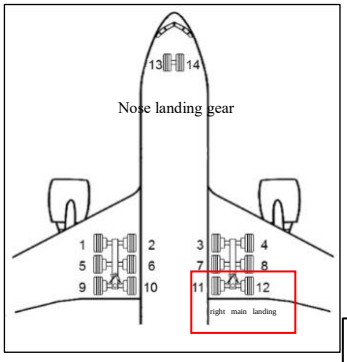
Korean Air Co., Ltd., Boeing 777-300, HL7573

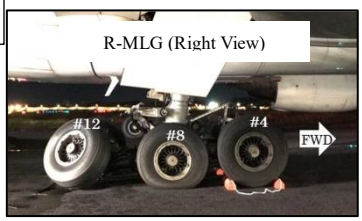
Summary of the serious incident: On Friday, June 29, 2018, a Boeing 777-300, registered HL7573, operated by Korean Airlines Co., Ltd., had the right main landing gear aft axle fractured when landing at Narita international airport. Consequently, the aircraft was forced to halt and was unable to continue taxiing on the taxiway.

Findings

History of the flight

10:38 The aircraft took off from Incheon airport.
12:37 The aircraft arrived at Narita International airporttook off from Incheon airport.
Around 12:41, Other aircraft reported with radio communication to the Narita Ground that it sighted something, which was seemingly smoke, on the right main landing gear aft of the aircraft; and subsequently, the Narita Ground instructed the aircraft to halt at the position where it was.
Around 12:43, The captain halted the aircraft in accordance with the instruction from the Narita Ground.





Damage to Aircraft

(Slightly damage) ・The R-MLG AFT Axle was fractured. ・The R-MLG Truck beam was damaged. ・The R-MLG Steering system was damaged. ・Hydraulic hoses of Brake and the Steering system were cut. ・Hydraulic system fluid leaked. ・Brake components were damaged. ・Electric cables and junction box of the R-MLG were damaged.

Situation of main dameges to aircraft (The R-MLG AFT Axle was fractured)

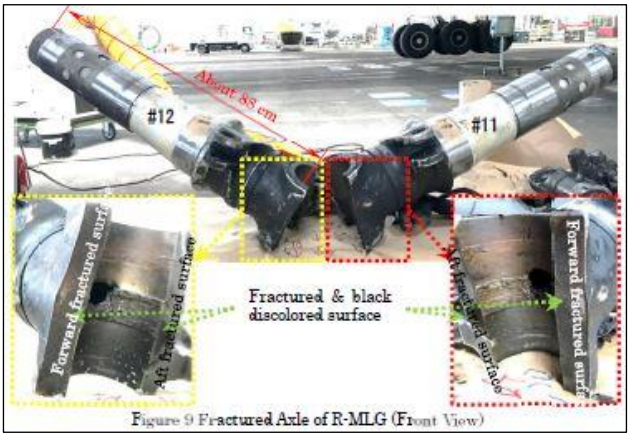
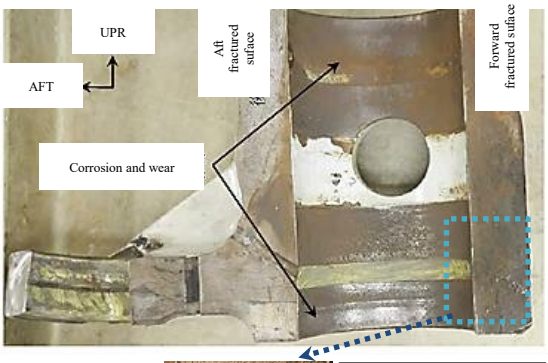


Figure 9 Fractured Axle of R-MLG (Front View)

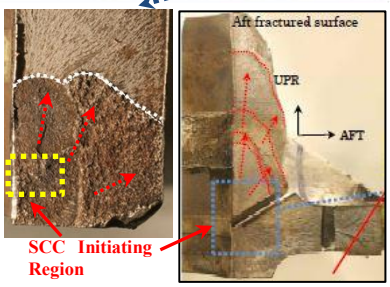
○The entire fractured surface of the front side of the pivot discolored black due to the corrosion.
○It wasconfirmed that a partially black-discolored portion due to corrosion and a grey new metal surface were confirmed on the fractured surface of the aft side of the pivot.



The forward fractured surface had an initiating region of corrosion on the lower side of the pivot boree,then was generating SCC and finally was fractured due to repetitively imposed loads.

The fillet seal was damaged due to the rotation of the bushings, which allowed water to penetrate between the pivot bore and the bushings.

The aft fractured surface was caused by SCC initiated by the corrosion generated on the lubrication passage, which then led to progressing cracking due to repetitively imposed loads.



Probable causes: It is certain that the aircraft had the right main landing gear aft axle fractured when landing in the serious incident, and subsequently, it was forced to halt on taxiway and could not continue taxiing.
It is highly probable that the fractured axle was attributed to the SCC originated from the corrosion generating on the pivot bore and ongoing operations of the aircraft thereafter with cracking occurred.
It is highly probable that the corrosion generated on the pivot bore was contributed by water penetration caused by the torn fillet seal due to rotation of the bushings and corrosion inhibitor that was not applied.

For details, please refer to the serious incident investigation report. (Published on September 26, 2019)
https://www.mlit.go.jp/jtsb/eng-air_report/HL7573.pdf

Case equivalent to damage to engine casing

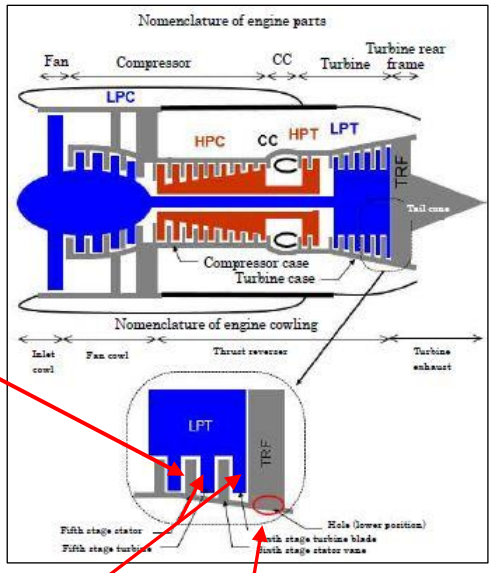
Japan Airlines Co., Ltd., Boeing777-300ER, JA743J

Summary of the serious incident: On Tuesday, September 5, 2017, a Boeing 777-300 ER, registered JA743J, operated by Japan Airlines Co., Ltd., had noise generating from the No. 1 engine (the left engine) along with indication of occurrence of engine failure illuminated on instruments immediately after take-off from runway 34R at Tokyo International Airport, and consequently, shut down the engine and returned to the airport for landing after obtaining a priority from air traffic control.
The inspection conducted after landing revealed that multiple stages of stator vanes and turbine blades in low pressure turbine (LPT) of the engine were damaged and a hole was confirmed to have been generated in turbine rear frame*.
*Turbine rear frame (TRF) is a structural part to attach the engine to the airframe.

Findings

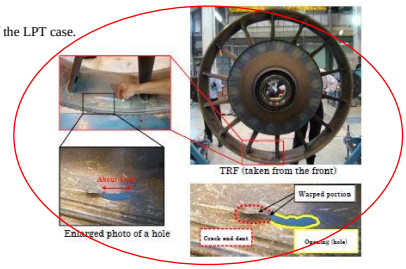
Fractured No.1 Engine

➤①One of LPT fifth stage stator vanes was fractured



➤②Fifth and sixth stage turbine blades which were downstream from LPT fifth stage stator vanes were damaged all along the circumference.

➤③A hole in size of about 6 cm x about 1 cm, concave deformation (dent) and crack were confirmed on the lower section of TRF attached to the aft flange of the LPT case.



Analysis of findings

The crack was generated due to the in creased stress of the trailing edge of L PT fifth stage stator vanes caused by a rch-binding,.

※**Arch-Binding** refers to the cond ition of adjacent segments that are stuck tight, and the free moveme nts of the adjacent segments are i mpeded.

The crack progressed due to the repetitive stress by engine operations.

One of LPT fifth stage stator vanes was fractured・・①

Continuous collisions of those fragments with fifth and sixth stage turbine blades →secondary damage. ・・②

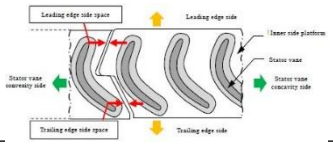
Collisions of fragments generated by the damaged LPT→the hole of TRF ・・③

Action before this serious incident occur

Engine manufacturer's action

March and April 2013
In-house test on the same type of the engine conducted by the engine manufacturer indicated the occurrence of the engine failure, whichis similar to the serious incident.

Changed design in a way to widen the space of adjacent segments of stator vanes.



The engine manufacturer published the service bulletin (SB72-0637) on May 4, 2015 notifying that the design-changed LPT fifth stage stator vanes segment is compatible with previous parts for use as spare parts.

Handling of service bulletin (SB72-0637) by the Operator

The Operator intended to replace LPT fifth stage stator vanes segment when it became worn away and required the replacement with a spare part which has design change in accordance with the service bulletin

Probable causes (excerpt): It is highly probable that the serious incident was caused by collisions of some of fragments with TRF, which led to generating the hole due to damage to multiple stages of stator vanes and turbine blades of LPT of No. 1 (left side) engine immediately after take-off.
It is highly probable that damage to multiple stages of stator vanes and turbine blades of low pressure turbine was contributed by the fracture of one of LPT fifth stage stator vanes.
It is highly probable that the fracture of one of LPT fifth stage stator vanes was contributed by the crack generated by stress concentration caused by arch-binding, which progressed to the fracture by repetitive stress associated with engine operation.

For details, please refer to the serious incident investigation report. (Published on October 31, 2019)
https://www.mlit.go.jp/jtsb/eng-air_report/JA743J.pdf

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="4" rowspan="2">All accidents*1) [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="8">Accidents that are particularly rare and exceptional [Ordinance 1-4]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 1-5]</td><td colspan="7">・Accidents involving the death of a passenger, crewmember, 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. [Notice 1-1]</td><td></td></tr>
<tr><td colspan="8">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 Railway 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 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.]

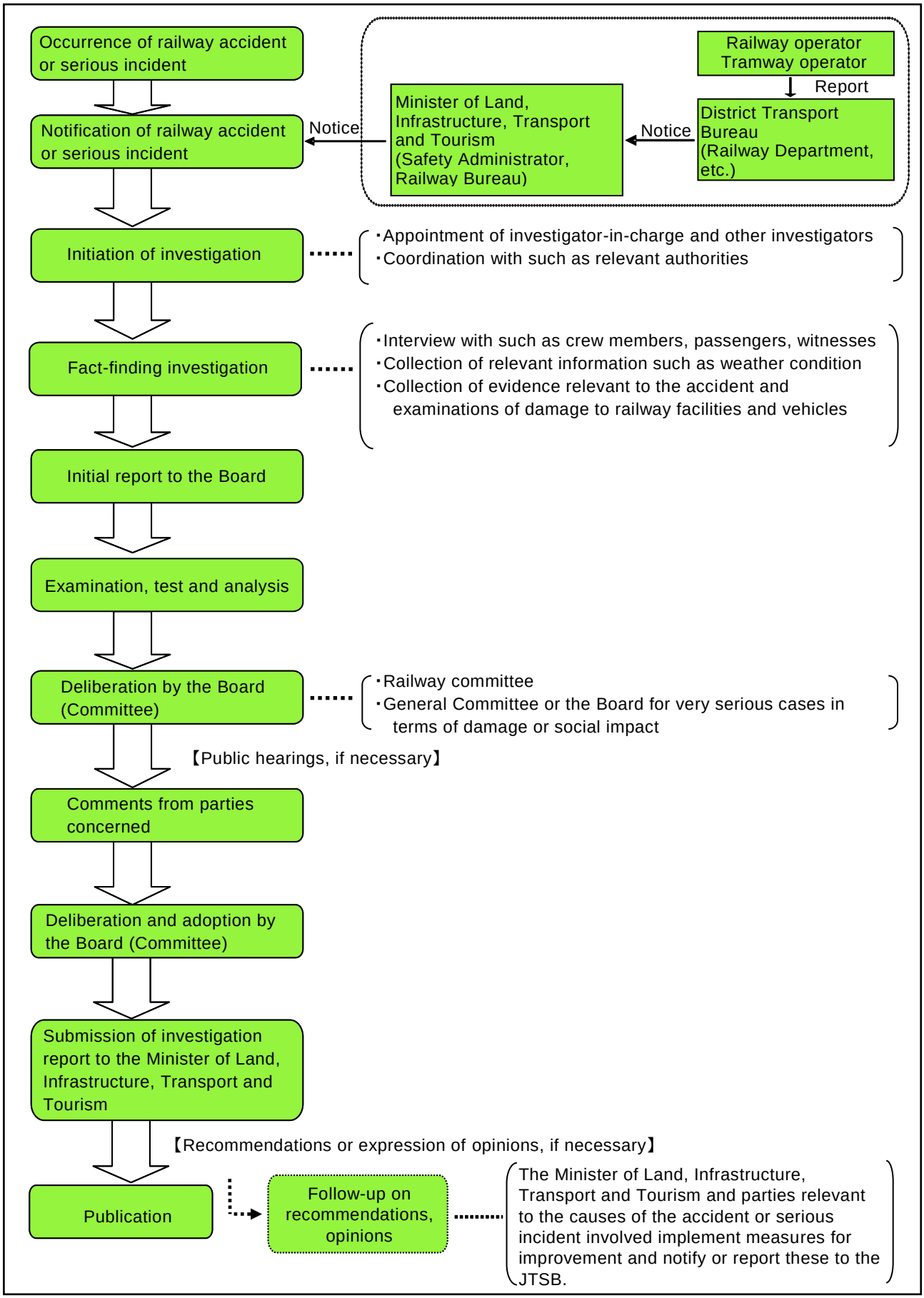
5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the situations equivalent to those specified 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><td>Category</td><td>・Incorrect management of safety block</td><td>・Incorrect indication of signal
・Violating red signal</td><td>・Dangerous damage in facilities</td><td>・Dangerous trouble in vehicle</td><td>・Main track overrun
・Violating closure section for construction
・Vehicle derailment
・Heavy leakage of dangerous object
・Others</td></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></td><td>・Incorrect management of safety block</td><td>・Violating red signal</td><td>・Dangerous damage in facilities</td><td>・Dangerous trouble in vehicle</td><td>・Main track overrun
・Heavy leakage of dangerous object
・Others</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/serious incident investigation



3 Statistics of investigations of railway accidents and serious incidents

The JTSB carried out investigations of railway accidents and serious incidents in 2019 as follows:

In 2019 11 accident investigations had been carried over from 2018, and 17 accident investigations were newly launched. Besides, 13 investigation reports were published in 2019, and thereby 15 accident investigations were carried over to 2020.

Moreover, three serious incident investigations had been carried over from 2018, and two serious incident investigations were newly launched in 2019. Furthermore, three investigation reports were published in 2019, and thereby two serious incident investigations were carried over to 2020.

Among the 16 investigation reports published, the JTSB provided no recommendation and one opinion.

Investigations of railway accidents and serious incidents in 2019

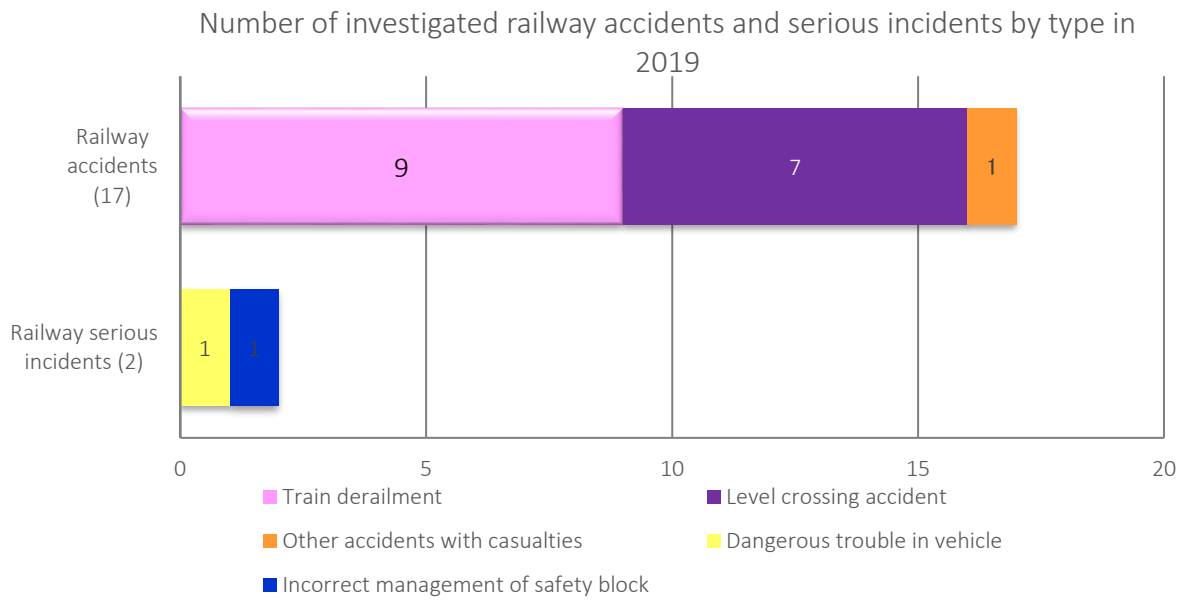
(Cases)

Category	Carried over from 2018	Launched in 2019	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2020	(Interim report)
Railway accident	11	17	28	13	(0)	(1)	15	(0)
Railway serious incident	3	2	5	3	(0)	(0)	2	(0)

4 Statistics of investigations launched in 2019

The railway accidents and serious incidents that were newly investigated in 2019 consisted of 17 railway accidents, increased six from 11 for the previous year, and two railway serious incidents, same number as the previous year.

The breakdown by type of accidents and serious incidents is as follows: The railway accidents included nine train derailment accidents, seven level crossing accidents, and one case of railway injury. The railway serious incidents included one dangerous trouble in vehicles and one dangerous damage in facilities.



There were 28 persons killed were killed or injured in 17 accidents, eight of whom were killed and 20 were injured.

The number of casualties (in railway accidents)

(Persons)

2019							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	0	8	1	18	1	28
Total	8			20			

*The above statistics include incidents under investigation so may change depending on the status of the investigation and deliberation.

5 Summaries of railway accidents and serious incidents which occurred in 2019

The railway accidents and railway serious incidents which occurred in 2019 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)
	January 9, 2019 Train	Kumamoto Electric Railway Co.,Ltd	Between Kurokami-machi station and Fujisakigumae station,, Fujisaki Line, Kumamoto Prefecture
	Summary	See “6 Publication of investigation reports” (Page 90, No.12)	
2	Date and accident type	Railway operator	Line section (location)
	January 16, 2019 Train derailment	Saitama New Urban Transit Co., Ltd.	Between Kamonomiya Station and Tetsudo-Hakubutsukan Station, Ina Line, Saitama

			Prefecture
	Summary	The driver of the train noticed a loud noise from the rear of the train, then applied the emergency brake. When the driver checked the car after stopping, he found that the tire of the left running wheel of the front axle among the two axles of the sixth car in the direction of travel was broken and the car was off the track.	
3	Date and accident type	Railway operator	Line section (location)
	March 21, 2019 Level crossing accident	East Japan Railway Company	Yamanonelevel crossing, class 4 level crossing without automatic barrier machine nor road warning device, on the premises of Zushi Station, Yokosuka Line, Kanagawa Prefecture
	Summary	The driver of the train heard an abnormal sound, so he resorted to emergency braking action and confirmed that the train collided with a pedestrian. After that, the pedestrian was rescued but was confirmed to be dead.	
4	Date and accident type	Railway operator	Line section (location)
	April 13,2019 Level crossing accident	Fukui Railway Co., Ltd.	Yabugaichi level crossing, class 3 level crossing without automatic barrier machine but equipped with road warning device, between Iehisa station and Sundome-Nishi station, Fukubu Line, Fukui Prefecture
	Summary	See “6 Publication of investigation reports” (Page 91, No.13)	
5	Date and accident type	Railway operator	Line section (location)
	April, 14, 2019 Train derailment	Konan Railway Co., Ltd.	Between Chuo-Hirosaki Station and Hirokoshita Station, Owani Line, Aomori Prefecture
	Summary	When the driver of the train noticed an impact while running between Chuo-Hirosaki Station and Hiroko-shita Station, he stopped the train, checked and found that the first axle of the first bogie of the first train was derailed.	
6	Date and accident type	Railway operator	Line section (location)
	May 4, 2019 Level crossing accident	Hitachinaka Seaside Railway Co., Ltd.	Mitanda Daiichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Kaneage Station and Nakane Station, Minato Line, Ibaraki Prefecture
	Summary	The driver of the train recognized a car entering the level crossing from the left side in the traveling direction, sounded a whistle, and resorted to emergency braking action, but the train hit the car. Subsequently, the car driver was confirmed to be dead and the car passenger was confirmed to be injured.	
7	Date and accident type	Railway operator	Line section (location)
	May 22, 2019 Level crossing accident	East Japan Railway Company	Sasaki level crossing, class 3 level crossing equipped with road warning device but without automatic barrier machine, between Yomogita Station and Gosawa Station, Tsugaru Line, Aomori Prefecture
	Summary	When the train was passing the level crossing, the driver of the train noticed an abnormal noise, so he resorted to emergency braking action, then the train passed the level crossing and stopped. After stopping the train, the train driver contacted the transport order and confirmed that the pedestrian had lain. After that, the pedestrian being hit by the train was confirmed to be dead.	
8	Date and accident type	Railway operator	Line section (location)
	June 1, 2019 Other accident with casualties	Yokohama Seaside Line Co., Ltd.	In the premises of Shin-Sugita Station, Kanazawa Seaside Line,Kanagawa Prefecture
	Summary	After the train departed from Shin-Sugita Station, the starting station, it proceeded in the opposite direction to the original direction of travel, collided with the car stop at the end of the line, and stopped. 17 injured persons * Information as of February 27, 2020, Interim Report	

9	Date and accident type	Railway operator	Line section (location)
	June 1, 2019 Level crossing accident	Akita Nairiku Jukan Railway Co., Ltd.	Kamatari level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Ugo-Nagatoro Station and Yatsu Station, Akita Nairiku Line, Akita Prefecture
	Summary	The driver of the train sounded a whistle and resorted to emergency braking action on discovering an agricultural machine (rice planting machine) entering the level crossing from the left side of the traveling direction and stalled at the level crossing but the train hit the machine. The driver of the agricultural machine was confirmed to be dead.	
10	Date and accident type	Railway operator	Line section (location)
	June 6, 2019 Train derailment	Transportation Bureau City of Yokohama	Between Shimoiida Station and Tateba Station, Line 1 (Blue Line), Kanagawa Prefecture
	Summary	After leaving Shimoiida Station, the driver of the train noticed the impact and stopped the train. As a result, 14 axles of seven cars of the first to fourth cars were found to have derailed.	
11	Date and accident type	Railway operator	Line section (location)
	June 7, 2019 Level crossing accident	West Japan Railway Company	Tomimasu No.5 level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Yumigahama Station and Wadahama Station, Sakai Line, Tottori Prefecture
	Summary	The driver of the train recognized a car entering the level crossing and resorted to emergency braking action, but the train hit the car. The car driver was later confirmed to be dead.	
12	Date and accident type	Railway operator	Line section (location)
	June 19, 2019 Train derailment	Odakyu Electric Railway Co., Ltd.	Hon-Atsugi No. 13 level crossing, class 1 level crossing with automatic barrier machine and road warning device, between Hon-Atsugi Station and Aiko-Ishida Station, Odawara Line, Kanagawa Prefecture
	Summary	While the train was running, the driver of the train noticed that a car was staying in the level crossing, so he resorted to emergency braking action, but the train hit the car. As a result, all two axles of the rear bogie of the leading car were derailed.	
13	Date and accident type	Railway operator	Line section (location)
	June 28, 2019 Train derailment	East Japan Railway Company	Between Shibukawa Station and Shikishima Station, Joetsu Line, Gunma Prefecture
	Summary	While the train was running, it collided with a fallen tree, and the first axle of the front bogie of the first train derailed.	
14	Date and accident type	Railway operator	Line section (location)
	September 5, 2019 Train derailment	Keikyu Corporation	Kanagawa-shimmachi Daiichi level crossing, class 1 level crossing with automatic barrier machine and road warning device, between Kanagawa-shimmachi Station and Nakakido Station, Main Line, Kanagawa Prefecture
	Summary	The train collided with a truck on the level crossing, and the first to third cars were derailed.	
15	Date and accident type	Railway operator	Line section (location)
	Nobember 27, 2019 Train derailment	Aizu Railway Co., Ltd.	Between Yunokami-onsen Station and To-no-hetsuri Station, Aizu Line, Fukushima Prefecture
	Summary	While the train was running between Yunokami-onsen Station and To-no-hetsuri Station, the driver of the train found earth and sand flowing into the track.He resorted to emergency braking action, but the train ran on the earth and sand, and all the axles of the first train derailed.	

16	Date and accident type	Railway operator	Line section (location)
	December 2, 2019 Level crossing accident	Tenryu Hamanako Railroad Co., Ltd.	Tonokisaka level crossing, class 3 level crossing equipped with road warning device but without automatic barrier machine, on the premises of Nishikajima Station, Tenryu Hamanako Line, Shizuoka Prefecture
	Summary	The driver of the train recognized a pedestrian entering the railroad crossing and made an emergency stop arrangement, but he was shocked. After that, the death of the pedestrian was confirmed.	
17	Date and accident type	Railway operator	Line section (location)
	December 24, 2019 Train derailment	Aizu Railway Co., Ltd.	Between To-no-hetsuri Station and Yagoshima Station, Aizu Line, Fukushima Prefecture
	Summary	While the train was running between To-no-hetsuri Station and Yagoshima Station, all two axles of the front bogie were derailed to the left in the traveling direction.	

(Railway serious incidents)

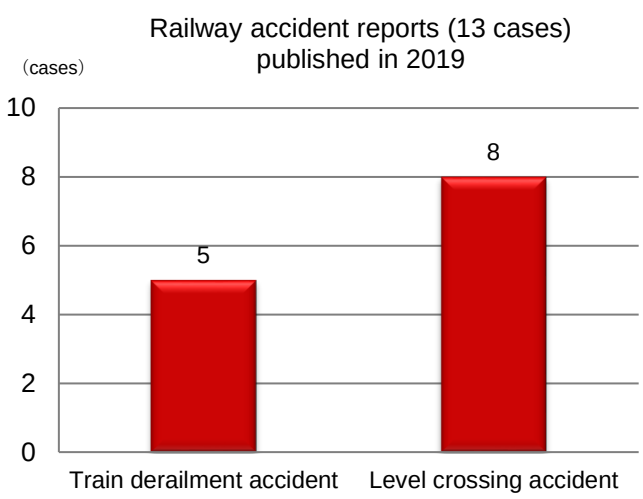
1	Date and incident type	Railway operator	Line section (location)
	March 25, 2019 Incorrect management of safety block	Tosaden Traffic Co., Ltd.	Between Asakura stop and Yashiro stop, Ino Line, Kochi Prefecture
	Summary	At the Asakura stop where is a pass-by track, the driver of the outbound train forgot to receive the Tablet (procedures for entering a single track section) that should be received when the oncoming train arrived, and started the train even though the oncoming train had not arrived. After that, the driver immediately stopped the outbound train because he had visually confirmed that the inbound train No. 332 was stopping at the Asakura intersection ahead of him.	
2	Date and incident type	Railway operator	Line section (location)
	August 24, 2019 Dangerous trouble in vehicle	Nankai Electric Railway Co., Ltd.	In the premise of Suminoe train inspection depot, Osaka Prefecture
	Summary	The inspector in charge of this inspection in the Suminoe Train Inspection Depot, who received a report from the train conductor that there was a sound of metal rubbing from the connecting part (crossing plate part), checked the connecting part, but there was no abnormality. When the inspection of the whole vehicles was carried out, a crack of approximately 140 mm was found in the main motor seat of the bogie, which was a place different from the connecting part.	

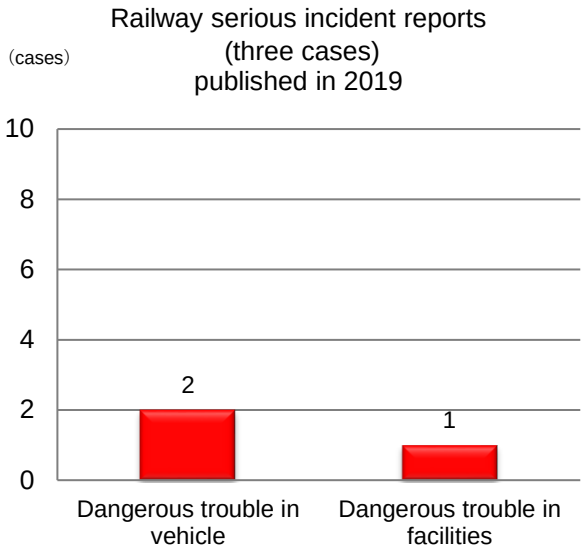
6 Publication of investigation reports

The number of investigation reports of railway accidents and serious incidents published in 2019 was 16, consisting of 13 railway accidents and three serious incidents.

Breaking them down by type, the railway accidents contained five train derailment accidents, eight level crossing accidents. The railway serious incidents contained two dangerous trouble in vehicle, and one dangerous trouble in facilities.

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





The investigation reports of railway accidents and serious incidents published in 2019 are summarized as follows.

Railway accident investigation reports published in 2019

1	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	January 31, 2019	October 22, 2018 Train derailment	Nankai Electric Railway Co., Ltd	Between Tarui station and Ozaki station, Nankai Line, Osaka Prefecture

Summary

October 22, 2017, the outbound Local 6867 train, composed of 4 vehicles started from Namba station bound for Wakayamashi station, Nankai Line of Nankai Electric Railway Co.Ltd., departed from Tarui station on schedule at 16:38. While the train was operated in coasting at about 70 km/h on Onosatogawa bridge, the driver of the train noticed that the track about 50 m ahead had sagged, and applied the brake immediately but the train passed the sagged track and stopped after running for about 250 m.

It was found in the investigation implemented after the occurrence of the accident, that the 2nd axle in the rear bogie of the 3rd vehicle of the train derailed to right on Onosatogawa bridge, and had restored after that. Hereinafter, the words "front", "rear", "left" and "right" are used based on the running direction of the train.

In addition, the pier No.5 of the down track of Onosatogawa bridge had been subsided and tilted, and the track had been sagged and wound.

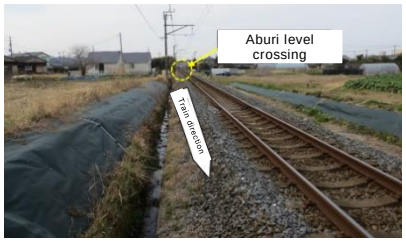
There were about 250 passengers and 2 train crews, i.e., the driver and the conductor, onboard the train, among them 5 passengers were injured.

Here, it had been raining in wide area in the southern area of Osaka Prefecture including the accident site, as the front crossed the southern coast of the main island of Japan was activated by the Heisei 29th year Typhoon No.21 which was moving northward in south of Japan, on the day of the occurrence of the accident.

	Probable Causes	It is highly probable that the accident occurred as the 2nd axle in the rear bogie of the 3rd vehicle had derailed to right because the train was running on the track on the bridge significantly deformed by the subsided and tilted pier, after that, the derailed axle restored in the level crossing while passed as being derailed. It is probable that the pier had subsided and tilted because the ground in around the pier was scoured in wide area by the swollen river water at the time of the occurrence of the accident, while the function to protect the piers from scouring had already been deteriorated before the occurrence of the accident, such as the subsided riverbed in around the pier caused by the concentration of the river water due to the change of the water route, damages of the foot protection as the scour protection work, etc. It is probable that the deterioration of the function to protect scouring was related with that the measures such as the repair, reinforcement, etc., of the foot protection were not implemented, because the evaluation for the unusual status were not implemented sufficiently, even though the unusual status of the foot protection of the pier was recognized in the inspection of the piers.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-2e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-2-p.pdf (Explanatory materials)
	Referece	Feature 1 (5) (page 9), Chapter 1 (page 25), Case Studies (page 100)

2	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	January 31, 2019	December 6, 2017, Train derailment	Hokkaido Railway Company	In the premises of Zenibako station, Hakodate Line, Hokkaido
	Summary	The driver of the train noticed an abnormal sound and recognized the indication showing an abnormal situation in the monitor display in the driving desk while the train was coasting in the No.2 track, the refuge track for inbound and outbound trains, in Zenibako station, at a velocity of about 34 km/h, then the driver applied an emergency brake and stopped the train. After checked the vehicles, train operation was resumed, but the indication of the abnormal situation had been displayed repeatedly. Therefore, the train operation was cancelled, and the train was deadheaded to Sapporo Operation Depot. As the traces showing that wheel derailed and continued running, was found in the wheel of the 1st axle in the front bogie of the 1st vehicle of the train, in the results of the vehicle inspection implemented in Sapporo Operation Depot, the investigation of the track in the premises of the station was implemented. As the results of the investigation, the trace of the derailment of train was found in Zenibako West level crossing and the trace of restoring was found in the No.11 turnout which was located in about 83 m apart from the level crossing in the direction of Otaru station. As the concerned train had been operated in the deadhead operation, only the driver was boarded, but he was not injured.		

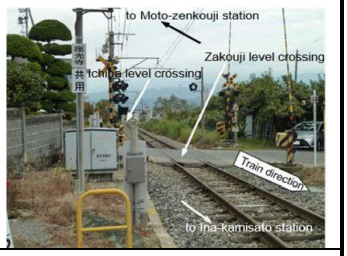
	Probable Causes	It is probable that the accident occurred as the left wheel of the 1st axle in the front bogie of the 1st vehicle climbed up the left rail, i.e., the outer rail, and derailed to left, while the train Japan Transport Safety Board was passing the level crossing in the premises of the station, located in the right curved track in the refuge track for inbound and outbound trains where the frequency of train operation was low. It is somewhat likely that the derailment was caused as the wheel flange climbed up the compacted snow which had existed on the rail and the flangeway in the level crossing. It is somewhat likely that the compacted snow had been formed as it snowed hard in the previous day of the accident in the situation that the temperature around 0 °C had been continued, and the snow had been trodden hard by the automobiles passing the level crossing road in the long interval between the concerned train and the train operated just before the concerned train. In addition, it is somewhat likely that the compacted snow formed on the rail and the flangeway had been remaining without removed, because the snow removal works had not been implemented before the concerned train passed. It is somewhat likely that the snow removal works had not been implemented related with that the accident occurred before the period to prepare the snow removal formation in winter, that the status check of the level crossing had been implemented by the simple inspection such as the visual inspection, etc., and that the interval of the train operation was not considered well in the onsite confirmation and in the judgement to implement the snow removal work. 
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-1-p.pdf (Explanatory material)

3	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	January 31, 2019	February 27, 2018, Level crossing accident	East Japan Railway Company	Renkoji level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Tateyama station and Kokonoe station, Uchibo Line, Chiba Prefecture
	Summary	The driver of the train noticed a passerby entering Renkoji level crossing while the train was running between Tateyama station and Kokonoe station at a velocity of about 77 km/h, then the driver applied an emergency brake, but the train hit the passerby. The passerby was dead in the accident.		
	Probable Causes	It is highly probable that the accident occurred as the train hit the passerby who entered Renkoji level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the passerby entered the level crossing in the situation that the train was approaching the level crossing, because the passerby was dead in the accident. 		
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-3e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-3-p.pdf (Explanatory material)		

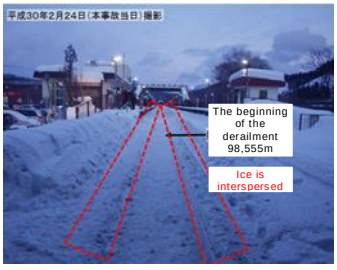
4	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	January 1, 2019	July 30, 2018 Level crossing accident	East Japan Railway Company	Between Ashikaga station and Yamamae station, Ryomo Line, Tochigi Prefecture
	Summary	The driver of the train noticed a passerby pushing a bicycle was entering Ota No.3 level crossing while the train was running between Ashikaga station and Yamamae station at a velocity of about 83 km/h, then the driver sounded a whistle and applied an emergency brake immediately, but the train hit the passerby. The passerby was dead in the accident.		

	Probable Causes	It is highly probable that the accident occurred as the train hit the passerby pushing a bicycle who entered Ota No.3 level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the passerby entered the level crossing in the situation that the train was approaching the level crossing, because the passerby was dead in the accident, although it is somewhat likely that the passerby entered the level crossing without recognizing the approaching train. 
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-4e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-1-4-p.pdf (Explanatory material)

5	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	March 28, 2019	October 3, 2018 Level crossing accident	Central Japan Railway Company	Miyamae level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Moto-Zenkoji station and Ina-Kamisato station, Iida Line, Nagano Prefecture

	Summary	The driver of the train noticed a pedestrian entering Miyamae level crossing while the train was running between Moto-Zenkoji station and Ina-Kamisato station at a velocity of about 53km/h, then the driver applied an emergency brake and had been sounding a whistle, but the train hit the pedestrian. The pedestrian was dead in the accident. 
	Probable Causes	It is certain that the accident occurred as the train hit the pedestrian because the pedestrian entered Miyamae level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the pedestrian entered the level crossing in the situation that the train was approaching, because the pedestrian was dead in the accident.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-2-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-2-1-p.pdf (Explanatory material)

6	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	April 25, 2019	February 24, 2018, Train derailment	Japan Freight Railway Company	In the premises of Tomamu station, Sekisho Line, Hokkaido

	Summary	The staff for track maintenance boarded on the snowplow motor car received the communication that the turnout in the station could not been switched from the train dispatcher. Therefore, the staff for track maintenance checked the turnout and found the traces that the train had derailed and had been running.  In order to identify the derailed train, the wheels in the trains passed the concerned place were inspected, and the trace as derailed and continued running, was found in the wheel of the 1st axle in the front bogie of the 3rd vehicle of the High Speed Freight 2077 train, started from Sapporo Freight Terminal station bound for Obihiro Freight station of Japan Freight Railway Company, operated before the previous train of the snowplow motor car. The train had passed the station at a velocity of about 49 km/h. In the investigation implemented after that, the restored trace of the train was found in around the turnout in the station. The driver was boarded on the train, but he was not injured.

	Probable Causes	It is probable that the accident occurred as the flange of the right wheel of the 1st axle in the front bogie of the 3rd vehicle climbed over the right rail and derailed at the place where large amount of ice and snow were stacked on the track, while the train was passing the straight track section in the premises of the station, and after that the train restored in the turnout while passing in the status as derailed. It is somewhat likely that the 1st axle in the front bogie of the 3rd vehicle of the train derailed because the side beam of the front bogie of the 3rd vehicle was pushed up over the ice and snow stacked on the railway track, at the same time, the wheel flange was raised up by the hard ice and snow which had existed in around the flangeway. It is somewhat likely that large amount of ice and snow had been stacked on the railway track in around the place where the derailment accident occurred, related with a large amount of snow fall and stacked snow in the previous day of the concerned accident, and that the snow removal works had not been implemented for 6 days before the occurrence of the accident.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-3-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-3-1-p.pdf (Explanatory material)
	Reference	Case Studies (page 101)

7	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	April 25, 2019	June 16, 2018, Level crossing accident	Kyushu Railway Company	Oho level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Nabeshima station and Kubota station, Nagasaki Line, Saga Prefecture

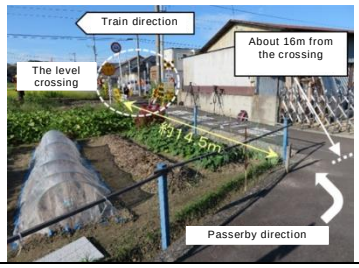
	Summary	The driver of the train noticed an automobile entering Oho level crossing while the train was running between Nabeshima station and Kubota station at a velocity of about 84 km/h, then the driver of the train applied an emergency brake and sounded a whistle, but the train collided with the automobile. The driver of the automobile was dead in the accident. 
	Probable Causes	It is highly probable that the accident occurred as the train collided with the automobile because the automobile entered Oho level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the automobile entered the level crossing in the situation that the train was approaching, because the driver of the automobile was dead in the accident.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-3-2e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-3-2-p.pdf (Explanatory material)

8	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	June 27, 2019	June 16 , 2018 Train derailment	Keiyorinkai Co., Ltd.	In the premises of Soga station, Rinkai Main Line, Chiba, Prefecture

	Summary	After departed from Soga station, the driver of the train felt as the train was dragged from backward. Therefore, the driver checked the backward and found that the wagon, the 4th vehicle from the front including the locomotive, had been tilted to left, then the driver operated an emergency brake and stopped the train. After the train stopped, the driver checked the concerned wagon, the 4th vehicle, and found that all four axles of the concerned wagon had derailed to left. There was the driver onboard the train, but he was not injured. 
	Probable Causes	It is probable that the accident occurred as all four axles of the wagon, the 4th vehicle from the front, derailed because the gauge widened while the freight train composed of 19 vehicles

		was running in around the 106-B turnout in the premises of Soga station. It is probable that the gauge in around the 106-B turnout widened due to the decreased rail fastening force caused as the Japan Freight Railway Company, who was in charge of the management of track maintenance, had not implemented the measures such as the replacement of sleepers or the repairing work, etc., although the sleepers, which had been judged as inferior in the periodic inspection, existed continuously. It is somewhat likely that Japan Freight Railway Company had not implement the measures such as the replacement of the sleepers or the repairing work, etc., because it had not recognized the dangerous situation against the gauge widening well, as the irregularity of gauge measured under unloaded condition in the periodic inspection was within the maintenance standard value.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-4-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-4-1-p.pdf (Explanatory materials)

9	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	July 25, 2019	September 27, 2018, Level crossing accident	West Japan Railway Company	Iwasakinoichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, between Michinoue station and Managura station, Fukuen Line, Hiroshima Prefecture

	Summary	The driver of the train noticed a bicycle entering Iwasakinoichi level crossing while the train was running between Michinoue station and Managura station at a velocity of about 72 km/h, class 4 level crossing, then applied an emergency brake immediately, but the train collided with the bicycle. The passerby riding the bicycle was dead in the accident. 
	Probable Causes	It is certain that the accident occurred as the train collided with a bicycle because the passerby riding bicycle entered Iwasakinoichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the passerby riding bicycle entered the level crossing in the situation that the train was approaching, because the passerby was dead in the accident, although it is somewhat likely that the passerby did not recognize the approaching train.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-5-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-5-1-p.pdf (Explanatory materials)
	Reference	Case studies (page 103)

10	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	July 25, 2019	December 12, 2018 Level crossing accident	Shikoku Railway Company	Nakatsuchi level crossing, class 4 level crossing without automaticbarrier machine nor road warning device, between Iyo-Tomita station and IyoSakurai station, Yosan Line, Ehime Prefecture

	Summary	The driver of the train noticed a motorized bicycle entering Nakatsuchi level crossing, class 4 level crossing, while the train was running between Iyo-Tomita station and Iyo-Sakurai station at a velocity of about 120 km/h, then applied an emergency brake and sounded a whistle, but the train collided with the motorized bicycle. The driver of the motorized bicycle was dead in the accident.
	Probable Causes	It is highly probable that the accident occurred as the train collided with the motorized bicycle because the motorized bicycle entered the Nakatsuchi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the motorized bicycle entered the level crossing in the situation that the train was approaching, because the driver of the motorized bicycle was dead in the accident. 

	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-5-2e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-5-2-p.pdf (Explanatory material)

11	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	August 29, 2019	December 19, 2018, Level crossing accident	Chichibu Railway Co., Ltd.	Hanyu No.22 level crossing, class 4 level crossing without automatic barrier machine nor road warning machine, in the premises of Shingo station of Chichibu Main Line, Saitama Prefecture

Summary

The driver of the train noticed a pedestrian entering Hanyu No.22 level crossing while the train was running in the premises of Shingo station at a velocity of about 43 km/h, then sounded a whistle and applied an emergency brake immediately, but the train hit the pedestrian.

The pedestrian was dead in the accident.

Probable Causes

- It is highly probable that the accident occurred as the train hit the pedestrian because the pedestrian entered Hanyu No.22 level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching.
- It could not be determined why the pedestrian entered the level crossing in the situation that the train was approaching, because the pedestrian was dead in the accident.

Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-6-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-6-1-p.pdf (Explanatory materials)

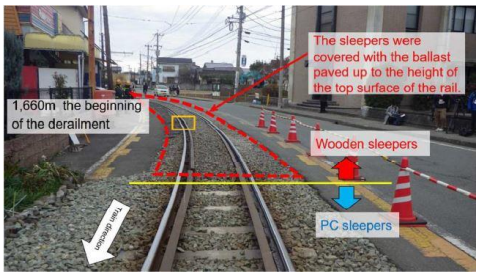
12	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	October 31, 2019	January 9, 2019 Train derailment	Kumamoto Electric Railway Co., Ltd.	Between Kurokami-machi station and Fujisakigumae station, Fujisaki Line, Kumamoto Prefecture

Summary

The velocity of the train suddenly decreased while the train was passing the right curved track of 100 m radius between Kurokami-Machi station and Fujisakigumae station and the train stopped.

After the train stopped, the driver checked the situation and found that all two axles in the rear bogie of the rear vehicle had derailed to left.

There were about 25 passengers and the driver onboard the train, but no one was injured.



Probable Causes

It is probable that the concerned accident occurred as the right wheel of the 1st axle in the rear bogie of the rear vehicle fell to inside gauge because the gauge was widened significantly while the train was passing the right curved track of 100 m radius, and after running as being widening the gauge, the left wheel flange of the same axle climbed up left rail and went off to left, and the 2nd axle of the same bogie followed to went off to left.

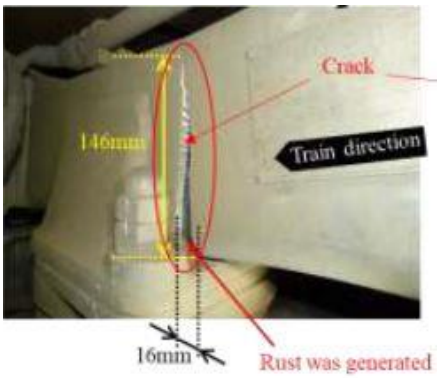
It is probable that the gauge had widened significantly as the gauge was dynamically widened due to the rail tilting etc., caused by the lateral force by the running train, because the inferior rail fastening devices existed continuously in the concerned curved track.

It is probable that the inferior rail fastening devices existed continuously because the inspection of the sleepers and the rail fastening devices was not implemented well as the sleepers were covered by the ballast spread in the height of upper surface of the rail, and the measures preventing the recurrence of the same kind accident occurred in 2017, such as the replacement to the prestressed concrete sleepers or the additional driving spikes, had not been implemented. In addition, it is somewhat likely that the occurrence of the concerned accident was related with that the function of the guardrail to prevent the derailment could not work well, because of the decreased margin against derailment to inside gauge due to the relatively large slack in the curved track, and the dynamically enlarged width of the flange way by the tilting, etc., of the guardrail due to the lateral force acting on backside of wheel, etc., from right wheel caused by

		the insufficient fastening of the guardrail to the sleepers.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-7-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-7-1-p.pdf (Explanatory materials)

13	Date of Publication	Date & Accident type	Railway operator	Line section (location)
	December 19, 2019	April 13, 2019, Level crossing accident	Fukui Railway Co., Ltd.	Yabugaichi level crossing, class 3 level crossing without automatic barrier machine but equipped with road warning device, between Iehisa station and Sundome-Nishi station, Fukubu Line, Fukui Prefecture
	Summary	The driver of the train noticed a light motor truck entering Yabugaichi level crossing while the train was running between Iehisa station and Sundome-Nishi station at a velocity of about 45 km/h, then applied an emergency brake immediately and sounded a whistle, but the train collided with the light motor truck. The driver of the light motor truck was dead in the accident. 		
	Probable Causes	It is certain that the accident occurred as the train collided with the light motor truck because the light motor truck entered Yabugaichi level crossing, the class 3 level crossing equipped with the road warning device, in the situation that the road warning device was operating as the train was approaching. It could not be determined why the light motor truck entered the level crossing while the road warning device was operating because the driver of the light motor truck was dead in the accident, although it is somewhat likely that the driver of the light motor truck did not recognize the approaching train.		
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-8-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RA2019-8-1-p.pdf (Explanatory materials)		

Railway serious incident investigation reports published in 2019

1	Date of Publication	Date and serious incident type	Railway operator	Line section (location)
	March 28, 2019	December 11, 2017 Dangerous trouble in vehicle	West Japan Railway Company	In the premises of Nagoya station, Tokaido Shinkansen, Aichi Prefecture
	Summary	The inbound 34A train, "Nozomi 34", of West Japan Railway Company, composed of 16 vehicles started from Hakata station bound for Tokyo station, departed from Hakata station of Sanyo Shinkansen on schedule. The train crews, etc., had been noticed unusual smell in the cabin and unusual noise from underfloor of the vehicle, from just after departed from Hakata station, but the train was operated until to Shin-Osaka station, and the subsequent train operation was handed over to Central Japan Railway Company. When the 34A train arrived at Nagoya station of Tokaido Shinkansen, the vehicle maintenance staffs, dispatched to Nagoya station obeying the instruction of the operation dispatcher of Central Japan Railway Company,noticed unusual sound from the 4th vehicle, and implemented the underfloor inspection in Nagoya station. As the results of the inspection, the leaked oil was found in around the gear box in the front bogie of the 4th vehicle, then the further operation of the 34A train was cancelled. After that, when the works to move the concerned vehicle to the train depot, i.e., Nagoya Rolling Stock Depot, was implemented, the crack was found in the side beam in left side of the bogie frame of the front bogie in the 4th vehicle. There were about 1,000 passengers, 4 train crews, i.e., the driver and 3 conductors, and 3 pursers engaging in the cabin sales, etc., boarded on the train when the train had arrived at Nagoya station, but there was no injured person. Here, the vehicles operated as the 34A train were owned by West Japan Railway Company. 		

	Probable Causes	It is highly probable that the concerned serious incident occurred because the gear type flexible shaft coupling displaced exceeding the allowable range and damaged due to deformation of the bogie frame caused by the crack which had generated in the side beam of the bogie frame of the vehicle and had expanded by fatigue. The crack had generated in the side beam of the bogie frame of the vehicle because it is somewhat likely that the split had generated in around the back boundary of the slot welded part where the crack had originated when the welding work had implemented. In addition, it is highly probable that the crack had generated related with the followings. (1) The residual stress was generated in around the slot welded part due to the implementation of the overlay welding on the bottom surface of the axle spring seat after annealed. (2) The thickness of the bottom plate of the side beam had become thinner than the designed standard value, because the bottom surface of the side beam had been grinded excessively when attached the axle spring seat to the bottom plate of the side beam. In addition, it is highly probable that the crack had expanded in the period shorter than the vehicle life, i.e., the usable period of the bogie, because the expanding speed of the crack became faster as the thickness of the bottom plate of the side beam became thinner due to the excessive grinding works implemented in the bottom plate of the side beam. Here, it is highly probable that the bottom plate of the side beam was grinded excessively related with that the problem, that the machining work was required to attach the axle spring seat due to the swell in the bottom surface of the side beam generated in the manufacturing process of the bogie frame, was dealt without studying the essential causes and counter measures, and the manufacturing works had implemented without well understandings on the instructions for the work related to the strength of the bogie frame.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2019-1-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RI2019-1-1-p.pdf (Explanatory materials)
	Reference	Case Studies (page 104)

2	Date of Publication	Date and accident type	Railway operator	Line section (location)
	August 29, 2019	May 15, 2018, Dangerous troubles in vehicle	Nishi-Nippon Railroad Co., Ltd.	At Shirakibaru station, Tenjin Omuta Line, Fukuoka Prefecture
	Summary	The passenger standing on the platform talked to the conductor of the train about the door, something unclear, when the train was departing the station. After the conductor finished watching the platform while departing, he went to check the doors of each vehicle, and found that the rear door of the double doors in left side of the rear most of the 3rd vehicle had been opening by about 40 cm. Therefore, he locked the concerned door when the train stopped at the next station, i.e., Zasshonokuma station. The train was operated to the next station, i.e., Ijiri station, and the train operation was cancelled. There were about 250 passengers and 3 train crews, i.e., the driver, the conductor and the assistant station master for handling operation, but no one was injured.		

	Probable Causes	It is probable that the concerned serious incident was caused as the door did not closed certainly when the closing door operation was implemented, because the hanging device of the door and the piston rod transferring the force to open and close operation of the doors were disconnected and became not to work as linking each other as the buffer rubber of the hanging part for a door in the double door of the vehicle had fallen away, in addition, the train operation was continued in the status that the opening door could not be detected. It is probable that the buffer rubber in the hanging part of the door had fallen away in the following process, i.e., the nut of the piston rod and the buffer rubber had been in the status as contacted directly with each other due to mistaking the attached position of the plain washer in the fastening works of the hanging parts in the important parts inspection of the vehicle, the doors had been operated to open and close actions repeatedly in this status, then, the nut continued to cut into the hole part of the buffer rubber to cause the removal of the buffer rubber. It is probable that the situation of the opening door could not be detected because the opened door could not be detected by the door control switch, as the door was in the opening status even though the piston rod was in the close position, because the piston rod and the door had become not to work as linking with each other due to the fallen away buffer rubber.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2019-2-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RI2019-2-1-p.pdf (Explanatory materials)

3	Date of Publication	Date and accident type	Railway operator	Line section (location)
	December 19, 2019	November 9, 2018, Dangerous damege in facilities	Hokkaido Railway Company	In the premises of Shin-Sapporo station, Chitose Line, Hokkaido
	Summary	The driver of the train checked the indication of the caution signal in the No.2 home signal of Shin-Sapporo station in order to stop at the station while the train was running between Heiwa station and Shin-Sapporo station at a velocity of about 50 km/h , after that, he found that the column of the No.1 starting signal, planted in the opposite track side, had collapsed and hindered the up and down tracks, from about 200 m before the No.1 starting signal. Therefore, the driver applied the normal brake and stopped the concerned train, then, he issued the train protection radio and reported to the train dispatcher. No one was injured in the incident.
		
	Probable Causes	It is probable that the concerned serious incident had occurred because there was the inferior construction work as the insufficient cleaning in the hole after drilled into concrete body in the construction work of the metal extension anchor based on the "after constructing anchor method", in the planting work of the down line No.1 starting signal column. It is probable that the metal extension anchor was in the status as insufficient tolerance against tensile force because the cone of the metal extension anchor had not expanded the swelling part of the anchor due to the inferior construction work when the signal column had been planted. Therefore, it is somewhat likely that the signal column had collapsed because the external force exceeded the tolerance of the metal extension anchor fixing the signal column of the home signal, as the anchor of the metal extension anchor was loosening gradually, caused by vibration due to running trains on the viaduct in addition to the effects of the external force such as windstorm, earthquake, etc., in the period of about 38 years from planting, in the status that the metal extension anchor supporting the signal column had been insufficient endurance against tensile force, in cooperation with the wind pressure of about 20 m/s instantaneous wind speed on the collapsed day.
	Report	http://www.mlit.go.jp/jtsb/eng-rail_report/English/RI2019-3-1e.pdf http://www.mlit.go.jp/jtsb/railway/p-pdf/RI2019-3-1-p.pdf (Explanatory materials)
	Reference	Case Studies (page 102)

7 Actions taken in response to opinions in 2019 (railway accidents and serious incident)

A summary of the actions taken in response to opinions in 2019 is as follows.

(1) Opinions on the derailment accident at Nankai Electric Railway Co., Ltd Nankai Main Line

(Opinions on January 31, 2019)

See “Chapter 1: Summary of recommendations and opinions issued in 2019 – Opinions 1” (Page 25)

8 Provision of factual information in 2019 (railway accidents and serious incidents)

The JTSB provided factual information for one case in 2019. The content is as follows.

(1) Provision of information relating to the railway accident with caualties on the Yokohama Seaside Line Co., Ltd, Kanazawa Seaside Line

(Information provided on June 14, 2019)

* The progress report published on February 27, 2020 is posted on the Committee's website.
https://www.mlit.go.jp/jtsb/railway/rep-acci/keika20200227.pdf

(**Summary of Railway Accidents with Casualties**)

At around 20:15 on June 1 (Sat), 2019, when the train No. 2009B (5 car train set) from Shin-Sugita Station to Namikichuo Station departed from Shin-Sugita Station, it proceeded in the opposite direction to the original direction, and it collided with the car stop at the end of the line and stopped.

14 passengers were injured in this accident.

(**Provision of Information**)

The content of the information provided is as shown in the attachment.

The cause of the accident will be investigated in detail in the future.

Attachment

Provision of Information relating to the railway accidents with casualties on the Yokohama Seaside Line Co., Ltd, Shin-Sugita Station

The factual informations that the JTSB has ever investigatedare described on pages 2 to 5. The summary is as follows. Note that [ ] indicates the description part corresponding to the content of the fact information.

Summary of factual information

1. Disconnection of the line transmitting the direction of travel command

- Disconnection of the F line near the rear end of the first car on the Kanazawa-hakkei Station side [1. (1)]
- Of the F line (forward direction command) and the R line (reverse direction command), the F line is disconnected.
- One of the broken portions of the F line is welded to a member on the vehicle body side [1. (2)].
- The broken F line was detached from the bundle of cables [1. (3)]

2. Operation record of the equipment

- Confirmed that the F line was not pressurized when the accident occurred in the operation record of the equipment [2. (2)].
- When the F line was changed to non-pressurized, it was confirmed that one outbound trains before the one where the accident occurred were running according to the operation records of the equipment. [2. (3)]

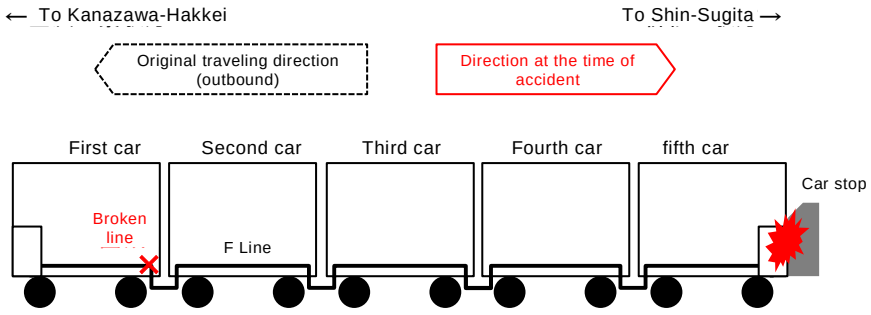
3. Motor control specifications

- The motor control device is designed to maintain the direction of travel immediately before the F line and R line when they are not pressurized. [3.]

* In the case of the vehicles where the accident occurred, the signal device switches the traveling direction to the "down direction" when turning back at Shin-Sugita Station, but the motor control device maintains the previous "up direction" due to the disconnection of the F line.

4. Operation Records of Station ATO On-board Equipment and Ground Equipment

- In the records of the operation of the station ATO on-board equipment and the station ATO ground equipment, there is no record showing any abnormality of the equipment related to the occurrence of this accident. [4.]



Contents of the factual information

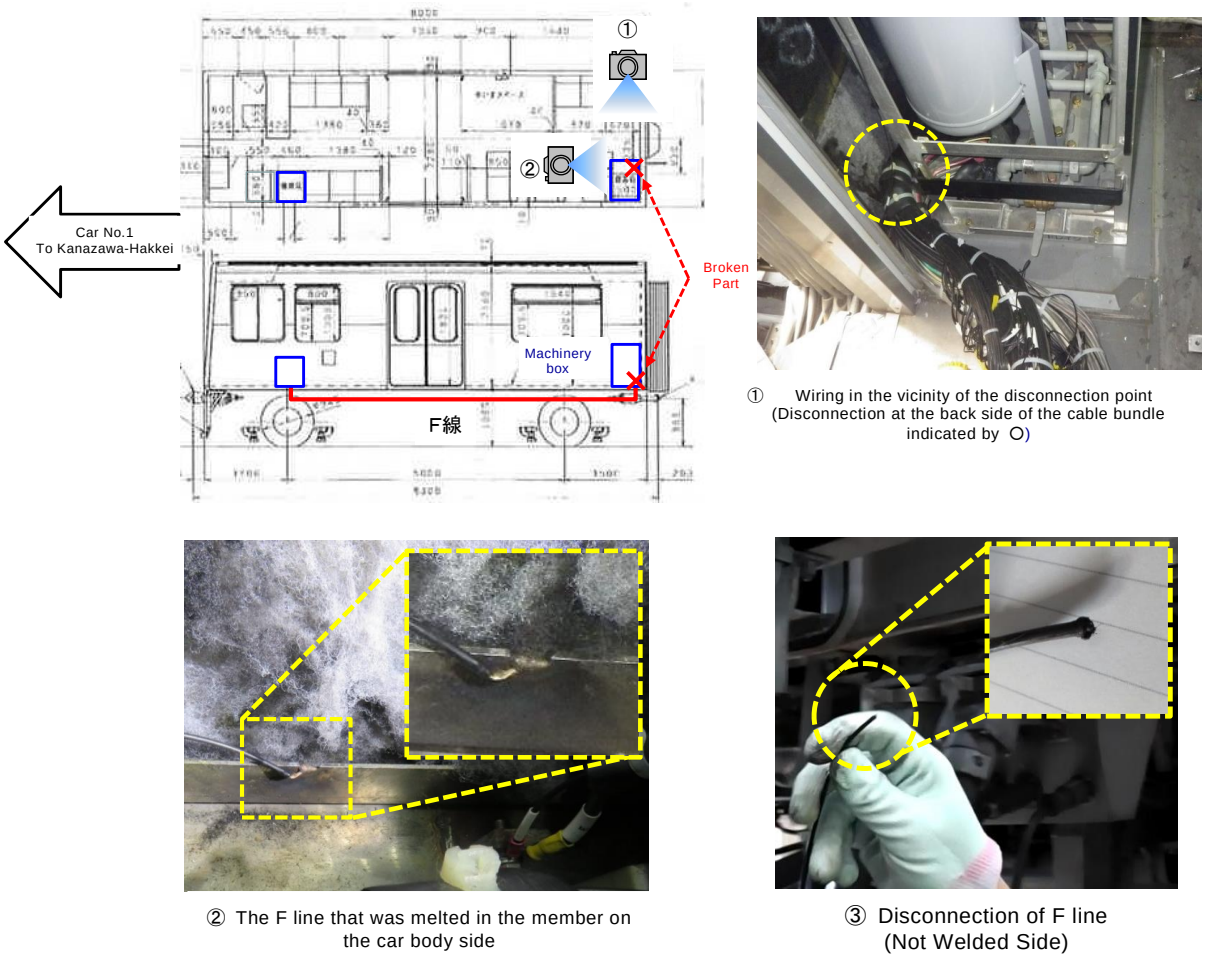
1. Results of Train Wiring Investigation

In the investigation of the wiring of the train, the following conditions were found.

(1) When the train (No. 2009B) collided with the train stop on the Kanazawa-hakkei Station side (hereinafter, the train is counted from the Kanazawa-hakkei Station side), Of the F line

and the R line for transmitting the traveling direction to the VVVF control device (motor control device installed in the first, third, and fifth car) from the station ATO on –board equipment, the F line was found to be disconnected. The relation between the conditions of the F line and the R line and the traveling direction will be described later in 3.

(2) Lines F and R were routed through the entire 5 - car train, and the disconnection of Line F was found near the rear end of the first car (on the connecting side with the second car), and one of the disconnection parts was welded to the member on the car body side.



① Wiring in the vicinity of the disconnection point (Disconnection at the back side of the cable bundle indicated by ○)

② The F line that was melted in the member on the car body side

③ Disconnection of F line (Not Welded Side)

Figure 1 Disconnection of F line

(3) Only one of the F-lines were separated from the bundle of bundled cables.

Figure 2　F line out of bundle

(4) The traveling direction is set by the on-board equipment of the station ATO, and a voltage (100 V) is applied to the F line or R line through a relay to transmit the traveling direction to the VVVF controller. However, the condition of the F line was not transmitted to all the VVVF controllers due to the disconnection of the F line.

2. Operation record of the equipment

The following records were found in the operation records of the equipment at the time of the accident.

(1) There was a record that Line 194 was pressurized in Shin-Sugita Station before this accident occurred, and the station ATO on - board equipment set the train's traveling direction to the outbound direction (from Shin-Sugita Station to Kanazawa-hakkei Station). This is the predetermined operation.

(2) A voltage should have been applied to the F - line by the setting of the traveling direction in (1), but there was no voltage on the F - line even after the setting of the traveling direction, and neither the F - line nor the R - line was pressurized.

Table 1　Status of Operation Records of Equipment

Traveling Direction	Train Status	Station ATO On-board Device Output		F Line	R Line
		194 line	195 line		

Inbound	Arrival at Shin-Sugita	Without pressure	With pressure	Without Pressure	With Pressure
Outbound	Departure from Shin-Sugita	With Pressure	Without pressure	Without Pressure	Without Pressure

* With regard to Content 1 (3) of the Factual Information, in the subsequent investigation, the F line one of the 4 cable bundles. It was confirmed that the cable was in the cable bundle at the bottom. (February 27, 2020 interim report)

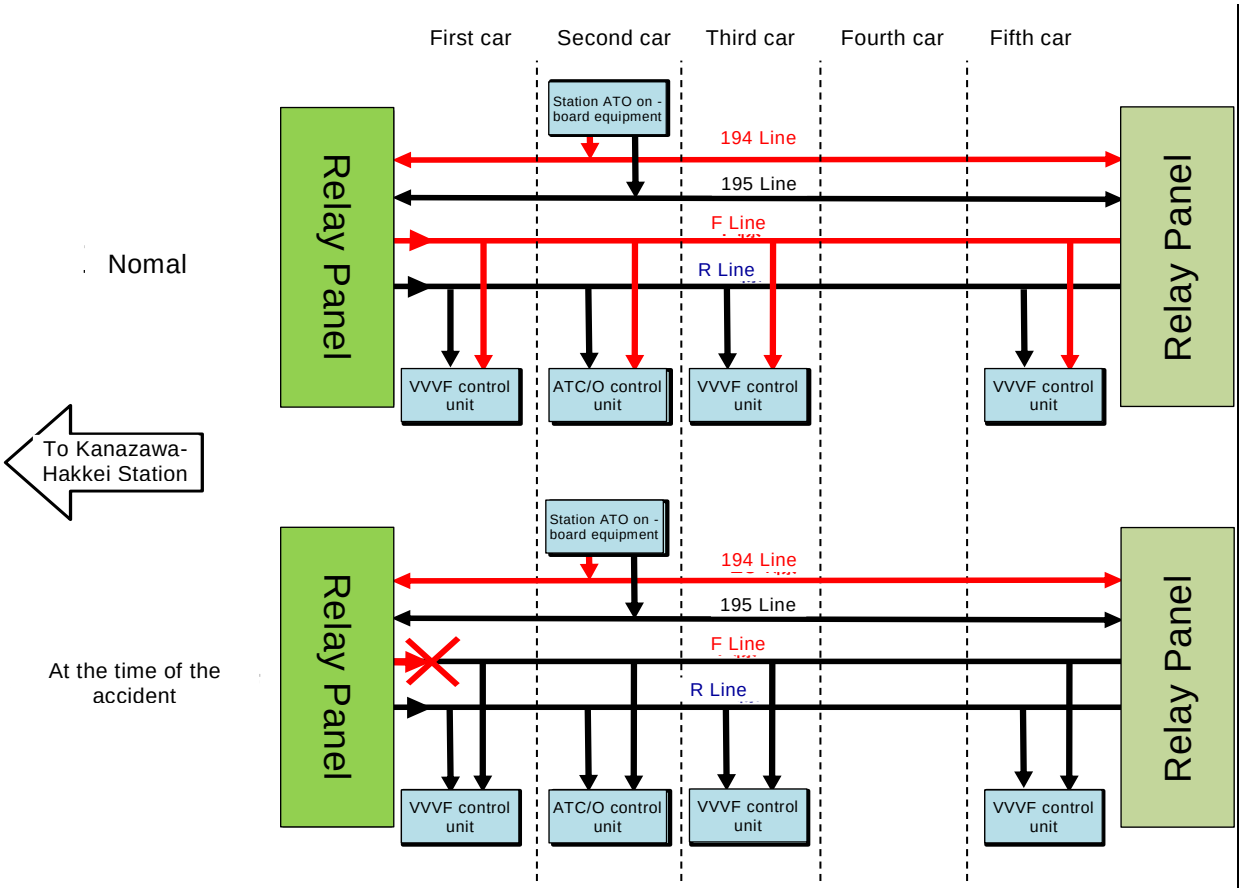


Figure 3 : Schematic diagram of vehicle related wiring (red line indicates pressurization when traveling direction is down)

(3) While the outbound train (No. 1905) was running (between Sachiura Station and Sangyoshinko Center Station), the voltage on Line F changed from pressurized to non - pressurized. The next inbound train (No. 1910 (the inbound train just before the accident occurred)) was running in the correct direction because voltage was applied to the open R - line.

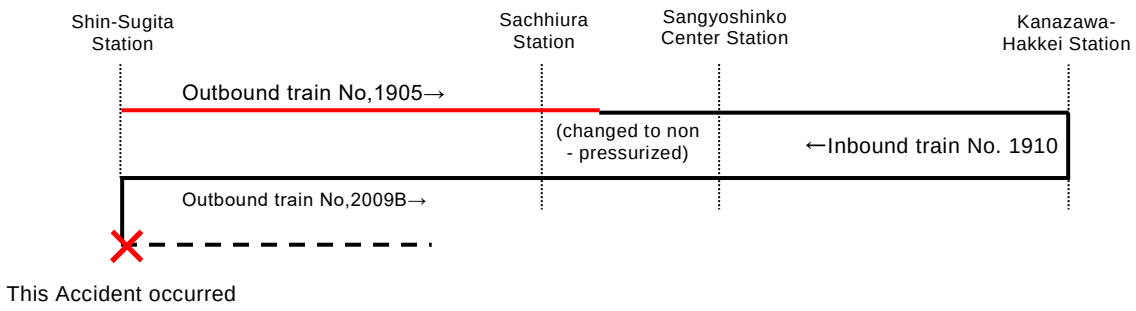


Figure 4 Pressing Condition of F Line (Red Line Indicates Pressing of F Line)

3. VVVF Control unit Specifications

According to the specifications of the VVVF control unit, the relationship between the conditions of the F and R lines and the direction of travel is shown in the table below. The VVVF control unit is designed to maintain the previous direction of travel when both F and R lines are not pressurized.

Table 2. Relationship between F - and R-line Conditions and Traveling Direction Based on VVVF Control unit Specifications

F line	R line	Direction of travel, etc.
Without pressure	With pressure	Maintain the previous condition
With pressure	Without pressure	Shin-Sugita Station → Kanazawa-hakkei Station (outbound direction)
Without pressure	With pressure	Kanazawa-hakkei Station → Shin-Sugita Station (inbound direction)
With pressure	With pressure	protection operation

4. Operation Records of Station ATO On-board Equipment and Ground Equipment

In the investigation so far, the records of the operation of the station ATO on-board equipment and the station ATO ground equipment have not been found to show any abnormality of the equipment related to the occurrence of this accident.

* This information is published on the JTSB website.
http://www.mlit.go.jp/jtsb/iken-teikyo/seasideline20190614.pdf

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

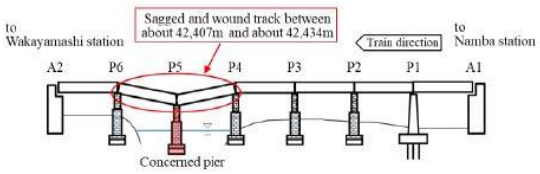
A train ran on a track where a bridge pier sank and tilted, causing a large deformation, and derailed

Nankai Electric Railway Company, Nankai line, between Tarui station and Ozaki station, Train derailment

Summary: On October 22, 2017, While the train was operated in coasting at about 70 km/h on Onosatogawa bridge, the driver of the train noticed that the track about 50 m ahead had sagged, and applied the brake immediately but the train passed the sagged track and stopped after running for about 250 m. It was found in the investigation implemented after the occurrence of the accident, that the 2nd axle in the rear bogie of the 3rd vehicle of the train derailed to right on Onosatogawa bridge, and restored after that. In addition, the pier No.5 of the down track of Onosatogawa bridge had been subsided and tilted, and the track had been sagged and wound. There were about 250 passengers and 2 train crews, i.e., the driver and the conductor, onboard the train, among them 5 passengers were injured.

Findings

The damages had started from the part of the soldier beams and lagging structure using the log piles and the wooden plates, where it was fragile compared to the steel sheet piles, as the riverbed had been subsided and the foot protection had been exposed due to the erosion by the flowing water after 2008.

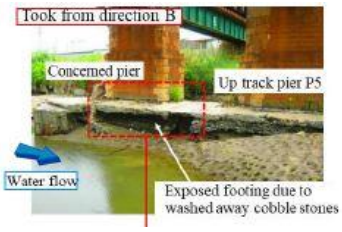


The side surface of the footing had been exposed by the deterioration of the washed away cobble stones, etc., between 2012 and 2014.

Insufficient evaluation of the deformation of the foot protection and necessary measures were not taken

It is somewhat likely that the water flow in backward of the steel sheet piles became to complex and generated exfoliation flow and eddy current, and the ground in around the pier had been suffered the actions mainly composed of the drawing out effects.

It is required to judge the healthiness by comprehending the unusual status of the scour protection works such as the status of the riverbed and the foot protection, etc., from the viewpoints to maintain the function of the scour protection works against the swollen water, for the piers which the significant reduction of the natural frequency was not found at that time.



Probable causes : It is highly probable that the accident occurred as the 2nd axle in the rear bogie of the 3rd vehicle had derailed to right because the train was running on the track on the bridge significantly deformed by the subsided and tilted pier, after that, the derailed axle restored in the level crossing while passed as being derailed.

It is probable that the pier had subsided and tilted because the ground in around the pier was scoured in wide area by the swollen river water at the time of the occurrence of the accident, while the function to protect the piers from scouring had already been deteriorated before the occurrence of the accident, such as the subsided riverbed in around the pier caused by the concentration of the river water due to the change of the water route, damages of the foot protection as the scour protection work, etc.

It is probable that the deterioration of the function to protect scouring was related with that the measures such as the repair, reinforcement, etc., of the foot protection were not implemented, because the evaluation for the unusual status were not implemented sufficiently, even though theunusual status of the foot protection of the pier was recognized in the inspection of the piers.

Please refer to the accident investigation report for the detailed investigation results. (Published on January 31, 2019)
http://www.mlit.go.jp/jtsb/eng-rail_report/English/RA2019-1-2e.pdf

Based on the results of this accident investigation, JTSB has stated our opinions to the Minister of Land, Infrastructure, Transport and Tourism in order to contribute to the prevention of recurrence of similar accidents.
For details, please refer to “Chapter 1: Summary of recommendations and opinions issued in 2019 (page 25)”.

Train derailed due to the lifting of the bogie side beam of the freight car by the ice and snow on the track

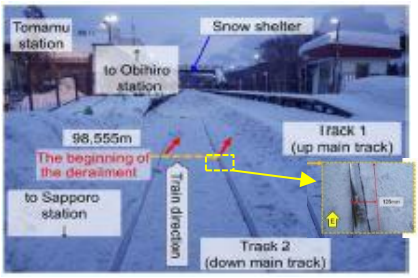
Japan Freight Railway Company, In the premises of Tomamu station, Sekisho Line, Train derailment

Summary: At about 03:55, February 24, 2018, while the snowplow motor car of Hokkaido Railway Company, dispatched for the snow removal works, arrived at the down line main track in Tomamu station of Sekisho Line, the staff for track maintenance boarded on the snowplow motor car received the communication that the turnout in the station could not been switched from the train dispatcher. Therefore, the staff for track maintenance checked the turnout and found the traces that the train had derailed and had been running. The train had passed Tomamu station at a velocity of about 49 km/h, at about 02:09, February 24, 2018. In the investigation implemented after that, the restored trace of the train was found in around the turnout in the station.
The driver was boarded on the train, but he was not injured.

Findings

It is highly probable that there was a large amount of snow and snow on the day before the accident at the accident site. In addition, it is considered somewhat likely that the snow on the track melted due to the sunshine was frozen because the temperature remained below freezing.

The area concerned had not been cleared of snow 6 days before the accident occurred.

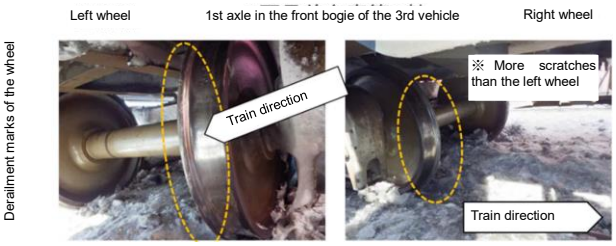


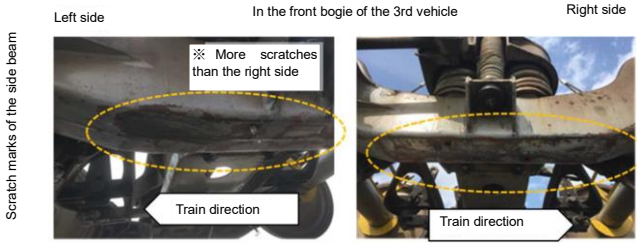
It is considered somewhat likely that the accumulated snow and ice pushed the bogie upward, and the wheel flange was lifted by the hard snow and ice, causing the derailment.

It is considered necessary to remove snow from railway tracks at a higher frequency in consideration of the conditions of snowfall, snow accumulation, and accumulated snow on the site, and to judge the appropriate timing, scope and method.

When removing snow, it is especially necessary to pay attention to the ice and snow formed higher than the rail surface on the outside of the track gauge in the railroad section where freight trains run, considering the side beam position of freight cars.

Since it is necessary for the driver to take corrective action immediately after detecting a derailment, it is desirable to develop and popularize a device that can notify the driver of the occurrence of a train derailment.





Probable cause: It is probable that the accident occurred as the flange of the right wheel of the 1st axle in the front bogie of the 3rd vehicle climbed over the right rail and derailed at the place where large amount of ice and snow were stacked on the track, while the train was passing the straight track section in the premises of the station, and after that the train restored in the turnout while passing in the status as derailed. It is somewhat likely that the 1st axle in the front bogie of the 3rd vehicle of the train derailed because the side beam of the front bogie of the 3rd vehicle was pushed up over the ice and snow stacked on the railway track, at the same time, the wheel flange was raised up by the hard ice and snow which had existed in around the flangeway. It is somewhat likely that large amount of ice and snow had been stacked on the railway track in around the place where the derailment accident occurred, related with a large amount of snow fall and stacked snow in the previous day of the concerned accident, and that the snow removal works had not been implemented for 6 days before the occurrence of the accident.

Please refer to the accident investigation report for the detailed investigation results. (Published on April 25, 2019)
http://www.mlit.go.jp/jtsb/eng-rail-report/English/RA2019-3-1e.pdf

The traffic light collapsed, obstructing the tracks and affecting the safety of train operation. Hokkaido Railway Company, Chitose Line, in the premises of Shin-Sapporo station, Serious Incident (Facilities damage)

Summary: On November 9, 2018、the driver of the train composed of 3 vehicles checked the indication of the caution signal in the No.2 home signal of Shin-Sapporo station in order to stop at the station, after that, he found that the column of the No.1 starting signal, planted in the opposite track side, had collapsed and hindered the up and down tracks, from about 200 m before the No.1 starting signal. Therefore, the driver applied the normal brake and stopped the concerned train, then, he issued the train protection radio and reported to the train dispatcher. No one was injured in the incident.

Findings

The traffic signal pole of this traffic signal is fixed to the existing concrete body using the metal expansion anchor, and this method is called "post construction anchor" construction.

As all eight of the metal expansion anchors to which the traffic signal pole was fixed were removed from the concrete body, and the cone remained in the perforation of the concrete body, it is probable that all eight anchors had the same construction conditions.

Judging from the condition of the cone inside the perforation of the concrete body, it is highly probable that the worker cast the anchor of the metal expansion anchor in the condition that chips, etc. remained at the bottom because the cleaning inside the perforation was insufficient.

It is presumed that the cone sank inside the chip without receiving the reaction force at the time of anchor injection, and as a result, the anchor expansion part was not expanded.

It is somewhat likely that the reason why the cleaning of the inside of the perforation was insufficient was that the knowledge and experience of the worker at the time of the construction was insufficient.

Since it is difficult to find out any problems after construction, it is desirable desirable to carry out the construction surely after satisfying the conditions described in the guide, etc., and it is desirable that the construction is carried out by the worker with the work qualification, and that the record of the construction content, etc. is left.

It is desirable to add reinforcement to areas where there is no record to confirm the contents of construction work, etc., and where there is a high risk of contact with a train in case of collapse.

Probable Causes: It is probable that the concerned serious incident had occurred because there was the inferior construction work as the insufficient cleaning in the hole after drilled into concrete body in the construction work of the metal extension anchor based on the "after constructing anchor method", in the planting work of the down line No.1 starting signal column.

It is probable that the metal extension anchor wasin the status asinsufficient tolerance against tensile force because the cone of the metal extension anchor had not expanded the swelling part of the anchor due to the inferior construction work when the signal column had been planted.

Therefore, it is somewhat likely that the signal column had collapsed because the external force exceeded the tolerance of the metal extension anchor fixing the signal column of the home signal, as the anchor of the metal extension anchor was loosening gradually, caused by vibration due to running trains on the viaduct in addition to the effects of the external force such as windstorm, earthquake, etc., in the period of about 38 years from planting, in the status that the metal extension anchor supporting the signal column had been insufficient endurance against tensile force, in cooperation with the wind pressure of about 20 m/s instantaneous wind speed on the collapsed day.

Please refer to the serious incident investigation report for the detailed investigation results. (Published on December 19, 2019)
http://www.mlit.go.jp/jtsb/eng-rail-report/English/RI2019-3-1e.pdf

A bicycle with a child entered a class 4 level crossing and collided with a train.

West Japan Railway Company, between Michinoue station and Managura station, Fukuen Line, Level crossing accident

Summary: On September 27,2018, train was running between Michinoue station and Managura station at a velocity of about 72 km/h, the driver of the train noticed a bicycle entering Iwasakinoichi level crossing, class 4 level crossing, then applied an emergency brake immediately, but the train collided with the bicycle.

The passerby, an elementary schoolchild, riding the bicycle was dead in the accident.

Findings

About one year before the accident, a level crossing accident occurred at the same level crossing, in which the driver of a motorized bicycle died.

After the previous accident, the level crossing warning signs were replaced, color plates were attached to the level crossing warning fence, and road markings were carried out. Therefore, it is probable that the level crossing had been maintained so that passers by could easily notice the existence of the level crossing.

It is considered probable that through the execution of the weed - proof soil, it was possible to see 240m or more ahead from the dot - line display on the side of the passers by approach, and the distance of the down train was secured.

In the traffic safety education at the elementary school where the passers - by went, it is somewhat likely that there were some children who did not know the existence of the level crossing, there was no instruction that there was a class 4 level crossing in the school district and it was necessary to cross carefully.

It is somewhat likely that, from the child's point of view, it was not possible to easily recognize that "the warning sound did not sound and the crossing gate did not descend, but the train might be dangerous if it approaches and crosses over." Therefore, it is considered probable that sufficient measures were not taken in terms of facilities in consideration of the child's point of view and in terms of education concerning the existence of the class 4 level crossing.

Expected Measures to Prevent the Recurrence:

- Necessity of the traffic safety education on the class 4 level crossing based on the viewpoint of the children.
- Necessity of the measures in the region where the population is increasing.

Probable Causes: It is certain that the accident occurred as the train collided with a bicycle because the passerby riding bicycle entered Iwasakinoichi level crossing, class 4 level crossing without automatic barrier machine nor road warning device, in the situation that the train was approaching. It could not be determined why the passerby riding bicycle entered the level crossing in the situation that the train was approaching, because the passerby was dead in the accident, although it is somewhat likely that the passerby did not recognize the approaching train.

Please refer to the accident investigation report for the detailed investigation results. (Published on July 25, 2019)
http://www.mlit.go.jp/jtsb/eng-rail-report/English/RA2019-5-1e.pdf

Cracks in the bogie frame expanded, continued operation despite abnormal noise and odor. West Japan Railway Company, In the premises of Nagoya station, Tokaido Shinkansen, Serious Incident (Vehicle damage)

Summary: On December 11, 2017,the train crews composed of 16 vehicles had been noticed unusual smell in the cabin and unusual noise from underfloor of the vehicle, from just after departed from Hakata station, but the train was operated until to Shin-Osaka station, and the subsequent train operation was handed over to Central Japan Railway Company.

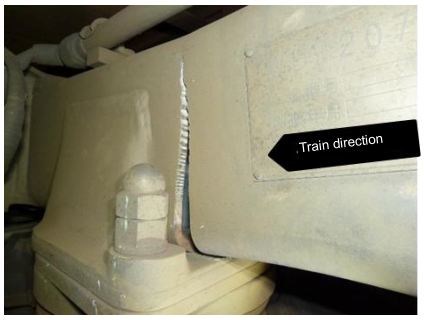
When the train arrived at Nagoya station, the vehicle maintenance staffs, dispatched to Nagoya station obeying the instruction of the operation dispatcher of Central Japan Railway Company, noticed unusual sound from the 4th vehicle, and implemented the underfloor inspection in Nagoya station. As the results of the inspection, the leaked oil was found in around the gear box in the front bogie of the 4th vehicle, then the further operation of the train was cancelled. After that, when the works to move the concerned vehicle to the train depot, i.e., Nagoya Rolling Stock Depot, was implemented, the crack was found in the side beam in left side of the bogie frame of the front bogie in the 4th vehicle.

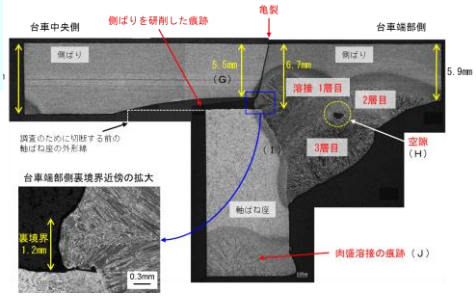
There were about 1,000 passengers, 4 train crews, i.e., the driver and 3 conductors, and 3 pursers engaging in the cabin sales, etc., boarded on the train when the train had arrived at Nagoya station, but there was no injured person.

Findings

It is highly probable that the crack, the broken surface in around the slot, was not expanded in a short period.

As the bottom surface of the side beam swelled during the manufacturing process, the assembly worker did the mating in order to remove the shake, but the worker did not know that "the grinder finishing of the bottom surface of the side beam should not be done" as described in the work order.





It is considered somewhat likely that the crack was not detected because the crack was not opened because the inspection was carried out in a non - loaded condition with the bogie frame as a single unit during the general inspection and no abnormality was found in the dimensional inspection.

No measures were taken

It is probable that on the previous day, the crack had developed to the extent that it affected the rigidity of the side beam, and that the crack had further expanded to the extent that the side beam was deformed during the operation on the day and affected the bogie components.

Probable Causes: It is highly probable that the concerned serious incident occurred because the gear type flexible shaft coupling displaced exceeding the allowable range and damaged due to deformation of the bogie frame caused by the crack which had generated in the side beam of the bogie frame of the vehicle and had expanded by fatigue.

The crack had generated in the side beam of the bogie frame of the vehicle because it is somewhat likely that the split had generated in around the back boundary of the slot welded part where the crack had originated when the welding work had implemented. In addition, it is highly probable that the crack had generated related with the followings.

(1) The residual stress was generated in around the slot welded part due to the implementation of the overlay welding on the bottom surface of the axle spring seat after annealed.

(2) The thickness of the bottom plate of the side beam had become thinner than the designed standard value, because the bottom surface of the side beam had been grinded excessively when attached the axle spring seat to the bottom plate of the side beam.

In addition, it is highly probable that the crack had expanded in the period shorter than the vehicle life, i.e., the usable period of the bogie, because the expanding speed of the crack became faster as the thickness of the bottom plate of the side beam became thinner due to the excessive grinding works implemented in the bottom plate of the side beam.

Here, it is highly probable that the bottom plate of the side beam was grinded excessively related with that the problem, that the machining work was required to attach the axle spring seat due to the swell in the bottom surface of the side beam generated in the manufacturing process of the bogie frame, was dealt without studying the essential causes and counter measures, and the manufacturing works had implemented without well understandings on the instructions for the work related to the strength of the bogie frame.

Factors to Continue Train Operation as Being Noticed Abnormal Sound and Nasty Smell, etc.:

It is probable that the staffs concerned in the JR West could not concluded to judge that there was the hindrance in the train operation although they had noticed the abnormal sound, the nasty smell, etc., related with the followings.

(1) The dispatcher was in the situation that the definite information to understand the seriousness of the abnormal situation were not obtained, as the generation of the abnormal sound, the nasty smell, etc., were discontinuously, and when the dispatcher asked as "Is there any hindrance in the train operation?", the vehicle maintenance staff had replied as "I think it was not in such situation".

(2) The vehicle maintenance staff understood that the dispatcher had been arranging the implementation of the underfloor inspection of the vehicle, but the dispatcher received some reports from the vehicle maintenance staff and thought that the vehicle maintenance staff would implement the measure to open motor circuit instead of the underfloor inspection against the abnormal situation in the vehicles. Thus, the difference in the recognition on the necessity of the underfloor inspection of the vehicle between the dispatcher and the vehicle maintenance staff was brought out, and the differences did not clear and continued after that.

(3) The dispatcher considered that the vehicle maintenance staff would report that there was the hindrance in the train operation if it was dangerous actually, because the vehicle maintenance staff was the professional engineer on the vehicles. On the contrary, the vehicle maintenance staff understood that the decision to implement underfloor inspection had been entrusted to the dispatcher. Therefore, there was a side of the characters to depend on each other between the dispatcher and the vehicle maintenance staff, to judge the continuation of the train operation.

Please refer to the serious incident investigation report for the detailed investigation results. (Published on March 28, 2019)
http://www.mlit.go.jp/jtsb/eng-rail-report/English/RI2019-1-1e.pdf

On June 28, 2018, based on the results of the fact - finding investigation and analysis of the bogie cracks, the JTSB submitted a interim report to the Minister of Land, Infrastructure, Transport and Tourism and stated its opinions.

Columns

Analysis of Causes of Train Derailment Accident Due to Gauge Widening

Railway accident investigator

The causes of train derailment accidents are diverse. One of them is the "derailment on the track due to an increase in the gauge widening." This is a phenomenon in which the gauge widening, which is the distance between the left and right rails, has abnormally increased from the basic dimension (for example, 1067 mm for narrow rails, which are often used on domestic conventional lines), causing the wheels to fall and derail within the gauge widening.

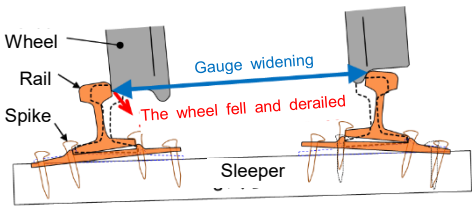


Image of a derailment caused by gauge widening

The Japan Transport Safety Board investigates the damage and traces of tracks and vehicles at the accident site in order to identify the cause of a train derailment accident. The main train derailment on a track are as follows :

- In many cases, it occurs on a curve rather than a straight line. This is because a lateral pressure (a force that a wheel pushes a rail sideways) is generated when a vehicle travels on a curve, and a slack (a width of a rail is made larger than a predetermined size in order to smoothly travel on a curve) is set.
- In many cases, the wheels fall within the inner rail (rail inside the curve) because the wheels on the front axle of the bogie travel along the outer rail (rail outside the curve) within the curve.
- It occurs even when the rail is wet due to rain, etc. flange climb derailment in which a wheel rides on a rail while rotating does not occur almost when the friction coefficient between the wheel and the rail is low due to rain, etc.

・ The track gauge is enlarged for some reason. In the vicinity where the wheel fell into the track and became the starting point of the derailment, there are damage and traces related to the track gauge enlargement, such as a large track gauge displacement (difference between the dimension of the track gauge and the design value) and a floating dog spike.

There are various reasons for the expansion of the gauge widening. However, the gauge widening, which was originally wide, has expanded further due to the lateral pressure caused by the running of vehicles, resulting in a large expansion of the gauge widening. The main reasons are as follows :

- Because of corrosion of wooden sleepers and loosening of rail fastening devices such as dog nails, the ability to fasten the rail and hold the track gauge has become weak. These are not a major problem on their own, but are more significant as they continue.
- A large gauge displacement exceeding the standard value was found in the periodic inspection, but the track maintenance was not carried out.
- The standard value of track gage displacement is not appropriate, and necessary track maintenance is not carried out.
- Slack is larger than the required amount, and there is less room for derailment on the track.

In order to show preventive measures for each accident, it is important to analyze and identify the cause of the increase in the gauge widening at the time of accident investigation.

Train derailment accidents due to an increase in the gauge widening are common among local railways. In many cases, local railways are difficult to secure sufficient profits with a small number of employees. On the other hand, in order to operate railways safely, it is essential to secure facilities in various fields such as civil engineering, rolling stock, and electricity, as well as the level of technology to maintain and manage them. As these are almost the same as those of major railway companies, economic and technical support is required.

In June 2018, the Japan Transport Safety Board stated its opinion to the Minister of Land, Infrastructure, Transport and Tourism about the derailment accident caused by the gauge widening.

For example, it is difficult to manage wooden sleepers because they often rely on visual inspection. Replacing wooden sleepers with concrete sleepers with excellent durability and maintainability requires a large amount of money. Therefore, it takes time to take measures to prevent track gauge expansion. However, it is important to advance as much as possible what can be done using public assistance systems and technical support systems to prevent similar accidents.

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.

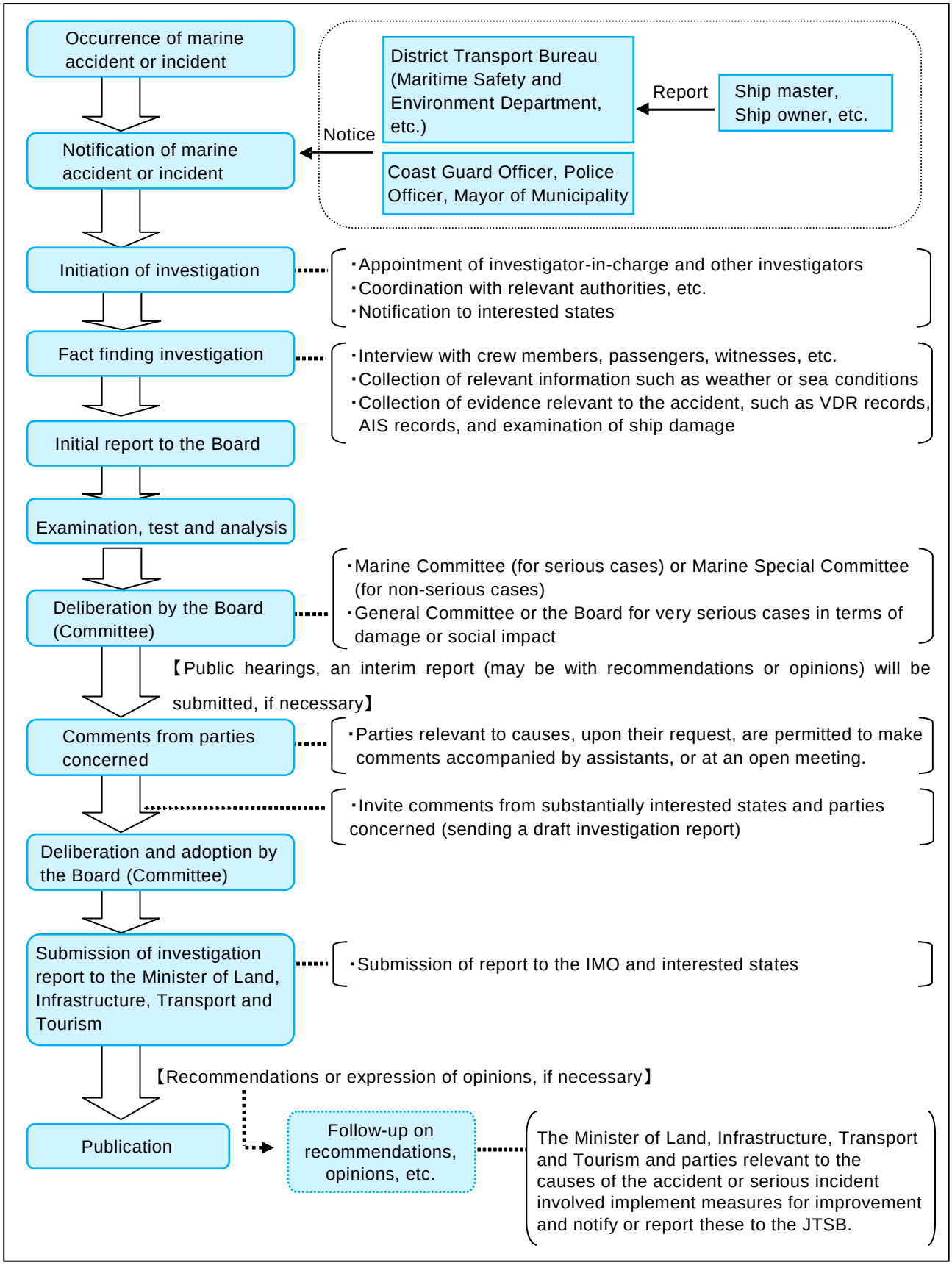
2 The situation where a ship grounded without any damage to the hull; and

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

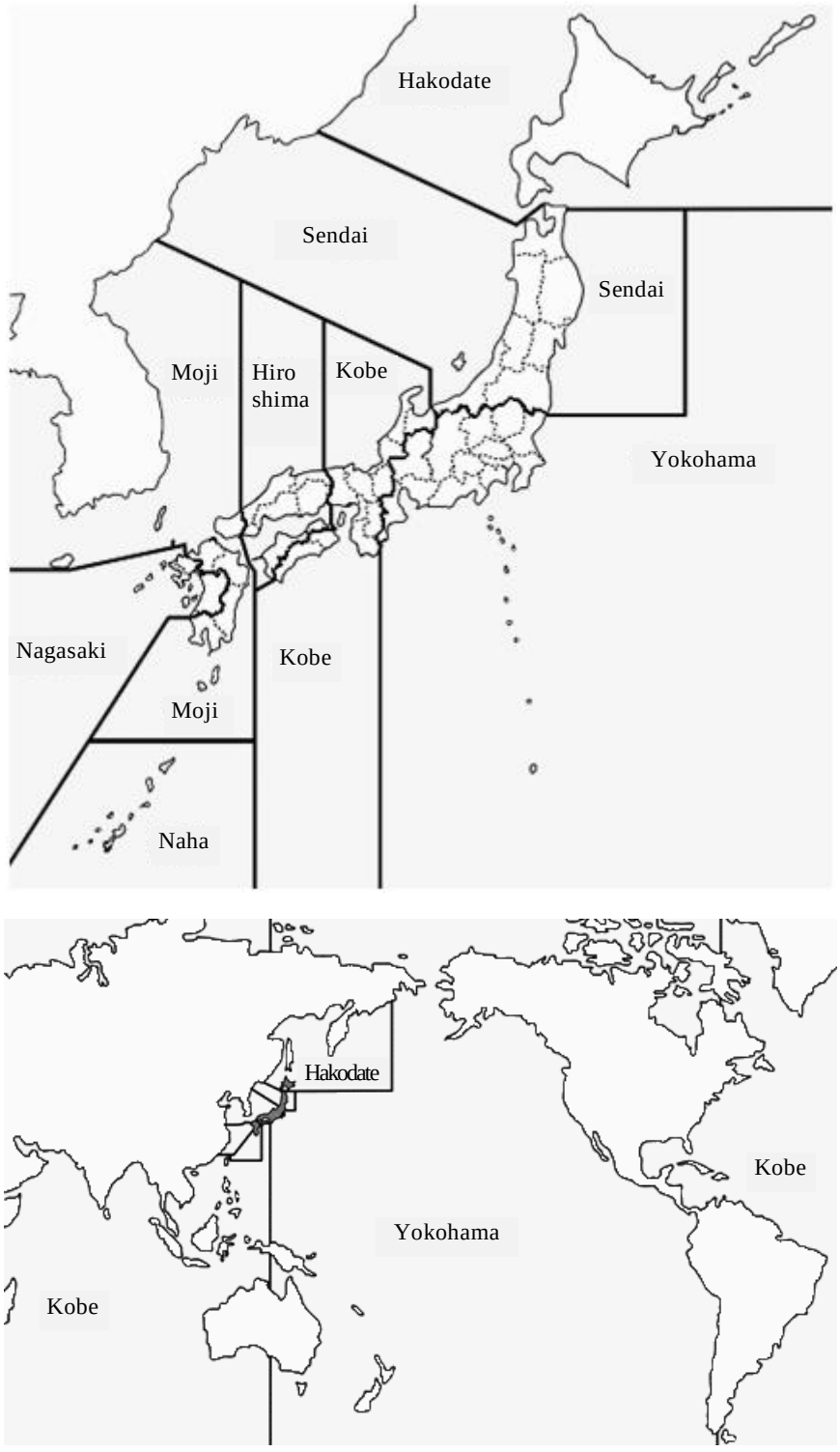
2 Procedure of marine accident/incident investigation



* Provisions of the Act for Establishment of the Japan Transport Safety Board after it came into effect in June 2020

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 2020)

The JTSB carried out investigations of marine accidents and incidents in 2019 as follows:

In 2019, 599 accident investigations had been carried over from 2018, and 836 accident investigations were newly launched. Besides, 838 investigation reports were published in 2019, and thereby 596 accident investigations were carried over to 2020.

Moreover, 87 incident investigations had been carried over from 2018, and 221 incident investigations were newly launched in 2019. Futhermore, 162 investigation reports were published in 2019, and thereby 145 incident investigations were carried over to 2020.

Among the 1,000 investigation reports published in 2019, one was issued with recommendation and one was issued with opinions.

Investigations of marine accidents and incidents in 2019

(Cases)

Category	Carried over from 2018	Launched in 2019	Not applicable	Transferred to Tokyo Office	Total	Publication of investigation report	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2020	(Interim report)
Marine accident	599	836	△1	0	1,434	838	(1)	(4)	(1)	596	(1)
Tokyo Office (Serious cases)	21	23	0	3	47	23	(1)	(4)	(1)	24	(1)
Regional Offices (Non-serious cases)	578	813	△1	△3	1,387	815				572	
Marine incident	87	221	△1	0	307	162	(0)	(0)	(0)	145	(0)
Tokyo Office (Serious cases)	1	1	0	1	3	2	(0)	(0)	(0)	1	(0)
Regional Offices (Non-serious cases)	86	220	△1	△1	304	160				144	
Total	686	1,057	△2	0	1,741	1,000	(1)	(4)	(1)	741	(1)

Note 1. The figures for “Launched in 2019” includes cases which occurred in 2018 or earlier, and which the JTSB was notified of in 2019 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.

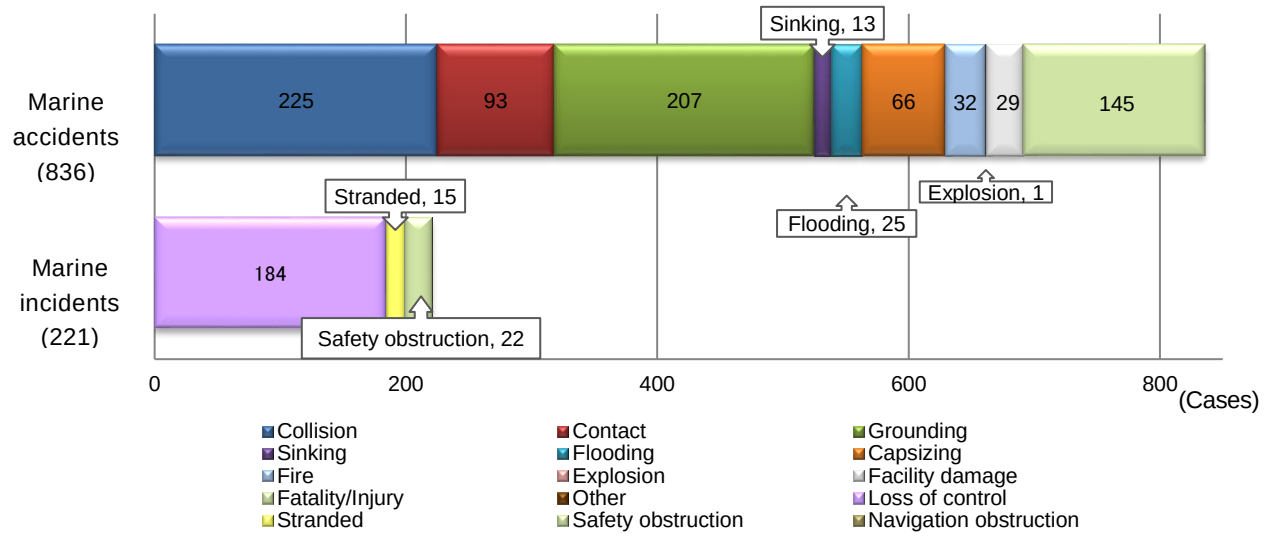
Note 3: The column “Transferred to Tokyo Office” shows the number of cases where the investigation found out that it was serious and the jurisdiction was transferred from the regional office to the Tokyo Office.

6 Statistics of investigations launched in 2019 (As of end of February 2020)

(1) Types of accidents and incidents

The breakdown of the 1057 investigations launched in 2019 by type of accidents and incidents is as follows: The marine accidents included 225 cases of collision, 207 cases of grounding, 145 cases of fatality/injury (not involved in other types of accidents), and 93 cases of contact. The marine incidents included 184 cases of loss of control, 22 cases of navigation obstruction, and 15 cases of stranded. The objects of contact were breakwaters in 20 cases, quays in 18 cases, and piers in 12 cases.

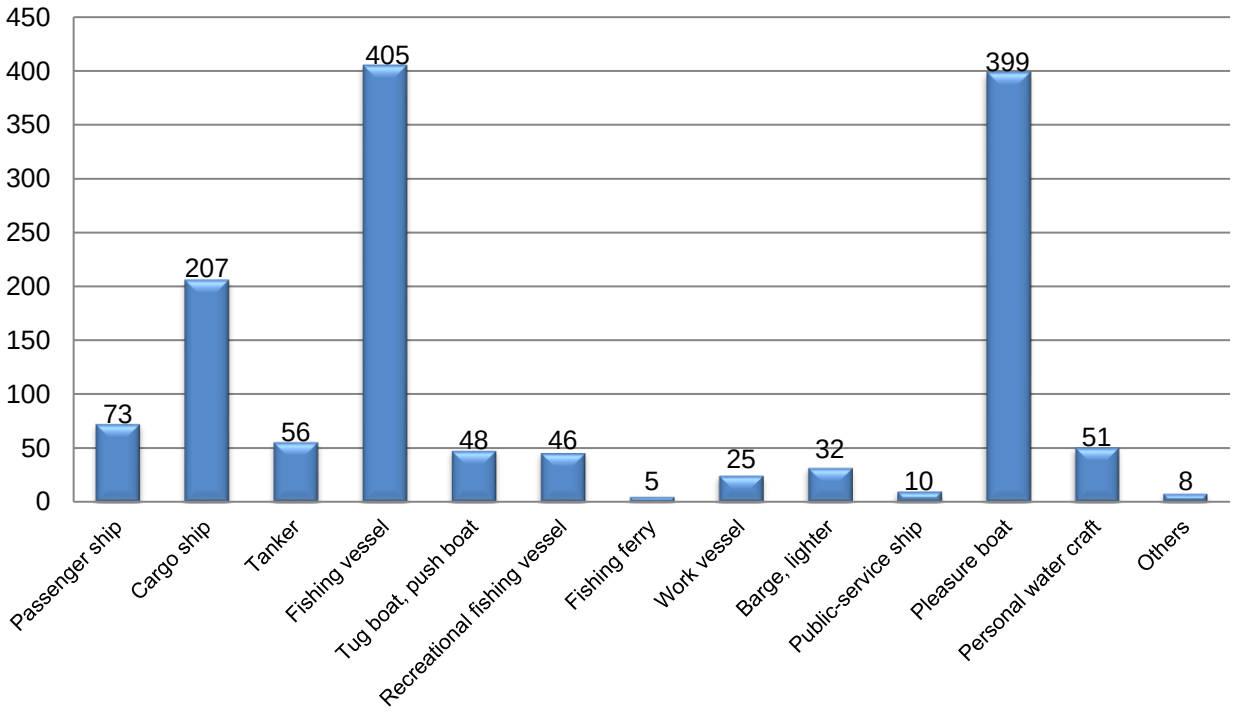
Number of investigated marine accidents and incidents by type in 2019



(2) Types of vessels

The number of vessels involved in marine accidents and incidents was 1,365. By type of vessel, they included 405 fishing vessels, 399 pleasure boats, 207 cargo ships, 73 passenger ships, and 56 tankers.

Number of vessels involved in marine accidents and incidents by type in 2019



The number of foreign-registered vessels involved in marine accidents and incidents was 56, and they were classified by accident type as follows: 31 vessels in collision, eight vessels in contact and seven vessels in grounding. As for the flag of vessels, 16 vessels were registered in Panama, 10 vessels in Republic of Korea, six vessels in Bahamas.

Number of foreign-registered vessels by flag

(Vessels)

Panama	16	Belize	4	Singapore	2
Republic of Korea	10	Sierra Leone	4	Marshall Islands	2
Bahamas	6	Antigua and Barbuda	3	Others	9

(3) Number of casualties

The number of casualties was 548, consisting of 99 deaths, 24 missing persons, and 425 injured persons. By type of vessel, 171 persons in passenger ships, 166 persons in fishing vessels and 107 persons in pleasure boats. By type of accident, 419 persons in contact, 145 persons in fatality/injury, 100 persons in collision, 30 persons in grounding, and 28 persons in capsizing.

With regard to the number of persons dead or missing, 77 persons were involved in fishing vessel accidents, 20 persons in cargo ship accidents, 20 persons in pleasure-boat accidents, indicating dead or missing cases occurred frequently in fishing vessels.

Number of casualties (marine accident)

(Persons)

2019										
Vessel type	Dead			Missing			Injured			Total
	Crew	Passengers	Others	Crew	Passengers	Others	Crew	Passengers	Others	
Passenger ship	0	0	0	0	0	0	9	156	6	171
Cargo ship	15	0	3	2	0	0	3	0	1	24
Tanker	0	0	0	0	0	0	2	0	0	2
Fishing vessel	55	0	1	20	0	1	86	0	3	166
Tug boat, push boat	0	0	0	0	0	0	4	0	0	4
Recreational fishing vessel	1	1	0	0	0	0	7	17	1	27
Fishing ferry	0	0	0	0	0	0	0	1	0	1
Work vessel	0	0	0	0	0	0	4	0	0	4
Barge, lighter	0	0	1	0	0	0	0	0	1	2
Public-service ship	0	0	0	0	0	0	5	0	0	5
Pleasure boat	9	0	10	1	0	0	26	1	60	107
Personal water craft	2	0	0	0	0	0	13	0	18	33

Others	1	0	0	0	0	0	0	0	1	2
Total	83	1	15	23	0	1	159	175	91	548
	99			24			425			

※ The figures above include accidents under investigation and therefore are subject to change depending on the course of investigations and deliberations.

7 Summaries of serious marine accidents and incidents which occurred in 2019

The serious marine accidents which occurred in 2019 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 accidents)

1	Date and location	Vessel type and name, accident type
	March 9, 2019 Off the east of Himesaki, Sado City, Niigata Prefecture	Passenger ship GINGA Injuries to persons on board due to collision (floating objects in the water)
	Summary	The Vessel was boarded by the master, the chief engineer, and 2 other crew members. With 121 passengers on board, the Vessel was lifted above the sea surface by the lift of the hydrofoil. While proceeding westward at a speed of about 41.7 knots, the Vessel collided with floating objects in the water, and 108 passengers and one crew member were injured. * This case was investigated as a "particularly serious accident."
	Reference	Major activities in the past year (page 1), Feature 1 (1) (page 5)
2	Date and location	Vessel type and name, accident type
	January 6, 2019 Around 283 ° true, 1,400m from Light Beacon No. 8, West Route, Nagoya Port, Berth T1, Nabeta Wharf, Yatomi City, Aichi Prefecture	Container ship HARRIER (Bahamas) Fatality of a stevedore
	Summary	See "8. Publication of investigation reports " (page 127, No. 15)
3	Date and location	Vessel type and name, accident type
	January 17, 2019 Kikumoto No. 6 Berth, Niihama Port, Ehime Prefecture	Cargo ship ISHIZUCHI (Panama) Fatality of a worker
	Summary	While the ship was unloading cargo at Niihama Port, a worker was hit by a bulldozer in the hold and died.
4	Date and location	Vessel type and name, accident type
	January 20, 2019 Kashii Park Port, Hakata Port, Fukuoka City, Fukuoka Prefecture	Roll-On / Roll-Off Cargo ship CHURASHIMA Fatality of a worker
	Summary	On the vehicle deck during the loading of the container, a worker who was engaged in the guidance work was caught between the container loaded on the deck and the trailer moving backward and died.
5	Date and location	Vessel type and name, accident type
	January 28, 2019 Okinoshima Fishing Port, Omihachiman City, Shiga Prefecture	Passenger ship OKISHIMA Contact with a breakwater
	Summary	The Vessel, with the master, one onboard worker and nine passengers on board, departed from the floating pier at Okinoshima Fishing Port, and collided with the Ichimonji-tsutsumi in same fishing port. The one passenger, the master and the onboard worker on the Vessel were seriously injured, and seven passengers were slightly injured, and the bow section of the Vessel had hole.

6	Date and location	Vessel type and name, accident type
	March 11, 2019 Sea area east of Kinjo wharf in Nagoya Port	Oil tanker and chemical tanker EOS (Vessel A, Republic of Korea) Cargo ship AISHO NO. 8 (Vessel B) Collision
	Summary	While Vessel A was proceeding southward and Vessel B was proceeding northward, both vessels collided.
7	Date and location	Vessel type and name, accident type
	March 21, 2019 Off the southeast of Yokohama Route, Yokohama Area, Keihin Port	Container ship APL GUAM (Vessel A, USA) Container ship MARCLIFF (Vessel B, Antigua and Barbuda) Container ship HANSA STEINBURG (Vessel C, Liberia) Collision
	Summary	While Vessel A was proceeding northward and Vessel B was proceeding southward, both vessels collided. After that, Vessel B collided with Vessel C, which was anchoring.
8	Date and location	Vessel type and name, accident type
	March 27, 2019 Around 176.5 ° true, 1,140m from Kosuge third triangulation point, right bank of Arakawa River, Yanagihara, Adachi-ku, Tokyo	Houseboat HAMADAMARU No. 18 Fire
	Summary	See "8. Publication of investigation reports" (page 127, No. 14)
9	Date and location	Vessel type and name, accident type
	May 26, 2019 Off the south of Inubosaki, Chiba Prefecture	Cargo ship SENSHOMARU (Vessel A) Cargo ship SUMIHOMARU (Vessel B) Collision
	Summary	Vessel A and Vessel B collided off the south of Inubosaki, Chiba Prefecture
10	Date and location	Vessel type and name, accident type
	June 10, 2019 Tokyo No.3 Area, Keihin Port	Cargo ship PANSTAR GENIE (Vessel A, Republic of Korea) Tugboat DAITOMARU (Vessel B) Collision
	Summary	Vessel A and Vessel B collided.
11	Date and location	Vessel type and name, accident type
	June 26, 2019 Sea about 1,500m northeast of the north end of Koneshima, Onomichi City, Hiroshima Prefecture (Aoki-seto)	Cargo ship JK III (Vessel A) Minesweeper NOTOJIMA Collision
	Summary	While Vessel A was proceeding northeastward and Vessel B was proceeding southward, both vessels collided at Aoki-Seto.
12	Date and location	Vessel type and name, accident type
	July 22, 2019 Shallows near the west side of Nakatoshima, Imabari City, Ehime Prefecture	Cargo ship AZUL CHALLENGE (Panama) Grounding
	Summary	While the Vessel was navigating in the Nakasuido of the Kurushima Kaikyo Traffic Route under the guidance of the pilot, the Vessel grounded on the shallows near the west side of Nakatoshima.
13	Date and location	Vessel type and name, accident type
	August 11, 2019 Off the northwest of Nakagamijima Island, Misumi-machi, Uki City, Kumamoto Prefecture	Recreational fishing boat KOMPIRAMARU No. 3 Fishing boat EBISUMARU Collision
	Summary	See "8. Publication of investigation reports" (page 132, No. 23)

14	Date and location	Vessel type and name, accident type
	September 2, 2019 In Akashi Kaikyo Traffic Route	Car carrier GLOVIS COMPANION (Vessel A, Marshall Islands) Fishing vessel HIGASHIDAMARU (Vessel B) Collision
	Summary	Vessel A and Vessel B collided in the Akashi-Kaikyo Traffic Route.
15	Date and location	Vessel type and name, accident type
	September 9, 2019 Minamihonmoku Hama Road, Yokohama Area, Keihin Port	Cargo ship BUNGO PRINCESS (Panama) Contact with a bridge
	Summary	The Vessel collided with Minamihonmoku Hama Road.
16	Date and location	Vessel type and name, accident type
	September 9, 2019 Kita Wharf, Maizuru Port, Maizuru City, Kyoto Prefecture	Cargo ship FIRST AI (Republic of Korea) Fatality of a crew member
	Summary	While the Vessel was berthed at Kita Wharf in Maizuru Port, the boatswain was injured when his head was caught while the hatch was being closed, and he was confirmed to be dead at the hospital to which he had been transported.
17	Date and location	Vessel type and name, accident type
	September 17, 2019 About 610 km off the east of Cape Nosappumisaki, Nemuro City, Hokkaido Prefecture (the place of finding)	Fishing vessel KEIEIMARU No. 65 Capsizing
	Summary	The Vessel capsized after the loss of contact.
18	Date and location	Vessel type and name, accident type
	October 12, 2019 Off the Higashiogishima, Kawasaki City, Kanagawa Prefecture	Cargo ship JIA DE (Panama) Sinking
	Summary	The Vessel was anchored off the coast of Higashiogishima, Kawasaki City, but it was confirmed that it had sank to the sea bed on October 13.
19	Date and location	Vessel type and name, accident type
	October 24, 2019 Shimizu Port, Shizuoka City, Shizuoka Prefecture	Container ship SITC BANGKOK (Vessel A, Hong Kong) Container ship RESURGENCE (Vessel B, Bahamas) collision
	Summary	Vessel A and Vessel B collided in the Shimizu Port.
20	Date and location	Vessel type and name, accident type
	November 2, 2019 Off Matsuyama Port, Matsuyama City, Ehime Prefecture	Recreational fishing boat KAZUMARU No.3 Grounding
	Summary	The Vessel grounded on a rock off the coast of Matsuyama Port.
21	Date and location	Vessel type and name, accident type
	November 16 ,2019 Sea around 3 km west-northwest from Wakayama-honko Offshore South Breakwater Lighthouse, Wakayama City, Wakayama Prefecture	Cargo ship ORANGE PHOENIX. Fatality of a crew member
	Summary	A third officer who was working around a lifeboat set up about 5 meters above the deck of the ship that was anchored off the Wakayama Port, died from falling on the deck .
22	Date and location	Vessel type and name, accident type
	December 2, 2019	Passenger ship NANKYU No.10

	Off the Northwest of Nejime Port, Minami-Osumi Town, Kagoshima Prefecture	Injury of a passenger
	Summary	After leaving Nejime Port, the hull of the Vesse was shaken and nine passengers were injured off the northwest coast of the Port.

(Marine incidents)

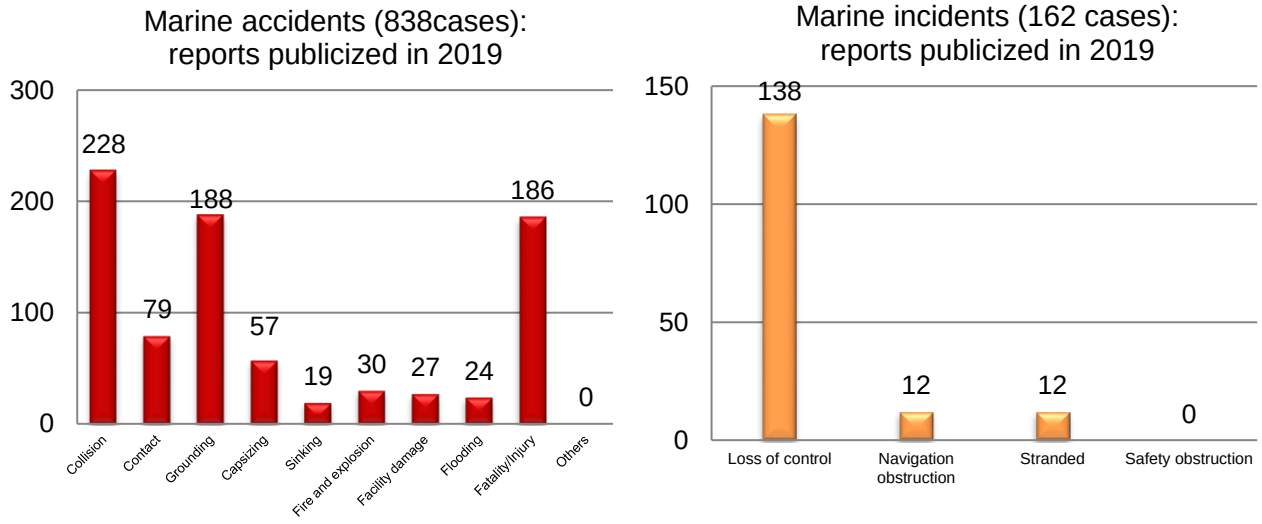
1	Date and location	Vessel type and name, incident type
	April 4, 2019 Sea about 770m east of Port Island, Nagoya Port	Container ship WAN HAI 316 (Singapore) Stranding
	Summary	WAN HAI 316 that was proceeding from the Asuka Wharf of the Nagoya Port toward the Yokkaichi Port stranded on the seabed off the east coast of the Port Island of the Nagoya Port.

8 Publication of investigation reports

The number of investigation reports of marine accidents and incidents published in 2019 was 1000, consisting of 838 marine accidents (among them, 23 were serious) and 162 marine incidents (among them, two were serious).

Breaking them down by type, the marine accidents included 228 cases of collision, 188 cases of grounding, 186 cases of fatality/injury, and 79 cases of of contact. The marine incidents included 138 cases of losses of control, (136 cases of navigational equipment failure, two cases of listing), 12 cases of navigation obstruction, and 12 cases of stranded.

As for the objects of contact, 20 were quays, 11 were breakwaters, and eight were buoy.



The number of vessels involved in marine accidents and incidents was 1,298. Breaking them down by type, the marine accidents involved 369 fishing vessels, 246 pleasure boats, 165 cargo ships, 56 passenger ships and 48 tankers. The marine incidents involved 67 pleasure boats, 35 fishing vessels, 28 cargo ships, and eight passenger ships.

Number of vessels by type involved in marine accidents and incidents for which reports were publicized in 2019

(Vessel)

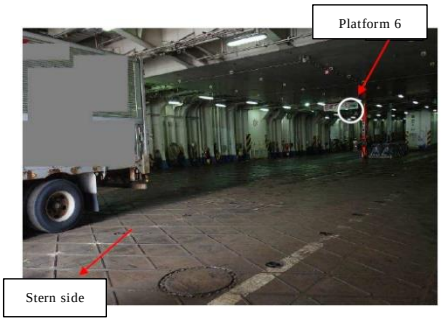
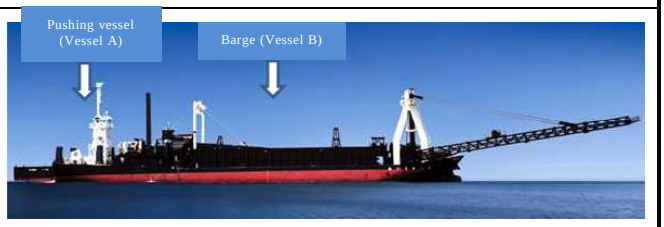
Classification	Passenger ship	Cargo ship	Tanker	Fishing vessel	Tug boat, push boat	Recreational fishing vessel	Fishing ferry	Work vessel	Barge, lighter	Public-service ship	Pleasure boat	Personal water craft	Others	Total
Marine accident	56	165	48	369	56	42	7	14	40	17	246	58	11	1,129
Marine incident	8	28	9	35	8	2	2	3	6	0	67	0	1	169
Total	64	193	57	404	64	44	9	17	46	17	313	58	12	1,298
Composition Ratio %	4.9	14.9	4.4	31.1	4.9	3.4	0.7	1.3	3.5	1.3	24.1	4.5	0.9	100.0

The marine accidents and serious incidents which occurred in 2019 are summarized as follows:

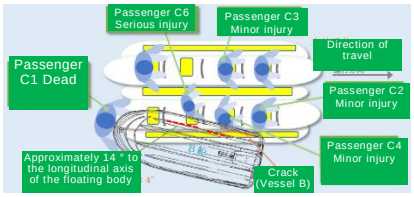
Marine serious accident reports published in 2019

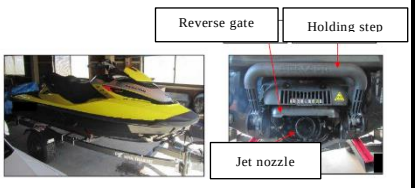
1	Date of Publication	Date and location	Vessel type and name, accident type
	February 28, 2019	April 2, 2018 Keihin port, Tokyo section 3, No. 10-1 Multi-purpose Terminal M-P	Training ship NIPPONMARU Fatality of a cadet
	Summary	While the training ship NIPPONMARU was moored at Keihin port, Tokyo section 3, No. 10-1 Multi-purpose Terminal M-P with the captain, one navigation officer, boatswain, and 49 crew taking 105 cadets onboard, around 14:25, April 2, 2018, during lay aloft training at the foremast, one of the cadets fell from the foremast to the superstructure deck and died.	
	Probable Causes	 It is probable that this accident occurred while the training ship NIPPONMARU was moored at Keihin Port Tokyo section 3, during lay aloft training at the foremast, a cadet who declared intent to abandon climbing from the top board to the gallant-top (gern board) was not equipped the life line and harness-typed safety belt which should be used for up/down and in-position works, when Cadet A came down from the top board to the superstructure deck, both of his legs were on the ratline, but both of his hands left the futtock shroud under the top board and he fell backward to the superstructure.at Keihin Port Tokyo section 3, during lay aloft training at the foremast, a cadet who declared intent to abandon climbing from the top board to the gallant-top (gern board) was not equipped the life line and harness-typed safety belt which should be used for up/down and in-position works, when Cadet A came down from the top board to the superstructure deck, both of his legs were on the ratline, but both of his hands left the futtock shroud under the top board and he fell backward to the superstructure. It is probable that the reason why a harness-typed safety belt for up/down and works in a position was not used is that the Japan agency of Maritime Education and Training for Seafarers and NIPPONMARU did not expect that they let a cadet declaring ceasing of lay aloft training down by himself. It is somewhat likely that the reason why both hands of the Cadet had left the futtock shroud is that the futtock shroud is an overhang, thus his arms were overworked However, since the Cadet died in this accident, it was not possible to establish a clear reason.	
	Report	http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0003e.pdf	
2	Date of Publication	Date and location	Vessel type and name, accident type
	February 28, 2019	September 18, 2018 Mitsubishi Naoshima wharf, Naoshima-cho, Kagawa Prefecture	Cargo vessel ERIK Fatality of a crew member

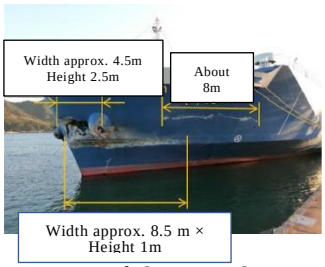
	Summary	While the vessel was moored at the Mitsubishi Naoshima wharf, with the master and 14 crew members on board, 4 crew members were performing the cleaning work of the upper hatch coaming of the cargo holds after unloading cargo, and an able seaman fell from the upper deck to the bottom floor of the cargo hold and dead. 	
	Probable Causes	It is considered probable that this accident occurred because Crew Member A who was working while being in an unstable posture on the Ladder fell forward and fell from the upper deck to the bottom of the cargo hold bottom when he doing the cleaning work while the vessel was moored at Mitsubishi Naoshima wharf. It is considered probable that the vessel carried out the cleaning work by the methods that differed from the Ladder guidelines of the CSWP, and that because there was nothing to support his upper body on the Ladder, Crew Member A was performing the cleaning work while being in an unstable posture on the Ladder. It is somewhat likely that Company A was insufficient in monitoring that the crew members clearly understood the Ladder guidelines of the CSWP and then applied and performed the Ladder guidelines in the cleaning work, because the vessel carried out the working methods being different from the Ladder guidelines in everyday work.	
	Report	http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0014e.pdf	
	Reference	Case Studies (page 156)	
3	Date of Publication	Date and location	Vessel type and name, accident type
	February 28, 2019	October 4, 2018 Off the north of Oshima, Munakata City, Fukuoka Prefecture	Recreational fishing boat SEIRYOMARU Fatality of a Fishing passenger
	Summary	While the Vessel was returning to Konominato Fishing Port, Munakata City, with one master and four passengers on board, one of the passenger fell into the water and died.	
	Probable Causes	It is probable that this accident occurred when the Vessel was shaken by the waves from the portside while returning to Konominato Fishing Port at night, Passenger A, who was not wearing a life jacket, fell into the water from the starboard side edge and drown due to the difficulty to keep his face above the water. 	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-2-3_2018tk0018.pdf	
4	Date of Publication	Date and location	Vessel type and name, accident type
	February 28, 2019	April 5, 2018 Nishi-ku, Niigata Port, Niigata Prefecture	Passenger Ferry YUKARI Injury of a crew member
	Summary	While the Vessel, with the master and 31 other crew members on board, was loading vehicles on the south side quay of Yamanoshita Wharf, Nishi-ku, Niigata Port, Niigata City, Niigata Prefecture, the second officer, who was in charge of the working instruction on the vehicle deck, was injured seriously such as compartment syndrome of both lower legs because his feet was run over by the right rear wheel of a reversing trailer (with the head (vehicle towing the chassis) and the chassis connected).	

	Probable Causes	It is probable that this accident occurred as follows ; At night, while the Vessel was loading vehicles on the lower vehicle deck at the south berth at the Yamanoshita Wharf, the second officer, who was in charge of the working instruction, approached the rear of the Trailer, which was waiting near the stern gate, with his back facing up, and as the Trailer started to go astern, the second officer hit his feet on the right rear wheel of the Trailer.  It is probable that the reason why the second officer approached the rear side of the Trailer with his back facing up was that the second officer, who was the work leader, was not aware of the Trailer because he could not grasp the entire work while he was carrying out the ballast adjustment in progress of the loading work, and that he did not pay attention to the Trailer which was waiting near the stern gate because he was concerned about the truck being guided to Platform 4 and was moving while watching the truck. It is probable that the reason why the Trailer started moving backward was that the Driver thought that the Trailer had started to be guided when he saw the crew near Platform 6 and heard the whistle, although the crew had not started to guide the Trailer at the time of the accident, because Company A did not thoroughly instruct the crew to follow the Safe Operation Manual, such as guiding the vehicle using both the whistle and the hand signal at an appropriate distance from the vehicle, and some crew members started to guide the vehicle at a distance where the hand signal could not be confirmed by the driver.	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-2-4_2018tk0017.pdf	
5	Date of Publication	Date and location	Vessel type and name, accident type
	March 28, 2019	August 22, 2017 Off the north-northeast of Yokoshima Island, Hirado City, Nagasaki Prefecture	Pushing Vessel AOIMARU No. 6 (Vessel A) Barge AOIMARU No. 8 (Vessel B) Sinking
	Summary	Vessel A, with the master and five other crew members were on board, formed a row of pushers (row of Vessel A) with Vessel B and anchored. During the salt removal work, the row of pushers leaned to the starboard side and sank. Three crew members of Vessel A died.	
	Probable Causes	It is probable that this accident occurred at night off the north-northeast of Yokoshima Island, while the row of Vessel A was anchored with its bow trimmed while carrying fine sand and salt-free water on board.  While the rows of Vessel A were carrying out salt-free work, bilge accumulated and Vessel A listed to starboard, which increased the list to starboard, overturned, lost buoyancy, and sank.	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-3-1_2017tk0012.pdf	
6	Date of Publication	Date and location	Vessel type and name, accident type
	March 28, 2019	March 24, 2018 Off the south-southwest of Cape Ashizuri, Tosashimizu City, Kochi PrefectureOff the south-southwest of Cape Ashizuri, Tosashimizu City, Kochi Prefecture	Cargo ship GENIUS STAR VIII (Vessel A, Panama) Cargo ship TOKUHOMARU No. 11 (Vessel B) Collision

	Summary	Vessel A was drifting off the south-southwest of Cape Ashizuri, Tosashimizu City, Kochi Prefecture, with the master, the officer and 16 crew members on board. Vessel B, on the other hand, was proceeding east-northeast toward Tokyo Area, Keihin Port, with the master B and 4 crew members on board. Vessel B collided with Vessel A off the south-southwest of Cape Ashizuri. Vessel A had a hole, etc. on the port side rear hull and Vessel B suffered a collapse on the bow. There were no casualties on both ships.	
	Probable Causes	It is probable that in this accident, while Vessel A was drifting off the south-southwest of Cape Ashizuri for the purpose of time adjustment and Vessel B was proceeding east-northeast by autopilot, Master B, who was on the bridge watch alone, fell asleep Vessel B collided with Vessel A. It is probable that the reason why the Master B fell asleep was that the level of awareness was lowered because he had accumulated fatigue during the long-term boarding, because there were few ships around the Vessel, because he sat on a chair and was on duty with autopilot, and because he thought that the alarm would be activated even if he fell asleep. It is somewhat likely that the Bridge Navigational Watch Warning System of Vessel B detected the movement of the body and legs of Master B, who fell asleep, and therefore the alarm did not work. It is probable that this fact contributed to the occurrence of the accident.	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-3-2_2018tk0019.pdf	
7	Date of Publication	Date and location	Vessel type and name, accident type
	March 31, 2019	April 8, 2018 Off the southeast of Kunisaki Port, Kunisaki City, Oita Prefecture	Chemical tanker GOLDEN SUNNY HANA (Republic of Korea) Explosion (cargo oil tank)
	Summary	While the Vessel with a master and 14 crew members on board, was proceeding southeast off the southeast of Kunisaki Port, Oita Prefecture, conducting cleaning work in a cargo oil tank, an explosion occurred in the cargo oil tank. Two of the Vessel's ordinary seamen were injured and her cargo oil tanks had holes and other damage.	
	Probable Causes	It is probable that the accident occurred when, as the Vessel was conducting the Circulation Work in the No. 2 port cargo oil tank and the No. 2 starboard cargo oil tank during cargo oil tank cleaning work while off the southeast of Kunisaki Port, Oita Prefecture, an explosion occurred in the No. 2 port cargo oil tank because steam was injected into the No. 2 port cargo oil tank under conditions in which a combustible gas mixture of vaporized pyrolysis gasoline and air in the explosive range was present. It is probable that the presence of the combustible gas mixture of vaporized pyrolysis gasoline and air in the No. 2 port cargo oil tank was not noticed because the gas concentration in the No. 2 port cargo oil tank was not measured prior to cleaning of the cargo oil tanks. It is somewhat likely that the combustible gas mixture was within the explosive range because flushing of the cargo lines and cargo oil tank bottoms was conducted under conditions in which ventilation and other measures were not implemented even though the gas concentration measurement taken after unloading was within the explosive range and approximately 30 liters of pyrolysis gasoline subsequently remained in both the No. 2 port cargo oil tank and the No. 2 starboard cargo oil tank, and the vaporized pyrolysis gasoline was not expelled outside, its gas concentration increased further with the passage of time, and it became mixed with air. It is probable that steam was injected into the No. 2 port cargo oil tank with the intention of raising the temperature of the seawater used in the work of repeatedly pumping up liquid collected on the cargo oil tank's bottom with a pump installed in the cargo oil tank and then spraying the liquid with the Cleaning Machine.	
	Report	http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0023e.pdf	
	Reference	Case Studies (page 153)	

<table>
<tr><td rowspan="4">8</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td>March 28, 2019</td><td>August 5, 2018
Off the west of Hokudan Murotsu Beach, Awaji City, Hyogo Prefecture</td><td>Personal water craft SJK Towed Floating Body (Vessel A)
Personal water craft No. 8 (Vessel B)
Collision</td></tr>
<tr><td>Summary</td><td colspan="2">While Vessel A, with a master and a watchman on board, was cruising for fun by towing a floating body called a 8-seater banana boat with seven passengers on board, and Vessel B, with a master on board, was cruising for fun , Vessel B and the floating body which was towed by vessel A collided off Hokudan Murotsu Beach, Awaji City, Hyogo Prefecture.
Among the person on board of the floating body, one person was killed, one person was seriously injured, and three persons were slightly injured. Scratch marks were produced on the right aft part of the floating body. In addition, the master of Vessel B was slightly injured, and cracks were produced on the gunnel part on the starboard aft part of Vessel B.</td></tr>
<tr><td>Probable Causes</td><td colspan="2"> 

In this accident, it is probable that while Vessel A was proceeding southwestward after towing a floating body called a 8-seater banana boat, while Vessel B was proceeding southwestward, the master of Vessel B turned to the left at a speed of about 40km/h and approached the floating body called a 8-seater banana boat in order to spray water, so that Vessel A and the floating body called a 8-seater banana boat were in front of Vessel B, and it was not possible to avoid though the control handle of Vessel B was turned full to the left, and Vessel B collided with the floating body called a 8-seater banana boat, off the west of Hokudan Murotsu Beach.</td></tr>
<tr><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-3-4_2019tk0005.pdf</td></tr>
<tr><td rowspan="4">9</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td>March 28, 2019</td><td>September 2, 2018
Off the east of Nihonmatsu Swimming Beach, Nagahama City, Shiga Prefecture (the northern part of Lake Biwa)</td><td>Personal water craft RXT-X260RS
Injury of passenger</td></tr>
<tr><td>Summary</td><td colspan="2">While the Vessel with one captain and two passengers(on the back seats) on board, was cruising back, a passenger who was sitting rear side of the back seats fell into the water toward the stern. She was recieved the jets of water discharged from the jet nozzle on the stern in the lower body opening, and she suffered serious injuries such as rectal injury.
 
</td></tr>
<tr><td>Probable Causes</td><td colspan="2">In this accident, while the Vessel was returning at a speed of about 60km/h with two passengers, who were wearing only swimsuits and life jackets without wearing wet suit bottoms, etc., on the rear seats off the east of Nihonmatsu Swimming Beach, Nagahama City, Shiga Prefecture, one pleasure boat and one personal watercraft passed across the bow of the Vessel from the right to the left, and when a sailing wave with a wave height of about 0.3m occurred ahead of the Vessel, the master thought that the Vessel would not be shaken so much even if the Vessel was climbing over the waves at the same speed, and the Vessel overcame the waves at a speed of about 60km/h. Therefore, the Vessel was shaken up and down. It is probable that the accident occurred when the passenger who was sitting fell into the water toward the stern and received the jets of water discharged from the jet nozzle on the stern in the lower body opening.</td></tr>
<tr><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-3-4_2019tk0005.pdf</td></tr>
<tr><td rowspan="2">10</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td>April 25, 2019</td><td>November 8, 2018 Mizushima Port, Kurashiki City, Okayama Prefecture</td><td>Cargo ship JFE VENUS
Collision (Breakwater)</td></tr>
</table>

	Summary	While the Vessel, with the master, chief engineer, and nine other crew members on board, was proceeding east-southeast in Mizushima Port, Kurashiki City, Okayama Prefecture, the diesel motor of the main power generator stopped, and the Vessel became uncontrollable due to a blackout (power failure). The Vessel collided with the Mizushima Port West No. 1 Breakwater. Although the hull of the bow of the Vessel was breached, no crew members were injured. The breakwater superstructure of the Mizushima Port West No. 1 Breakwater was collapsed. 
	Probable Causes	In this accident, it is probable that the Vessel collided with the Mizushima Port West No. 1 Breakwater with the steering device stopped and forward and reverse clutches of the main engine decelearator disengaged, because the diesel motor of the main power generator stopped and a blackout occurred while the Vessel was proceeding east-southeast in the Mizushima Port at night. It is probable that the reason why the diesel motor of the main power generator stopped and the blackout occurred was that the fuel oil in the service tank containing water was used without checking the condition of the drain by draining from the drain valve of the service tank for A heavy oil during the inspection before departure, and that this caused combustion failure or misfire in the cylinder of the diesel motor.
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-4-1_2018tk0021.pdf
11	Date of Publication	Date and location / Vessel type and name, accident type
	April 25, 2019	September 4, 2018 Kansai International Airport Access Bridge, Senshu Port, Osaka Prefecture Oil tanker HOUNMARU Collision (Bridge)
	Summary	When Typhoon No. 21 was approaching the Seto Inland Sea, including Osaka Bay, and a maritime typhoon warning was issued, the Vessel, with the master and 10 crew members on board, was anchored off the southeast of the Senshu Port. The Vessel was struck by strong wind which increased with the approach of the typhoon and being drifted to the north dragging the anchor pushed by the strong winds and waves. As a result, the vessel collided with Kansai International Airport Access Bridge. The deck on the starboard bow of the Vessel was crushed, and the road girder of Kansai International Airport Access Bridge was bent, broken, and scratched. The railway girder was collapsed, the rail was warped, and the gas pipe was broken. However, no crew members were injured.
	Probable Causes	In this accident, the Vessel continued single anchoring at the east side of the Oil Tanker Berth (hereinafter referred to as "the Anchorage") located on the southwest side of the Senshu Port in Osaka Prefecture, where Kansai International Airport Access Bridge is located about one nautical miles north of the southeast of the' Kansai International Airport First Stage Airport Island' (hereinafter referred to as "the Kanku Island") for the purpose of typhoon evacuation, under the condition that the Typhoon No. 21 was approaching and the maritime typhoon warning was issued in the Seto Inland Sea including Osaka Bay. In addition, the Vessel continued to anchor at the Anchorage due to the strong wind and waves caused by the approaching typhoon.Besides, once the drifting stopped by using the main engine so the master continued to hold the joystick in 

		the HOVER position as a ressult the Vessel was forced to drift down again and collided with Kansai International Airport Access Bridge under the condition that there was no sufficient distance to control the Vessel. It is probable that the reason why the Vessel anchored at the Anchorage, which is located about one nautical miles north of the southeast of the Kanku Island, was that the master thought that Typhoon No. 21 would pass the east side of the Anchorage and the left semicircle of the typhoon would enter the Anchorage, that the typhoon was traveling at a high speed and that strong wind would not blow for a long time, that the area was surrounded by the shore, that the seabed material was mud and the anchor would be highly effective, that other vessels were anchoring at the time of typhoon evacuation, that the next loading was planned to be carried out in the Sakai-Senboku Area of the Hanshin Port, and that he did not know the 2011 leaflet "Let's Prevent Anchor Dragging Maritime Accident ." and did not recognize to anchor avoiding the sea area within three nautical miles from the Kanku Island. It is probable that the reason why the Vessel kept single anchoring at the Anchorage was that the master thought that the double anchoring would be entangled when the wind direction changed and the mooring force would decrease, and that the master had the experience of using the main engine to cope with the typhoon wind. It is probable that the master set the joystick in the HOVER position because he thought that the anchor was stopped when the GPS speed over the ground indicated on the radar became zero, and that the Vessel would move forward if the joystick was in the forward position. It is probable that the reason why the Vessel was drifted down again that, under the situation where the forward thrust was lost due to the dispersion of the propeller thrust while the joystick was kept in the HOVER position, the anchor chain left the seabed with the increase of the water depth due to the high tide, the mooring force decreased, and the wind pressure on the hull and the wave drifting force increased. It is somewhat likely that Hinode Shipping Co., Ltd. and Tsurumi Sunmarine Co., Ltd. were involved in the occurrence of this accident because they did not provide the master with confirmation of the rough anchoring, information on the typhoon and information on the anchorage, and did not discuss the safe operation.
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-4-2_2018tk0013.pdf http://www.mlit.go.jp/jtsb/ship/p-pdf/MA2019-4-2-p.pdf (Explanatory Material)
	Reference	Major activities in the past year (page 2), Feature 1 (3) (page 7) Chapter 1 (page 21), Case studies (page 154)
12	Date of Publication	Date and location / Vessel type and name, accident type
	June 27, 2019	March 18, 2018 The Kantama South Light Buoy, west of the Akashi Strait Passage Passenger ferry FERRY FUKUOKA II Collision (Light buoy)
	Summary	The Vessel, with the master and 21 other crew members and 487 passengers on board, collided with the Kantama South Light Buoy while drifting in the western sea area at the west exit of the Akashi Strait Passage for the purpose of handing over the sudden illness that had occurred on board to the patrol craft of the Japan Coast Guard. The starboard propeller blades of the Vessel fell off, but no one was injured. The floating structure of the south light buoy of Kantama caused a broken hole, etc.
	Probable Causes	In this accident, it is probable that the Vessel, in the sea area west of the west exit of the Akashi Strait Passage, drifted to carry out the work of passing over the one passenger (hereinafter referred to as "the Patient"), who were lying in a state of stupor due to convulsions, to the Japan Coast Guard Patrol Craft NUNOBIKI (hereinafter referred to as "the Passing Work") at night, and while the Japan Coast Guard Patrol Craft NUNOBIKI was trying to go to the portside, the Vessel was drifted to the vicinity of the Kantama South Light Buoy due to the current, and collided with the Light Buoy because the Vessel could not secure a safe distance to pass the 

<table>
<tr><td></td><td></td><td colspan="2">Light Buoy.
It is probable that the reason why the Vessel could not secure the distance to safely pass the Kantama South Light Buoy when the Vessel was pushed down toward the vicinity of the buoy by the tidal current was as follows :
(1) The master of the Vessel was not able to continuously confirm the relative position between the Vessel and the Kantama South Light Buoy, and he did not notice the change in the direction in which the Vessel was being drifted, because he paied attention to the Passing Work. Therefore, he thought that the Vessel might pass through the south side of the Light Buoy, although he was concerned about the proximity to the Light Buoy.
(2) The master of the Vessel had been anxious to disembark the Patient as soon as possible because the time had passed since the occurrence of the sudden illness patient, and he was thinking of continuing the Passing Work as much as possible.
(3) When the master of the Vessel decided to operate the wing angle in order to obtain forward thrust in order to secure the distance from the Kantama South Light Buoy, he operated the wing angle step by step, because he had concerned about the influence of the rapid operation of the wing angle on the Japan Coast Guard Patrol Craft NUNOBIKI.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-6-1_2018tk0002.pdf</td></tr>
<tr><td>13</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td></td><td>June 27, 2019</td><td>May 4, 2018
South off Hanshin Port, Kobe Area</td><td>Container vessel NYK VENUS(Vessel A ,Panama)
Container vessel SITC OSAKA(Vessel B, Hong Kong)
Collision</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">While Vessel A, with the Master, 26 other crew, three other persons and a pilot on board, was turning toward the south entrance of Rokko Island East Coast of Kobe Area of Hanshin Port from the north-eastward under guide by the Pilot, container Vessel B, with the Master and 17 other crew on board, was proceeding toward in the direction of north west for the south entrance of Kobe Chuo Passage. Both vessels collided in the vicinity of Kobe Rokko Island East Waterway Central Floating Lighted Buoy.
Vessel A caused damage at the starboard side bow, and Vessel B caused damage at the accommodation spaces on the port side stern, but there were no casualties in both vessels.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that the accident occurred because, while Vessel A was traveling northeastward and turning left toward the south entrance of East Waterway and Vessel B was traveling northwestward toward the south entrance of the Kobe Chuo Passage, Pilot of Vessel A thought that Vessel A was able to to pass by the stern side of Vessel B and thus continued to navigate while turning left, while Master of Vessel B, thinking that Vessel B was able to pass by the bow side of Vessel A, continued to proceed northwestward, as a result of which both vessels collided.
 
 
It is probable that the Pilot thought that Vessel A was able to pass by stern side of Vessel B and continued to navigate while turning left because, Vessel A was slowing down even though turning left, in addition, by observing the relative orientation of Vessel A and B with his eyes,the Pilot overestimated that Vessel A would be able to pass by Vessel B's stern side and was not aware of the risk of collision with Vessel B.
It is probable that Master of Vessel B continued to proceed northwestward, thinking that the Vessel B would be able to pass by the bow side of Vessel A because, by observing Vessel A'straveling direction and from the radar’s predicted course, he thought Vessel A would maintain the course of travel.
It is probable that the fact that Vessel A and B were not communicating information by VHF in early stage of the encounter, for example letting each other know the course their own vessel was taking, contributed to the occurrence of this accident.
It is considered somewhat likely that the fact that the Pilot and Vessel A's crew were not having verbal communication in regard to maneuvering their own vessel and the movement of the other vessel and Master of Vessel A did not keep to lookout because of focusing his attention</td></tr>
</table>

		on the meeting about entering the port, also contributed to the occurrence of the accident.	
	Report	http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0004e.pdf	
14	Date of Publication	Date and location	Vessel type and name, accident type
	June 27, 2019	March 27,2019 Right bank of the Arakawa River in Yanagihara, Adachi-ku, Tokyo	Houseboat HAMADAMARU No. 18 Fire
	Summary	While the Vessel was moored at a mooring facility on the right bank of the Arakawa River in Yanagihara, Adachi-ku, Tokyo, with a master and three employees on board, a fire occurred from the kitchen. One employees of the Vessel suffered minor injuries and the hull was burnt (total loss).	
	Probable Causes	 It is probable that this accident occurred as follows : While the Vessel was moored at a mooring facility on the right bank of the Arakawa River and preparing for night operations, tempura oil, which left after the food materials had been deep-fried in an aluminum alloy pan (hereinafter referred to as "the Pan"), continued to be heated by a commercial gas stove on the portside of the kitchen (hereinafter referred to as "the Stove"), and the oil reached the ignition temperature, and the fire spread from the kitchen to the bow of the Vessel. It is probable that the reason why the tempura oil, which had left after deep-frying the food materials in the Pan, continued to be heated on the Stove was that the employee in charge of cooking felt sleepy after the completion of cooking on the Stove and wanted to take a break as soon as possible, and that the fire on the Stove was hidden in the Pan and the gas cock was hidden in the simple cooking table, and so that the employee was not conscious of extinguishing the fire on the Stove and left the kitchen.	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-6-3_2019tk0010.pdf http://www.mlit.go.jp/jtsb/ship/p-pdf/MA2019-6-3-p.pdf (Explanatory Material)	
15	Date of Publication	Date and location	Vessel type and name, accident type
	July 25, 2019	January 6, 2019 T1 berth of Nabeta wharf, Yatomi City, Aichi Prefecture	Container ship HARRIER (Bahamas) Fatality of a stevedore
	Summary	While the Vessel was moored at the T1 berth of Nabeta wharf, with the master and 17 crew members on board, 7 stevedores were loading containers to the vessel, and a stevedore who was serving as assistant wireless signal person and communicating the conditions of unloading and loading containers by radio apparatus got caught between two containers and dead.	
	Probable Causes	 The accident occurred when a 20 ft container (hereinafter referred to as "the Container") was moored at the berth. It is probable that the accident occurred as follows : After the Container was loaded and landed on the Vessel by gantry crane (the GC) of Quay 1 of Unit 2, and the Container was wound up at a speed of 3 notches without being separated from the spreader. As a result, the Container swung to the stern and then to the bow due to the impact of the Container being suddenly pulled out of the midlock, and Stevedore A was caught between the Container and another container loaded on the bow. It is probable that the gantry crane operator A, when the Container was loaded on the Vessel and landed on the Vessel at the GC, did not notice that the spreader that the spreader had not been separated from the Container and rolled up the spreader, because the Operator A, having received the radio communication, was conscious of the work contents of the next process. It is somewhat likely that Stevedore A, when the Container was loaded and landed on the Vessel, heard it by radio and approached the bow side of the Container because he had a role	

<table>
<tr><td></td><td></td><td colspan="2">to operate the twist lock at the bottom of the Container on the bow side, and when the Container swung to the bow side, Stevedore A was caught between the containers loaded on the bow side.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2019tk0007e.pdf</td></tr>
<tr><td>16</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td></td><td>July 25, 2019</td><td>June 20, 2018
Off the east of Inubosaki, Choshi City, Chiba Prefecture</td><td>Fishing vessel KORYOMARU No. 68
Flooding</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">While the Vessel was proceeding westward toward Kesennuma Port, Miyagi Prefecture, with the master, the chief fisherman, and 16 other crew members on board, a large wave continued to be received on the portside bow, and the bow warehouse flooded.
The chief engineer and two deck members were injured.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that this accident occurred at night while the Vessel was sailing westward in the sea off the east of Inubosaki, where a marine storm warning was issued and there were winds and waves from southwest to west and waves from south to southwest, the portside bow was continuously subjected to large waves and seawater accumulated on the upper deck of the portside bow,and so that the bow subsided and the bow of portside became more inclined to the left, and the port bow as submerged and the bow warehouse was flooded from the entrance.
  </td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-7-2_2018tk0005.pdf</td></tr>
<tr><td>17</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td></td><td>August 29, 2019</td><td>June 17, 2017
Off the southeast of Irozaki, Minamiizu Town, Shizuoka Prefecture</td><td>Container ship ACX CRYSTAL (Vessel A, Philippines)
Missile destroyer warship USS FITZGERALD (Vessel B, USA)
Collision</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">The Vessel A, with a master, a second officer, an able seaman and 17 crewmen on board, proceeding to northeast in the southeast off Irouzaki, Minamiizu town, Shizuoka Prefecture for Tokyo zone of Keihin port, and the Vessel B, with a commanding officer, three watch officers, an able seaman, and 288 crewmen on board, proceeding to south in the southeast off Irouzaki, collided.
 

Seven crews died and three crews were injured on board the Vessel B, which was flooded as a result of having holes and other damage in the starboard midship front shell, and the Vessel A had curve and other damage in the port bow bulwark.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that in this accident, at night, in the southeast off Irouzaki, while the Ship A was navigating for the northeast and the Vessel B was navigating for the south, the Vessel B navigated while keeping the course and speed without proper lookout for the Vessel A because the attention was paid to an ocean-going container ship, which navigated parallel in the north of the Vessel A, and the Vessel A navigated while keeping the course and speed, and therefore this accident was caused by the collision of the both vessels.
It is somewhat likely that Vessel B, because the fact that the ocean-going container ship approached the starboard bow side of the Vessel B and Radar information of the Vessel A were not surely obtained, paid attention to the ocean-going container ship, which navigated parallel in the north of the Vessel A, and was not properly on the lookout for the Vessel A.
It is probable that the Vessel A, because daylight signalling lamp were emitted to theVessel B and it was expected that the Vessel B would recognize them and avoid the Vessel A, navigated</td></tr>
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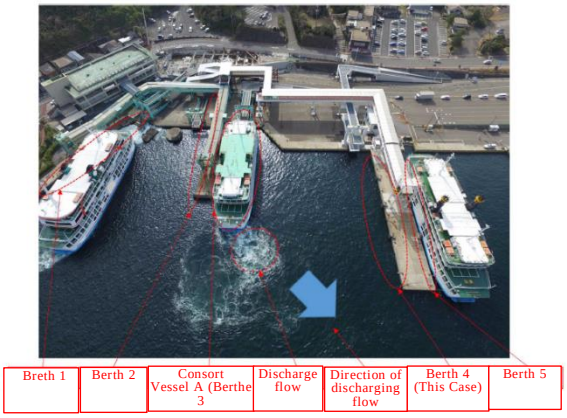
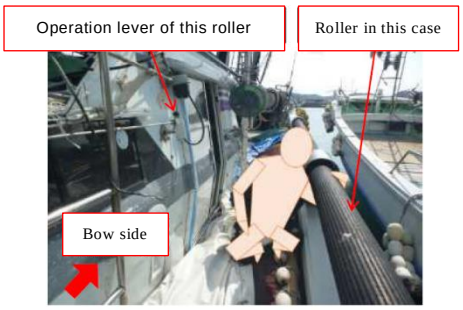
<table>
<tr><td></td><td></td><td colspan="2">while keeping the course and speed.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2017tk0009e.pdf
http://www.mlit.go.jp/jtsb/ship/p-pdf/MA2019-8-1-p.pdf, (Explanatory Materials)</td></tr>
<tr><td rowspan="4">18</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td>August 29, 2019</td><td>July 28, 2018
Sakurajima Port, Kagoshima City, Kagoshima Prefecture</td><td>Passenger Ferry SAKURAJIMAMARU No. 18
Collision (quay)</td></tr>
<tr><td>Summary</td><td colspan="2">The Vessel, with the master and 8 crew members, carrying 171 passengers and 55 vehicles on board, collided with the northeast end of Berth No.4 at the Sakurajima Port Ferry Terminal in Kagoshima City, Kagoshima Prefecture, while approaching the Berth No.4.
Two passengers were seriously injured, 15 passengers and two onboard salespersons were slightly injured, and the fender structure on the starboard bow of the Vessel was dented.
The Berth No.4 had a defect at the northeast end.</td></tr>
<tr><td>Probable Causes</td><td colspan="2">In this accident, it is probable that, while the Vessel was approaching Berth No.4 of the Sakurajima Port Ferry Terminal under the circumstance where discharging flow caused by propellers of the Consort Vessel at the Berth No.3, flowed from left to right on the course of the Vessel, the bow of the Vessel was pushed to the right by the water flow therefore the master set the propellers on both sides fully astern, but the starboard bow collided with the northeast end of Berth No.4 because he could not stop the coasting of Vessel.
 

It is probable that the reason why the bow of the Vessel was pushed to the right was that the Consort Vessel was pushing herself against the Berth No.3 by running the propellers on both sides, and the strength of the discharging flow generated from the propellers on the Consort Vessel was stronger than the discharging flow generated only from the propeller on one side, which is the usual way.
It is probable that the reason why the Vessel could not stop the force to move her forward was that the master kept the Vessel close to Berth No.4 at a speed faster than the standard speed.
It is somewhat likely that the reason why the master kept the Vessel close to Berth No.4 at a speed faster than the standard speed was that the master was accustomed to maneuvering the Vessel to approach Berth No.4 at a speed faster than the standard speed.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-8-2_2018tk0010.pdf</td></tr>
<tr><td rowspan="3">19</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td>August 29, 2019</td><td>September 14, 2018
Off the west of Oshima Island, Amakusa City, Kumamoto Prefecture</td><td>Fishing vessel SEIRYOMARU No.3
Injury of a crew member</td></tr>
<tr><td>Summary</td><td colspan="2">While the vessel with the chief fisherman, the master and 3 other crew members on board, was anchoring off the west of Oshima Island, Amakusa City, Kumamoto Prefecture and was hauling the net, the chief fisherman was caught in a side roller and was seriously injured.</td></tr>
</table>

<table>
<tr><td></td><td>Probable Causes</td><td colspan="2">It is probable that this accident occurred while the Vessel was anchoring off the west of Oshima Island, Amakusa City at night, hauling the net by adjusting the winding of the net with the bow side and the stern side roller for gathering a school of the fish to the bow side and making the bottom of the net flat, the chief fisherman who wore rubber gloves tried to fix the net to the stern side roller while the stern side roller was rotating, and so that the fingertips of the rubber gloves on the left hand were caught between the hauling net and the stern side roller, and then the left arm was got caught in the stern side roller.
 

It is probable that the reason why the chief fisherman tried to fix the net to the stern side roller by himself was because the lifting of the net was proceeding by the stern side roller rather than the bow side roller, and because the bow side of the net became heavy due to the uneven distribution of the fish in the net therefore the crew members except the chief fisherman, who were working to lift the net into the ship by pushing the net to the top of the side roller rotating toward the stern side at the most aft work position, had moved toward the net with the bow side roller.
It is probable that the reason why the chief fisherman wore rubber gloves and tried to fix the net to the stern side roller while the stern side roller was rotating was that he was impatient because he wanted to return to the port as soon as possible and secure a pier with good conditions for landing because of good fishing and prolonged operation time, and that he was used to the work.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-8-3_2019tk0016.pdf</td></tr>
<tr><td></td><td>Reference</td><td colspan="2">Case Studies (page 156)</td></tr>
<tr><td>20</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
<tr><td></td><td>October 31 2019</td><td>May 5, 2018
Off the west of the Koshikijima Islands, Satsumasendai City, Kagoshima Prefecture</td><td>Fishing vessel SHOTOKUMARU No. 87
Sinking</td></tr>
<tr><td></td><td>Summary</td><td colspan="2">While the Vessel, with the master and seven crew members on board, was proceeding northeast toward the Mie Area of Nagasaki Fishing Port, Nagasaki City, Nagasaki Prefecture, the Vessel listed to the right in the sea area off the west of the Koshikijima Islands, Satsumasendai City, Kagoshima Prefecture and sank.
All eight crew members were rescued, but one was slightly injured.</td></tr>
<tr><td></td><td>Probable Causes</td><td colspan="2">In this accident, it is probable that while the Vessel was proceeding north-eastward off the western coast of the Koshikijima Islands with a full load of catches under the strong sea wind warning was issued at night, the sea water entered the icebreaker room as the cover plate came off due to the launching wave, resulting the state trimmed by bow, and the water accumulated on the deck due to the launching wave under the state of the stability of the Vessel was degraded caused the upper end of the bulwark on the starboard side of the bow became submerged in the sea surface and sea water came into the Vessel, and the Vessel sank due to the loss of buoyancy.
 
It is probable that the accumulated water on the deck due to the launching wave was generated because the cover plate of the icebreaker room came off due to the launching wave and seawater flowed into the same room, resulting the trimmed by bow.
It is probable that the cover plate of the icebreaker room came off because it was not fixed by a cover cloth, crosspiece, wedge or other fasteners and was not tightly sealed.</td></tr>
<tr><td></td><td>Report</td><td colspan="2">http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-10-1_2018tk0007.pdf</td></tr>
<tr><td>21</td><td>Date of Publication</td><td>Date and location</td><td>Vessel type and name, accident type</td></tr>
</table>

	October 31 2019	October 22, 2018 Oshima Bridge which spans Obatake Seto, Yamaguchi Prefecture	Cargo ship ERNA OLDENDORFF Collision (Bridge)
	Summary	The Vessel was proceeding east in Obatake Seto toward a privately-operated berth in Etajima City, Hiroshima Prefecture, with a master, a second officer and 19 other crewmembers aboard when she collided with Oshima Bridge. The Vessel received dents and other damage to three of her four cranes as well as a bent damage to her aft mast; however, there were no fatalities or injuries on the Vessel. Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under its girders was broken and fell, and a water pipe was severed, causing a water outage that lasted for forty days affecting almost all of Suo-Oshima Town, Yamaguchi Prefecture; power cables, communication cables and others were severed as well.	
	Probable Causes	 It is probable that the accident occurred when, while the Vessel was proceeding east in Obatake Seto at night, she collided with Oshima Bridge because she proceeded under a bridge that she was unable to pass through at 'the heights above the water line at the time of the accident to the top of each cargo crane and the aft mast' (hereinafter referred to as "the height of crane and mast"). It is probable that the Vessel proceeded under Oshima Bridge which she was unable to pass through at the height of her cranes and mast because the Master of the Vessel approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge, and the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge. It is probable that the Master approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge because the Master did not check the details of the route assuming that the former master had already checked it. It is probable that the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge because he waited for a report from the Second Officer after the Master ordered the Second Officer to check the height of the bridge, and the Master was concerned that the Vessel would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after she turned to starboard off the west of Kasasa Shima. It is somewhat likely that although the Company A specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., the Master and the Second Officer were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.	
	Report	http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0020e.pdf http://www.mlit.go.jp/jtsb/ship/p-pdf/MA2019-10-2-p.pdf (Explanatory Materials)	
	Reference	Case Studies (page 157)	
22	Date of Publication	Date and location	Vessel type and name, accident type
	December 19, 2019	October 1, 2018 Kawasaki section, Keihin Port, Kanagawa Prefecture	Cargo ship MARINA (Belize) Collision (Seawall)

	Summary	Under the situation where Typhoon No. 24 was approaching, while being anchored at an anchorage in Yokohama section, Keihin Port, a cargo ship, MARINA, with 12 crew members, including the master, dragged the anchor and drifted toward to the northeast, and collided with the seawall at Ogishima, Kawasaki section. MARINA suffered dents, etc. to her starboard stern. The seawall suffered collision damage, etc. 
	Probable Causes	It is probable that in the accident, while being anchored in ballast at Anchorage Y1 at the Keihin Port for the purpose of evacuating from the typhoon under the situation where, during nighttime, Typhoon No. 24 was approaching and a typhoon warning had been announced for the northern part of the waters of the Kanto Section, including Tokyo Bay, the vessel dragged anchor when wind waves caused by the typhoon increased because she continued riding at single anchor and that the master set the main engine to full ahead but the vessel could not achieve sufficient forward thrust and drifted toward and collided with the seawall.
	Report	http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0015e.pdf

23	Date of Publication	Date and location	Vessel type and name, accident type
	December 19, 2019	August 11, 2019 Off the north-northwest of Nakagamijima Island, Misumi-machi, Uki City, Kumamoto Prefecture	Recreational fishing boat KONPIRAMARU No. 3 (Vessel A) Fishing boat EBISUMARU (Vessel B) Collision
	Summary	Vessel A, with the master and five fishing passengers on board, was drifting for recreational fishing off the north - northwest coast of Nakagamijima Island, Misumi-machi, Uki City, Kumamoto Prefecture. On the other hand, Vessel B, with the master and a deckhand on board, was heading north to the fishing ground, off coast of Nakagamijima Island. Both vessels collided with each other. In Vessel A, one of the fishing passengers was killed, the master and four fishing passengers were injured, the starboard bulwark was damaged, the starboard side wall of the bridge was fractured, etc., and in Vessel B, the master was injured, and the hull of the portside bow was scratched, etc.	
	Probable Causes	In this accident, it is probable that, while Vessel A was drifting for recreational fishing off the north-northwest of Nakagamijima Island, Vessel B was heading north to the fishing ground, Vessel A was late in noticing Vessel B approaching Vessel A, and Vessel B continued navigating toward Vessel A while turning to the left, causing both vessels to collide.  It is probable that although Master A was keeping a lookout on the bow because he was aware that the fishing passengers were starting fishing on the bow deck, he did not look at the starboard stern and was late in noticing Vessel B approaching while turning to the left. It is probable that Master B did not notice that Vessel B was approaching Vessel A while turning to the left, because he was navigating, taking his hand off the steering wheel and facing the stern for work on the stern deck.	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-12-2_2019tk0018.pdf	

Marine serious incident reports published in 2019

1	Date of Publication	Date and location	Vessel type and name, incident type
	March 28, 2019	June 30, 2018 Off the north of Ainoshima Island,	Oil tanker TENSHOMARU No. 2 Loss of control (no fuel supply)

		Shingu-machi, Fukuoka Prefecture	
	Summary	While the Vessel, with the master and seven crew members on board, was proceeding east-northeast off the northern coast of Ainoshima Island, Shingu-machi, Fukuoka Prefecture, the diesel motor of the power generator was stopped and the Vessel's power supply was lost. As a result, the Vessel became unable to operate the main engine, and the Vessel became loss of control.	
	Probable Causes	 It is probable that this incident occurred at night when the Vessel was navigating east-northeast off the northern coast of Ainoshima Island, Shingu-machi, and the liquid level in the A heavy oil service tank dropped to the A heavy oil outlet. As a result, air was sucked into the fuel oil system of the diesel motor of the power generator and the supply of fuel oil became impossible, the diesel motor of the power generator stopped and the Vessel's power supply was lost, and the main engine could not be operated. It is probable that the reason why the liquid level of the A heavy oil service tank dropped to the outlet of the A heavy oil was that the lower part of the acrylic window on the liquid level indicator came off the frame of the liquid level indicator cover and the gap with the liquid level indicator plate became small, the indicator needle did not drop, the start switch of the A heavy oil transfer pump and the read switch for the low liquid level warning did not work, and the transfer pump did not start automatically. It is probable that the read switch for the low-level alarm did not work because it was interlocked with the indicator needle on the liquid level indicator and did not work in the same way as the switch for starting the A heavy oil transfer pump; therefore, it is probable that the crew was not informed of the abnormally low level of the A heavy oil service tank by the alarm.	
	Report	http://www.mlit.go.jp/jtsb/ship/rep-inci/2019/MI2019-3-1_2019tk0003.pdf	
2	Date of Publication	Date and location	Vessel type and name, incident type
	March 28, 2019	July 12, 2018 Takamatsu Port, Takamatsu City, Kagawa Prefecture	Passenger Ferry KONPIRA No.2 Loss of control
	Summary	While the Vessel was proceeding northward in Takamatsu Port, Takamatsu City, Kagawa Prefecture, with the master, 11 crew members, 46 passengers, and 49 vehicles on board, the air circuit breaker of the main switchboard operated and shut down, causing a blackout. The main engine stopped, and the air circuit breaker could not be turned on again, and the Vessel became loss of control. There were no casualties among the passengers and crew members of the Vessel, and there was no damage to the hull.	
	Probable Causes	In this incident, while the Vessel was proceeding northward in Takamatsu Port, there was a short circuit between the wiring of the electric circuit on the starboard side and the electric circuit on the portside of the receptacle for the refrigerater vehicle, in the connecting box on the vehicle deck. When a short circuit current flowed into both electric circuits and the molded case circuit breaker for the starboard side wiring of the receptacle for the refrigerater vehicle on the main switchboard operated and became disconnected, two of the branch line of bus bar for the copper band connected to the molded case circuit breaker for the refrigerater vehicle on the vehicle deck was broken and jumped off, and the short circuit between the phases that came into contact with the branch line of the bus bar for the copper band of the receptacle for the refrigerater vehicle on the vehicle deck and the ground fault with the wall surface of the main switchboard caused excessive damage to the bus bar of the main switchboard. It is probable that the air circuit breaker of the main switchboard operated and shut down, causing a blackout, the main engine stopped, and the air circuit breaker could not be turned on again. It is highly probable that the reason why there was a short circuit between the wiring in the	

		connecting box of the electric circuit on the starboard side and the electric circuit on the port side of the receptacle for the refrigerater vehicle was that the wiring was not secured, the wiring was rubbed in the connecting box of both electric circuits, the wiring coating was broken, and the lead wires contacted each other. It is probable that, when the molded case circuit breaker for wiring on the starboard side deck of the receptacle for the refrigerater vehicle on the vehicle deck was cut off, the two of the branch of bus bar that had been connected to the receptacle for the refrigerater vehicle on the vehicle deck were broken and jumped off because of a short circuit between the phases of the branch line of the bus strip that had been connected to the power supply side, which caused melting and bending due to electromagnetic repulsion, because an arc was generated inside the molded case circuit breaker for wiring on the starboard side deck of the receptacle for the refrigerater vehicle on the vehicle deck that had been cut off due to the flow of short-circuit current several times in the past.
	Report	http://www.mlit.go.jp/jtsb/ship/rep-inci/2019/MI2019-3-2_2018tk0008.pdf

9 Actions taken in response to recommendations and opinions in 2019

None was notified in 2019.

10 Provision of factual information in 2019 (marine accidents and incidents)

The JTSB provided factual information on three cases (marine accidents) to relevant administrative organs in 2019. The details are as follows.

(1) Provision of information concerning the prevention of fatal and injury accidents caused by trucks, forklifts, etc., on the vehicle deck

(Information provided on February 28, 2019)

1. Introduction

According to the accident investigation report released by the Japan Transport Safety Board from October 2008 to February 2019, there were 10 cases (10 vessels) of fatal and injury accidents involving trucks and forklifts on the car decks of passenger and cargo ferries. Five people were died, and five people were seriously injured when they were run over by large vehicles or caught between containers and side walls.

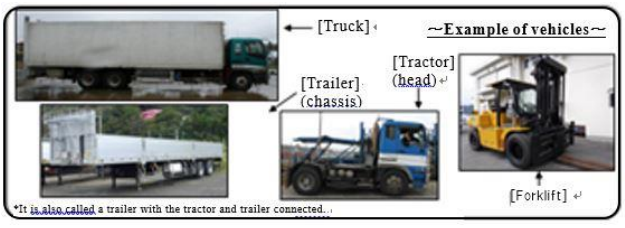
(The fatal accident in January 2019 in which a worker guiding a trailer was caught between the trailer and the container is under investigation.)

In order to load and unload vehicles in the following environments and in a short period of time, the vehicle deck may be equipped with a mixture of workers and vehicles, such as by guiding trucks, tractors, trailers, or moving forklifts.

(1) Many blind spots

(2) There is a sound.

(Noise from Vehicle Running, Air Blower, Truck Refrigerator, etc.)



(3) Parking spaces have structures (pillars, engine casings, etc.) and narrow.

(4) There is a shear (* 1) on the deck.

Also, the conditions for repeated daily work are always different due to the combination between workers and drivers, and changes in the environment.

By the way, according to the " Heinrich's law", "The 29 minor accidents and 300 incidents are behind one serious accident." In order to prevent the occurrence of serious accidents, let's check accidents that occurred in the past and near-miss incidents that did not lead to accidents, and strive to ensure safety.

* 1 :The shape of the deck warped upward in the longitudinal direction of the ship to improve wave resistance and drainage, and increase strength.

1

2. SHIPS, ACCIDENTS AND CASUALTIES

(1) Vessels: seven Passenger Ferries and three Cargo ships;

The gross tonnage is about 18,000 tons (the number of vehicles loaded: about 150 heavy-duty trucks and about 60 passenger cars) to about 1,000 tons, and the total length is about 200m to about 80m.

(2) Situation at the time of the accident:

On the driver's side: four cases while trucks, tractors and trailers were in operation, four cases while forklifts were in operation, etc.

Worker side: four cases while moving, one case while cargo handling, checking the loading condition, cleaning work, guiding, etc.

(3) Casualties: seven crew members and each of one passenger, stevedore and driver;

Accident date	Type	Gross tonnage(t)	Length over all(m)	Width (m)	Situation at the time of the accident		Casualty			
					Driver's side	Operator's side				
April, 2018	Passenger	18,229	199.9	26.5	Trailer moving backward	Moving	Navigator	Serious injury	Both lower leg compartment syndrome, fibula fracture, etc.	※ Refer to page 6 of the case studies
December, 2016	Cargo	2,502	121	16.5	Forklift moving forward	Moving	Navigator	Dead	Severe chest trauma	※ Refer to page 8 of the case studies
March, 2016	Cargo	13,950	173.34	26.6	Tractor moving backward	During cargo handling work	Stevedore	Serious injury	Renal trauma, lumbar spinous process fracture, etc.	
December, 2013	Cargo	999	89.52	13.5	Forklift moving forward	Checking the load	Navigator	Serious injury	Wrist fracture	
November, 2012	Cargo	13,539	182.29	27	Tractor moving backward	Moving	Deck member	Dead	Brain contusion	
May, 2012	Passenger	5,373	131.9	21	Other ※2		Passenger	Dead	Blood loss due to severe general injury	※2 A passenger suspected of having dementia of the Alzheimer's type, who was in the lower part of the vehicle, was hit by the vehicle when the freight vehicle was unloaded.
April, 2012	Passenger	1,867.80	79.76	14.3	Forklift moving backward	Washing moving	Deck member	Serious injury	Open lower leg fracture	
January, 2012	Passenger	3,555	86.01	15	Other ※3		Driver	Dead	Pelvic fracture	※3 When the chassis was unloaded, the driver who tried to return to the driver's seat of the trailer, which had started moving, was caught between the head and the sidewall.
November, 2010	Passenger	1,798	105.62	17	Forklift moving forward	Guiding	Navigator	Dead	Died by pressure(Injuries such as liver injury and thoracic transverse process fracture)	
January, 2009	Passenger	7,005	128.44	21	Track moving forward	Moving	Deck member	Serious injury	Pubis / ischium / sacral fracture	

3. Accident Causes, Factors, Examples and Preventive Measures

Let's look at the causes, factors, accident cases, and preventive measures for accidents during truck, tractor, and trailer operations and forklift operations, which were common conditions for accidents.

The causes of accidents include safety checks by workers and drivers, and actions related to communication between workers and drivers.

2

3-1. (1) Causes of accidents during operation of trucks, tractors and trailers

Main causes of accidents during operation of trucks, tractors and trailers.

○Items related to safety checks by workers and drivers

A guide is in a blind area of the vehicle, or the driver does not check the rear of the tractor when the vehicle is going backward.

○Matters related to communication between workers each other and between workers and drivers

The guide members did not take over the vehicle guidance, or driver started to move backwards when he or she heard the whistle, misunderstanding that the guide had started.

* Details are as shown in the table below.

Relevant person	Cause of accidents
Worker	The guide does not follow the instruction in the Safe Operation Manual, such as belows, The guide shall always pay attention to the movement of the surrounding vehicles; and the guide shall never enter the vicinity of a stopped or moving vehicle; as the guide shall guide the vehicle using both whistle and hand signals at an appropriate distance from the vehicle.
	Induction workers and cargo handling workers are in the blind spot of the vehicle and near the temporary storage space for the truck.
	The guides have not confirmed each other that they are in a safe place for the vehicle, and have not taken over the vehicle guidance by clearly indicating a signal such as a guide light.
	Some guides may start to guide the vehicle at a distance where the driver cannot confirm the hand signal.
	The work leader cannot hear the alarm sound (back buzzer) generated when the trailer moves backward due to the noise in the ship.
	The guide is not blinking the light emitting belt.
Driver	The driver misunderstands that guide has started when the driver hear the whistle, and start to move backward.
	The driver is paying attention to the proximity to the loaded vehicle while the vehicle is in reverse.
	When the driver leaned out from the right window of the tractor driver's seat and looked to the left rear of the tractor, the left side was the blind spot.
	The driver does not look back in reverse and does not use a rear-view mirror to check the rear of the tractor.
	The driver has not opened the window curtain at the rear of the tractor.

3

3-1. (2) Background of the Accident

Main background factors for accidents during truck, tractor, trailer operation and forklift operation.

○Matters related to safety management to be addressed by the entire organization

Operating company manuals, working environment, etc.

* Details are as shown in the table below.

Relevant Person	Cause of accidents
Operating company	The operator's manual is not strictly observed by stevedores.
	Training of newcomer stevedores on board is not provided.
	The speed limit on the vehicle deck was not specified in the figures such as the speed limit per hour, and it was indicated as "slow speed" on the inside wall.
Worker	Ship crew and shore workers are in charge of cargo handling, and shore workers are in charge of operation. In many cases, each one belongs to a different company.
	A single person may undertake multiple tasks, and multiple tasks may be performed in parallel. (Example 1 : The work leader was performing ballast adjustment; Example 2 : The moving work of the forklift truck and the cleaning work on the deck were carried out in parallel.)

	The stevedore was a newcomer on board.
	The crew of the ship were working on behalf of the shore workers, who are usually commissioned to handle cargo, on holidays when they do not come to the ship.
Driver	The driver doesn't know that there is a shear on the driver deck.
Working environment	There are many blind spots.
	There is noise. (Noise from Vehicles, Blowers, Truck Freezers, etc.)
	The sound is blocked. (The warning sound (back buzzer) of the tractor which goes backward by the earphone attached to one ear, etc. cannot be clearly heard.)
	The parking space is narrow with structures (pillars, engine casing, etc.).
	There is a shear on the deck.

4

3-1. (3) Accident prevention measures during operation of trucks, tractors and trailers

Operating company etc. [Safety management]

- ○Ensuring and Reviewing Compliance with Various Manuals
- ○Mutual understanding and information sharing between Workers and Drivers in Different Positions (Example：A Guide on the Front Passenger Seat of a Tractor, Experie the Sound of the Whistle and the Blind Spot of Public Relations)
- ○Instruction on Prohibition of from Crossing Near to the Front and Ba
- ○Sharing near miss events
- ○Education of New workers
- ○Setting and Display of Speed Limit on the Vehicle Deck
- ○Painting for Easy Identification of Structures
- ○Response for noise
- ○Education of New Workers
- ○Dissemination of the Safety Confirmation Map

Worker

[Safety check]
- ○Stay away from the vehicle
- Check the safety of the surroundings during wh
- l, such as being careful not to jump out.
- Equipment
- ○Guidance in a Safe Standing Position
- worsens

- ○Do not enter or create blind spots
- ○Approach to a Position Where Driver
- ○Clear Signals, ,combined use of Whistles and Guide Lights
- ○Recognition of Vehicle Deck Conditions (Noise, Blind Spot, Shear, etc.)
- ○Succession of Vehicle Guidance between Guides
- ○Operator Wearing a Light Emitting Vest Belt, Always Flashing

[Communication]
- ○Operator's Carrying of Radio

Replace as soon as sensitivity

Driver

[Safety check]
- ○Safety check driving conditions such as vehicle surroundings and direction of travel
- ○Operation at a Speed That Can Be Stopped Immediately and Safely
- ○Open the Driver's Seat Window and Check the Guide Whistle
- ○When moving backwards on the tractor, open the window curtain at the rear of the driver's seat and check the rear.

- ○The driver can make eye contact with the guide and start after confirming that the guidance has started.
- ○Clear signal, combined use of whistle and guide lights
- ○Checking the condition of the vehicle deck (noise,

[Communication]

5

3-1. (4) Accident case Guidance of trailer

Occurred around 22:15, April 5, 2018

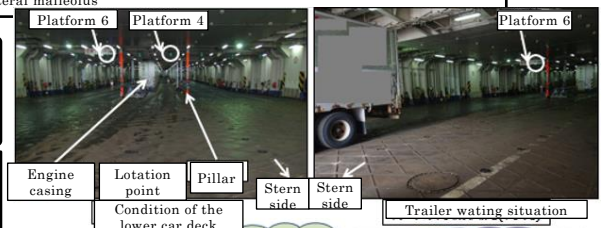
Ship Particulars：Gross Tonnage 18,229 tons, Length Over All × Width 199.90m × 26.50m
Summary of the accident：While the passenger ferry was loading a vehicle at the quay, the officer in charge of the operation was hit by the right rear wheel of the trailer moving backward with his legs.
Damage：Hospitalization for about 2 months due to compartment syndrome of both lower legs, peeling of right medial collateral ligament attachment, fracture of left fracture of fibula trunk and both fibula lateral malleolus

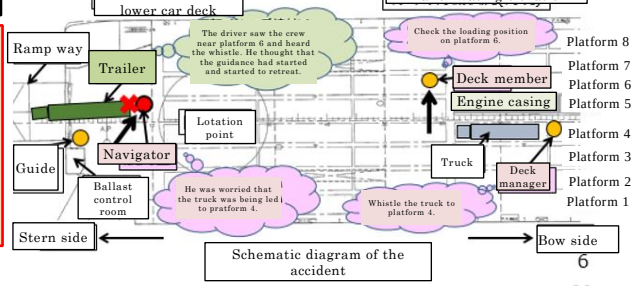
・Although the Officer had been instructed by the operating company not to enter the close range of the stopped vehicle, he was concerned about the truck leading to the Line 4 with the pillars and the engine casing after leaving the ballast control room. He was moving while looking at the truck. He did not pay attention to the waiting trailer, and approached the rear of the trailer while turning his back.
・The deckhands intended to approach and guide the trailer, and did not perform the whistle or hand signal, and did not start to guide the trailer.

・The driver knew that both a whistle and a hand signal were used to guide the vehicle. However, at the operating company, compliance with the Safe Operation Manual when guiding the vehicle was not thoroughly done to the crew members. Some crew members started to guide the vehicle at a distance where the driver could not confirm the hand signal. Therefore, the driver usually did not pay attention to the hand signal.

～Major Preventive Measures～
- ○A signal for starting guidance of a vehicle shall be given by using both a whistle and a guidance light (blue). [Safety check and communication]
- ○The crew members approached the driver to the point where they could make eye contact with him, and started to guide him using both a whistle and a guide light.。 [Safety check and communication]
- ○The driver started the vehicle after he was able to make eye contact with the crew and started the vehicle after the guide started using both a whistle and a guide light. [Safety check and communication]
- ○Instruct all onboard workers, including crew members, to prohibit vehicles from crossing near the front and back. [Safety management]
- ○In addition to work commanders and land guides, all crew members who carry out vehicle loading work are required to carry wireless devices to strengthen information sharing. [Communication]

※The operator took measures to prevent recurrence after the accident.





Schematic diagram of the accident

6

6

3-2. (1) Causes of accidents while operating forklifts

Major cause of accidents during forklift operation

○Safety Confirmation for Workers and Drivers

The guide is guiding the forklift from a position that is not visible to the forklift driver, the driver is not following the speed limit, etc.

○Communication between Workers and Drivers

The safety confirmation by the guide and the forklift operator is not done by the signal, etc.
※Details are as shown in the following table.

Relevant person	Cause of accidents
Worker	Stevedores do not understand the movement of the forklift and the blind spot from the driver's seat.
	The guide and the forklift operator did not check the safety of each other until the loading of the container was completed.
	The guide always guided the truck from a position not visible to the forklift operator.
	The guide always guided him by his voice without using the whistle.
Driver	A forklift has a dead angle due to a mast and a frame even when it is not loaded with cargo.
	The movement of the 10-feet container does not sufficiently visible ahead.
	The driver and the guide did not check the safety by the signal until the completion of the loading of the container.
	The driver is not following the speed limit.
	The driver did not notice the cargo handling work and the brake operation was delayed.

※See page 4 for background factors of the accident.

●The accident prevention measures during forklift operation are the same as the "accident prevention measures during truck / tractor / trailer operation" on page 5, and the specialized measures are "install a yellow rotating light behind the forklift driver's seat" (Operating company, etc. [Safety management]).

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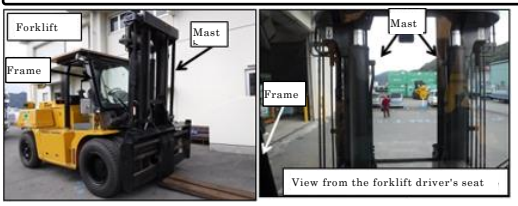
3-2. (2) Case of accident Loading and unloading of forklift

Occurred around 07:30, December 10, 2016

Ship Particulars : Gross Tonnage 2,502 tons, Length Over All × Width 121.00m × 16.50m
Summary of the accident : While the cargo ferry was unloading at the quay, Officer B jumped out of the sidewalk area near the air blower and contacted the moving forklift.
Damage : Officer B died of severe chest trauma.

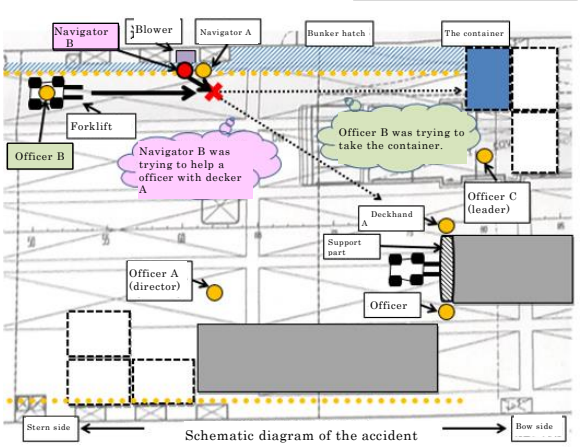


・Officer B did not understand that the movement of the forklift and existence of the blind spot from the driver's seat because he was about one month after he got on board.
・The vessel borrower did not provide appropriate education as stipulated in the regulations.
・Officer B did not notice that the forklift was approaching due to the noise from the air blower and other equipment.

・Although Worker B noticed that Officer B was near the air blower, Officer B entered the blind spot of the forklift and was traveling at a speed of about 17km/h. He did not notice that Officer B had jumped out of the sidewalk area, and the brake operation was delayed.

～Major Preventive Measures～
○The crew members shall, in principle, walk on the sidewalk area of the vehicle deck during the loading and unloading work using the forklift. They shall also accurately grasp the surrounding conditions and shall not protrude from the shadows of the cargo.
[Safety check]
○The forklift operator shall operate the forklift at a speed at which it can be stopped immediately when the forklift operator is travelling on the vehicle deck where a person is present. [Safety check]

※After the accident, the vessel's borrower and stevedores took measures to prevent recurrence.



Schematic diagram of the accident

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4. Introduction of good job examples

Four companies, including Hankyu Ferry Co., Ltd. and Taiheiyo Ferry Co., Ltd., cooperated in the questionnaire regarding efforts to prevent accidents during cargo handling work.

(1) What items do you think are particularly important in order to prevent accidents?

① **Communication between the guide and the driver.** Accidents are reduced by common understanding of guidance signals and the location of inboard protrusions, etc., verbally or by movement.
② All crew members shall carry out all cargo handling work under the common recognition, and the workers shall use their five senses to predict danger. When they feel danger, they shall immediately share information and endeavor to prevent accidents.
③ Compliance with the manual
④ (i) Signals for guidance and stop by the whistle (the driver does not hear or not heard by the driver), (ii) Types of guide light by the guide (some are easy to see and others are difficult to see), (iii) Skills of the guide and the driver (There is a difference depending on skills)

(2) Are there opportunities for ship crews and shore workers to share accident cases and near miss events?

① Each near miss event shall be promptly reported to the Operation Manager and shared with relevant departments and companies. (Examples in which all employees, including crew members, are allowed to view information on the company LAN)
② Prior to the busy season (multi - customer season) in summer and winter, it shall be conducted between workers (ship crew and ground workers) and between workers and the company.

(3) Please inform us of the safety measures taken for cargo handling work.

① Information on the past contact of vehicles with onboard structures, etc. was compiled into a single "map" and distributed and shared to workers. Visually check the location of occurrence and problems.
② Safety cargo patrol by top management.

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4. Introduction of good job examples

(3) Please inform us of the safety measures taken for cargo handling work. (Examples of Hankyu Ferry Co., Ltd.)

① Vehicle guidance training on board
・Participation of a guide (ship crew) and a driver
・A guide sat in the front passenger seat of the tractor and experienced how to hear the whistle, and confirmed the blind spot in the rear (Photo A).
・The guide and the driver check the sway-width of the rear of the chassis (Photo B).
・Confirmation of the stopping distance of the vehicle (Photo C)


(A)


(B ①)


(C guided simultaneously)

(B ②)

②Painting the pillars on the vehicle deck
・Remodeling with coloring to make it easier for drivers to check.


Before


After

10

There have been 10 fatal and injury accidents involving trucks and forklifts on the vehicle deck since October 2008. Five of them were died and five were seriously injured. Eliminate accidents by implementing the following preventive measures.

〔Worker, Driver〕
○Operators are prohibited from crossing near the front and rear of the vehicle!
○Operators shall wear a light - emitting vest and the lamp shall flash continuously so as to be visible to the driver.
○The guide and the driver communicate with each other through eye contact, etc. The driver must start after confirmation and comply with the speed limit.
○A guide shall use a guide light in addition to a hand signal and a whistle to clearly guide.
〔Operating companies, etc.〕
○Mutual understanding and information sharing between workers and drivers in different positions
⇒ Example :A guide enters the front passenger seat of the tractor and experiences the sound of the whistle and the blind spot at the rear.
⇒ Example :Workers sit in the forklift driver's seat and experience the view
○Painting for easy identification of structures.
○Collect past unsafe information, create a safety confirmation map, and share information.

Some shipping companies have already implemented efforts to prevent accidents. It is hoped that the working environment will be improved by referring to the efforts of other companies.
～You can prevent "traffic accidents in a ship" by following the manual and "always check safety". Safe!～

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*Publication of this information is detailed on the website of JTSB.

http://www.mlit.go.jp/jtsb/iken-teikyo/s-teikyo15_20190228.pdf

(2) Provision of information on blackouts (loss of onboard power) that occur suddenly

(Information provided on April 25, 2019)

1. Introduction

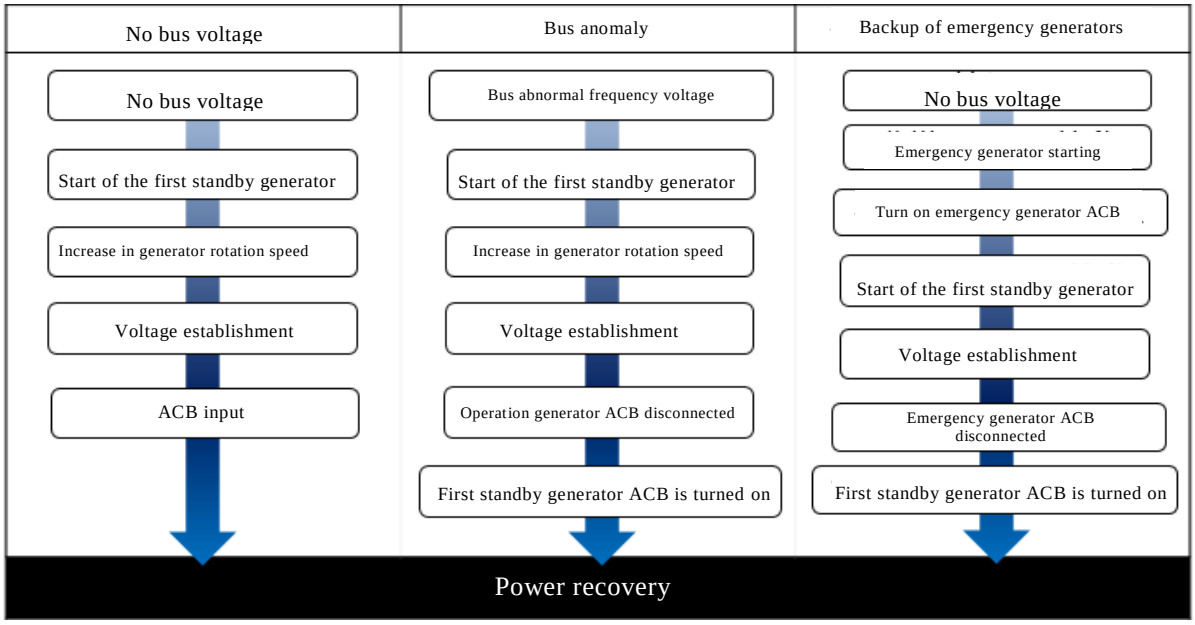
A loss of power on board a vessel (hereinafter referred to as "blackout") may occur suddenly, causing important equipment such as steering equipment to stop in a moment, resulting in a dangerous situation in which the vessel becomes uncontrollable, and then causing a collision, grounding, etc.

In the event of a blackout, at first, we should consider how to secure the onboard power supply and to restore the main engine and important auxiliary equipment in order to prevent the occurrence of accidents, rather than investigate the cause of it.

If there is a generator automation system, the standby generator is automatically started after the blackout and the onboard power supply is restored (see slide 3). However, there have been cases in the past investigations of Japan Transport Safety Board, could not immediately restore the onboard power supply or could not restore the onboard power supply at all due to a malfunction of the engine or system.

In this case, it is necessary to guide the ship to a safe place and to stop it, and it is important to check the equipment and train the crew on a daily basis.

When a blackout occurs, the system to restore the power supply in the ship will operate.



2. Statistical Data on Blackouts in Marine Accidents, etc.

The JTSB issued the following marine accident and incident investigation reports between October 2008 and November 2018.

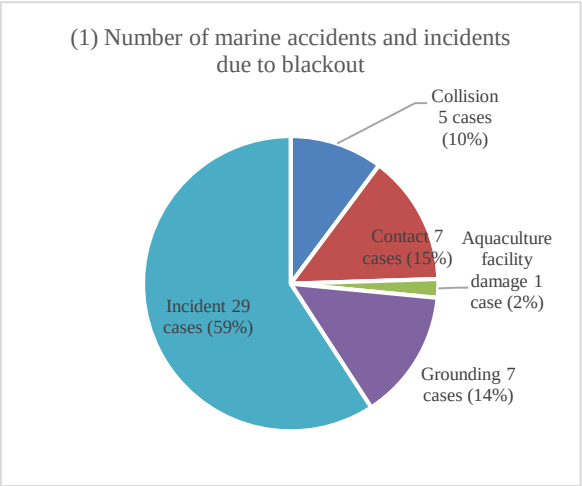
- Collision: 12 cases
- Grounding: seven cases
- Aquaculture facility damage : one case
- Incidents (engine failure, inability to supply fuel, navigation obstruct, etc.) : 29 cases

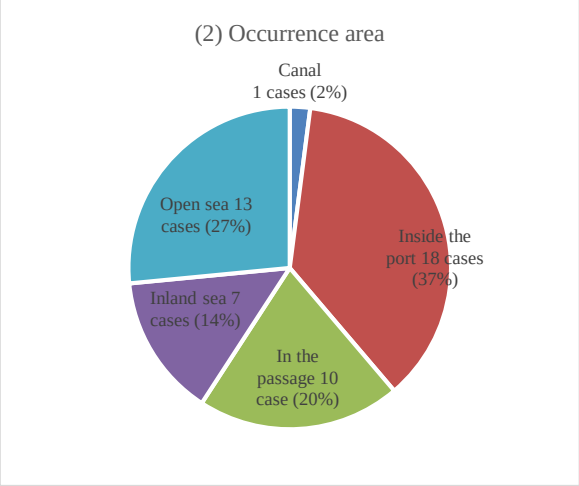
Characteristics and Risks of Blackouts

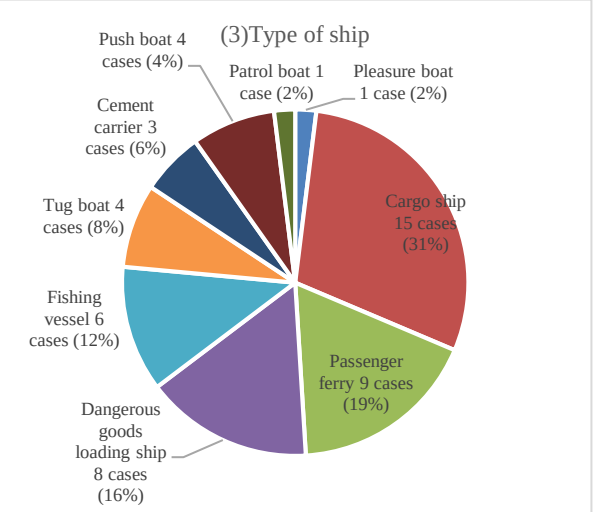
(1) There are various causes.

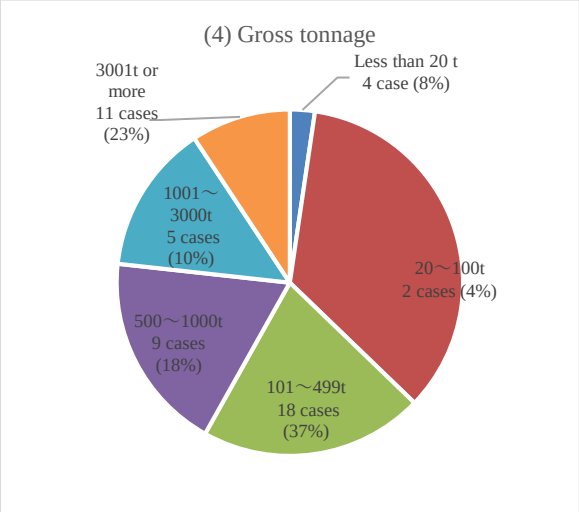
(2) It is difficult to predict when and where it will occur.

(3) If the accident occurs in the vicinity of a berth, shallow, or other vessel, it may cause an accident such as collision or landing.





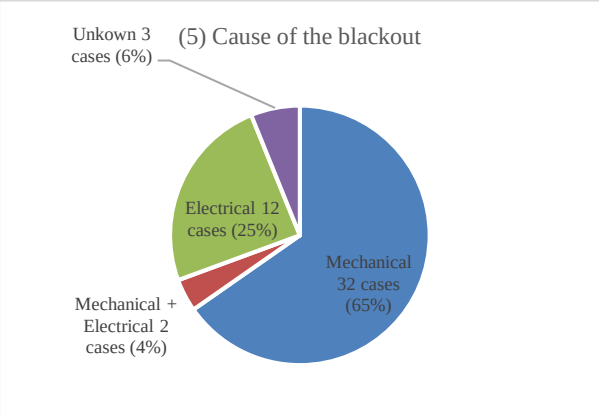


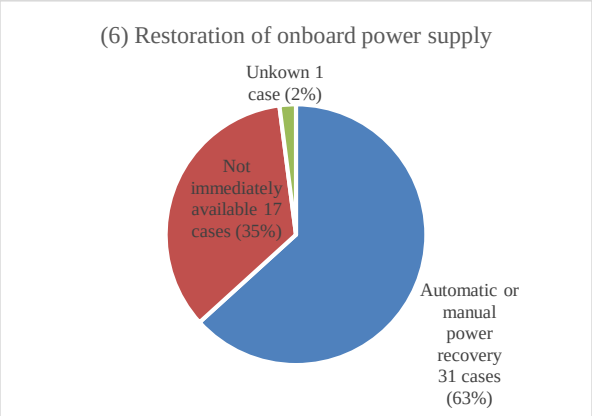


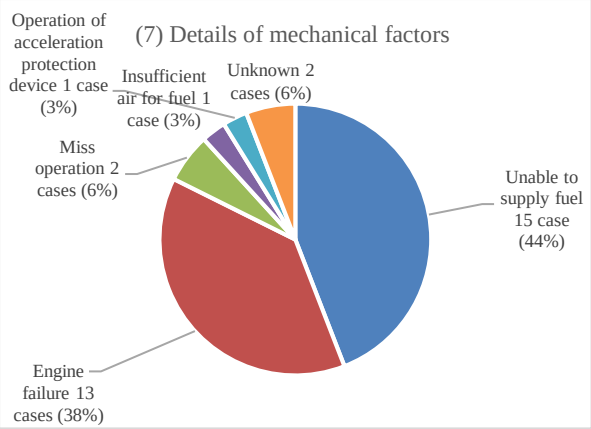
3. Classification of causes leading to blackouts

The causes of blackouts can be broadly divided into mechanical causes such as an abnormal stop of a generator motor, and electrical causes such as an air circuit breaker (ACB) trip.

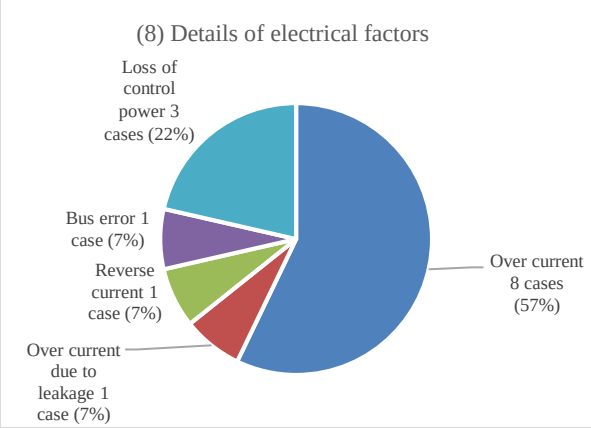
Abnormal stop of the generator motor	ACB trip
1. Activation of the prime mover protective device (emergency stop) (1) Overspeed (2) Oil pressure drop (3) Increase in cooling fresh water outlet temperature (4) Manual trip button operation 2. Fuel oil system failure (1) Fuel oil out (2) Fuel oil system pipe rupture (3) Blockage of Main Valve and Intermediate Valve (4) Contamination with a large amount of water (5) Strainer blockage 3. Malfunction of the moving part (1) Damage to the motor (2) Seizure of Rotating Parts and Sliding Parts	1. Activation of the ACB protective device (1) Overcurrent (Instantaneous, Short - limit, Long Time Limit) (2) Reverse power 2. Incorrect operation at ACB input 3. No bus voltage 4. Bus error (1) Voltage drop (2) Voltage rise (3) Frequency reduction (4) Frequency increase



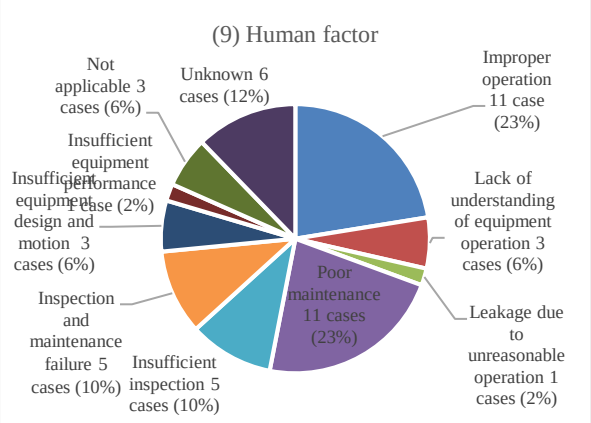




Characteristics of mechanical factors
① Fuel oil system factors (water contamination, sludge, valve closure, etc.) were the most common, and the onboard power supply could not be restored immediately.
② Among the engine failures, the failure of the shaft generator was caused by the power reduction of the generator, the combustion failure of the main engine, the abnormality of the coupling joint, etc.



Examples of electrical factors
① There are many cases where an overcurrent (short circuit, overload, etc.) flows and the air circuit breaker is disconnected.
② Loss of power supply due to out - of - synchronization caused by mode selection error during generator parallel operation.
③ Even when the generator started, there was a case in which control became impossible because the control power supply from the battery and 24 VDC was lost.



Example of human factors
① Overload due to excessive driving of winch
② Release the mode of the generator in the standby state in the route and clean the strainer.
③C Heavy oil is mixed into the A heavy oil tank due to erroneous operation of the valve (the check valve does not operate).
④ Connect the broken O-ring and use it in a strainer to inhale air.

4. Examples of blackouts

(1) The following is a case in which the onboard power supply could not be restored immediately after the blackout.

Oil tanker A (749 tons)

Incident: non - fueling drifting

① Location : Off the north of Fukuoka Prefecture (Shikanoshima Island)

② Operation status: Underway

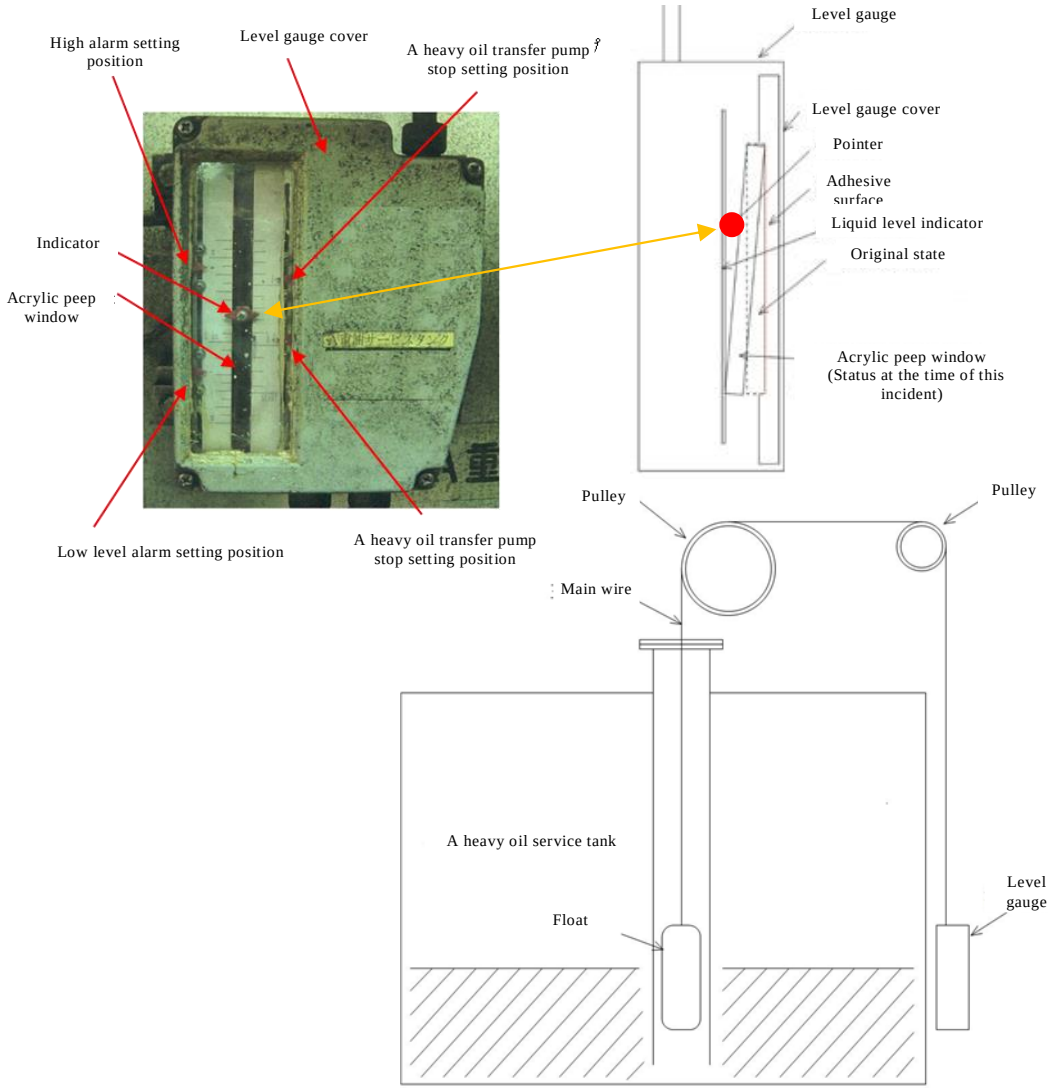
③ Cause of shutdown of the generator

The acrylic cover of the liquid level gauge came off and contacted the liquid level detection mechanism, and the liquid level down could not be detected. As a result, the fuel oil transfer pump did not start automatically, and the oil level in the fuel oil service tank decreased, and fuel supply became impossible.

④ Preventive measures

➢ Acrylic cover installed outside

➢ level indicator installed independently of pump and alarm



(2) The following is a case in which the onboard power supply could not be restored immediately after the blackout.

Passenger ferry B (3,633 tons)

Incident : Loss of power, emergency anchor

① Place of occurrence : Takamatsu Port, Kagawa Prefecture

② Operation status: Immediately after departure

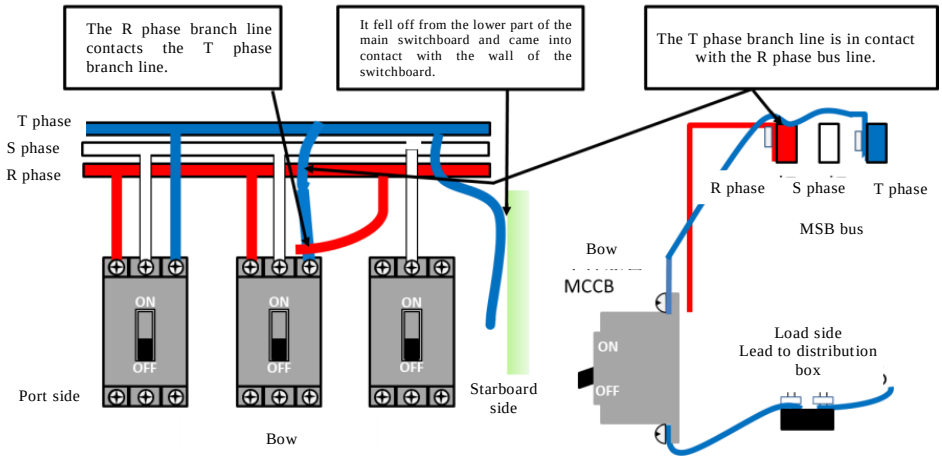
③ The reason why ACB could not be reinjected:

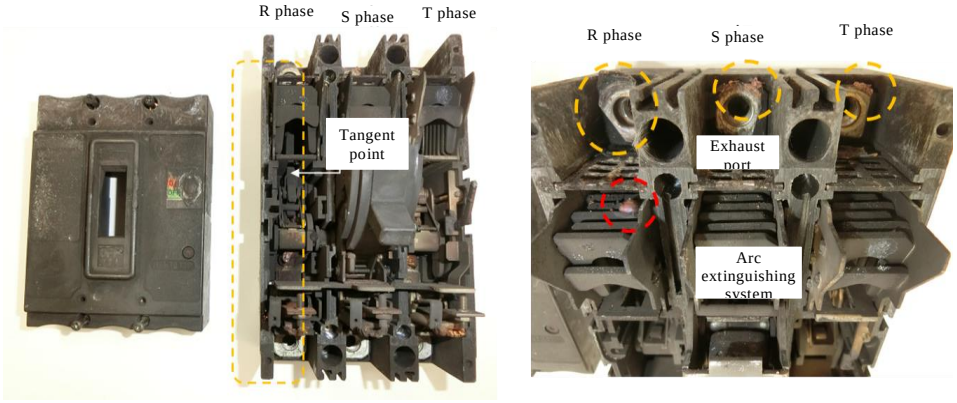
Arc gas was discharged from the molded case circuit breaker for wiring of the main switchboard which had a history that short - circuit current flowed several times due to failure on the load side and short - circuit of the electric circuit, and the bus copper band branch line was blown and jumped off, and the branch line was short - circuited to a branch line of different phase and grounded to the hull.

④ Preventive measures

➢ MCCB Update

➢ Review of insulation resistance measurement methods for electric circuit





(3) The following is a case in which the onboard power supply could not be restored immediately after the blackout.

Cargo ship C (9,378 tons)

Accident: collision (breakwater)

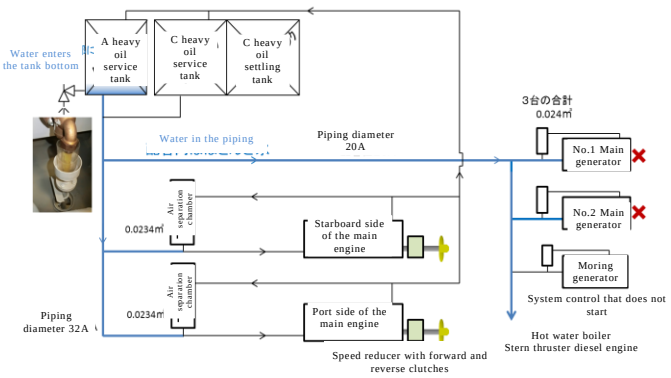
① Place of occurrence: Mizushima Port, Okayama Prefecture

② Operation status: After departure

③ Cause of shutdown of the generator:

Water was mixed in the fuel oil service tank, and water was mixed in the fuel oil piping of the generatormotor, which caused poor combustion.

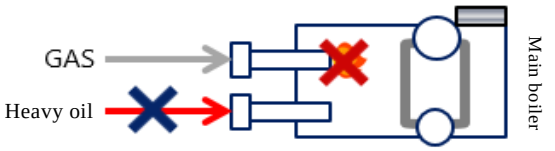
④ Preventive measures:
➢Confirmation of drain discharge from fuel oil service tank during pre - departure inspection
➢Check the condition of the sample oil at the time of supply
➢Preparation of response procedures in the event of a blackout



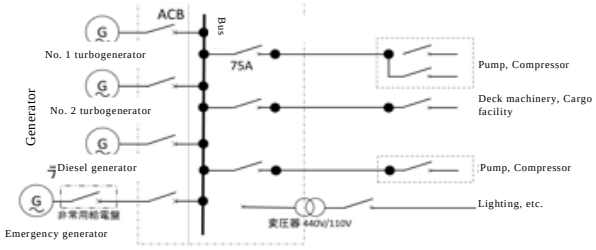
Sounding tape and Oil bottom water detecting agent

(4) The following is a case in which the onboard power supply could not be restored immediately after the blackout.
LNG carrier D (95,084 tons)
Incident: loss of power, towed
① Place of occurrence : Kawasaki Area, Keihin Port
② Operation status: Berthing
③ Cause of the generator becoming inoperable:
The turbine generator was unable to continue operation due to an misfire in the main boiler, the performance of the diesel generator was degraded due to contamination of the air cooler, and the emergency generator was unable to supply ACB due to an electrical system failure.
④ Preventive measures:
➢ Reliable use of gas and heavy oil mixed combustion mode when entering and leaving
➢ Proper maintenance operation and maintenance of diesel and emergency generators

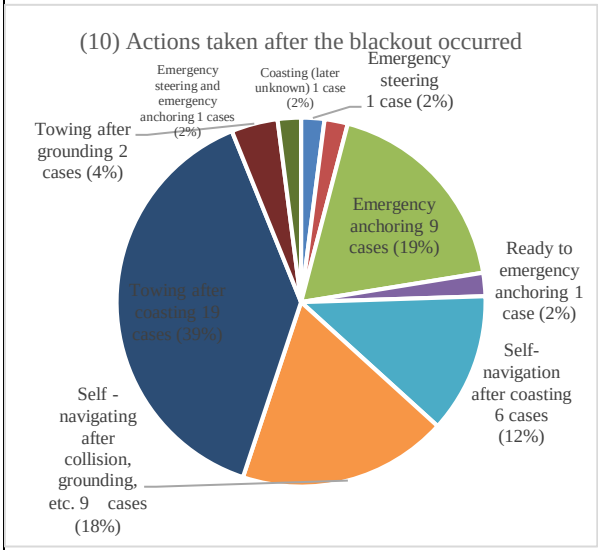
The flame of the gas - fired burner of the main boiler is extinguished.

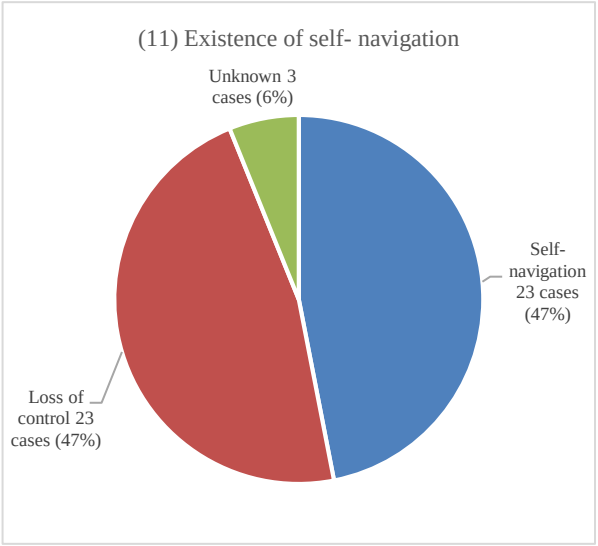


✓ Turbo generator cannot be used due to reduced steam pressure
✓ Performance degradation of the auxiliary diesel generator
✓ Inability to back up emergency generators

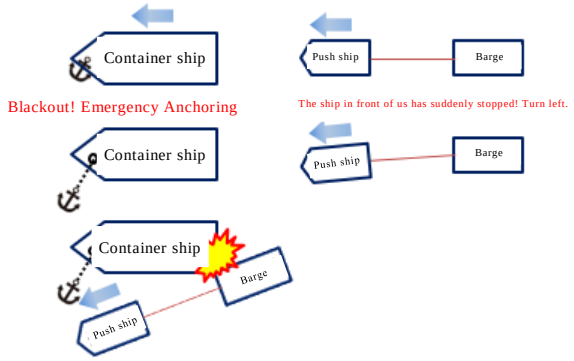


5. Post Blackout Actions
(1) Results of statistical data





Findings on post blackout responses
① There were two cases of emergency steering and 11 cases of emergency anchoring, and there were cases where these measures failed.
② 3/4 is coasting after the occurrence
* Emergency anchoring shall be carried out confirming the surrounding conditions.
Here's an example.



(2) Response guidelines
1. Grasp of the situation around the vessel
2. Informing surrounding parties and related organizations
3. Restoration of onboard power supply
・Automatic starting of the standby generator
4. Confirmation of sequential start of important auxiliary equipment
5. Main engine operation preparation and restart
6. In the event of imminent danger, the emergency steering operation shall be announced and the emergency steering shall be conducted in the steering gear room.
・Manual steering by manual pump;
・Direct operation of the solenoid valve for changing the oil pressure by the backup power supply from the emergency power generator, etc.;
7. In areas where anchoring is possible, emergency anchoring
・Removing the chain stopper
・Release the clutch of the windlass, loosen the brake and drop the anchor.

6. Routine checks in preparation for blackouts

1. Informing the surrounding
Let's check the emergency contact on the route of the voyage plan.
Vessel Traffic Service Center, Port Radio
Let's check the lighting of the lights or the hoisting of the shapes of the vessels with limited operation.

2. Restoration of onboard power supply
Make sure that the standby and emergency generators are on standby.
(1) Mode select of power generator on the main switchboard is set to AUTO.
No alarm for the main switchboard and the power generator motor
(2) Selection of 1 st and 2 nd standby generators
The standby indicator lights of the 1 st reserve unit, the 2 nd reserve unit, the emergency generator, etc. are turned on.
(3) Establishment of standby conditions for generator motors
Fuel handle RUN position, supply of starting air, predetermined position of turning bar.
(4) Support (for anchoring)
Maintenance operation of emergency generators (high load operation if possible)

3. Emergency steering
Let's practice switching from remote steering to emergency steering.
Switching operation of manual valve of hydraulic system
Manual operation of the solenoid valve

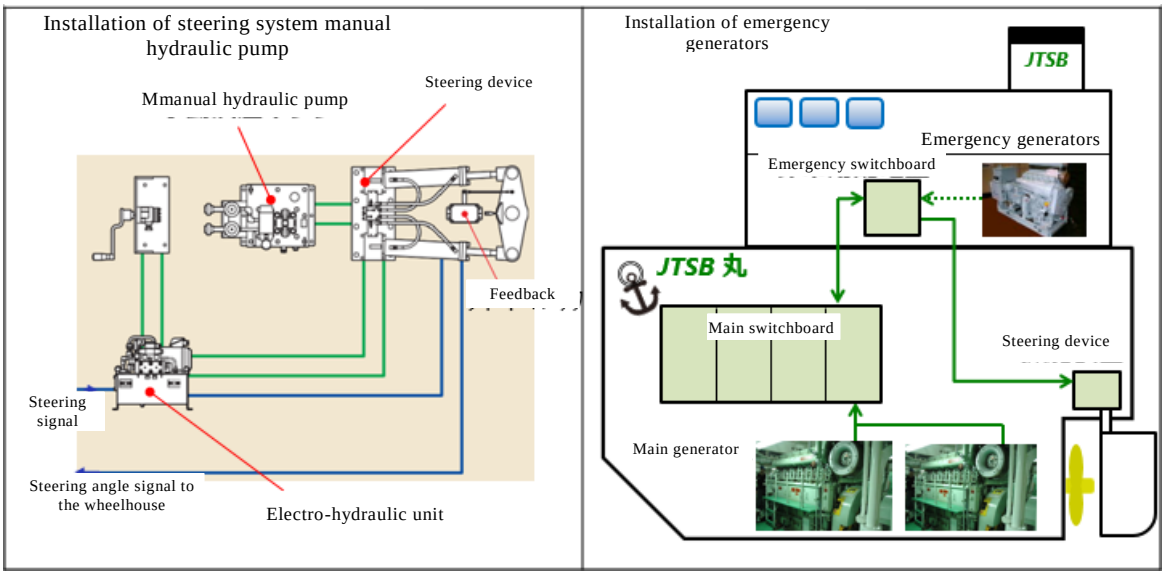
4. Emergency anchoring
Let's keep the anchor on standby when, entering and leaving port, the route, the narrow channel, etc.
Remove the chain stopper of the anchor chain.
Condition in which the clutch of the windlass can be disengaged and the brake can be loosened

Recommendations for routine inspection and maintenance
Effectiveness test
In some cases, power could not be restored automatically after a blackout occurred.
It is recommended to conduct an effectiveness test to check the operation state of the electric equipment periodically in daily operation or in a dry dock.
Action items to be confirmed in the effectiveness test (example)
① Automatic synchronous input and load sharing of the generator
② [Maintenance] operation of emergency generators and standby generators, and automatic power supply
Automatic supply of emergency batteries
③ Automatic start - up of the standby generator with no bus voltage
④ Operation check of the generator protection device
Overcurrent relay, reverse power relay, and priority cutoff device

Some ships are not required to install equipment such as emergency generators and manual pumps for steering systems. Therefore, there are cases in which any action cannot be taken respond to the loss of onboard power supply at all.
Daily vessel operations shall be carried out in accordance with the Navigational Watch Standards (Notification No. 704 of the Ministry of Transport), and the following daily inspections and maintenance shall be required in order to prevent blackouts or to ensure that onboard power supply even if blackouts occur.

Equipment	Items of inspection and maintenance (examples)
Fuel oil supply system	Cleaning the strainer and checking the operation of the flow meter Checking fuel oil status by draining fuel tank before departure
Molded case circuit breaker	Inspection, replacement based on the number of operations and ageing
Shaft generator	Confirmation of drive unit, connecting unit and joint
Electrical equipment	Prevention of erroneous operation by keeping things in order Mounting of the malfunction prevention cover Cleaning inside and around electrical equipment

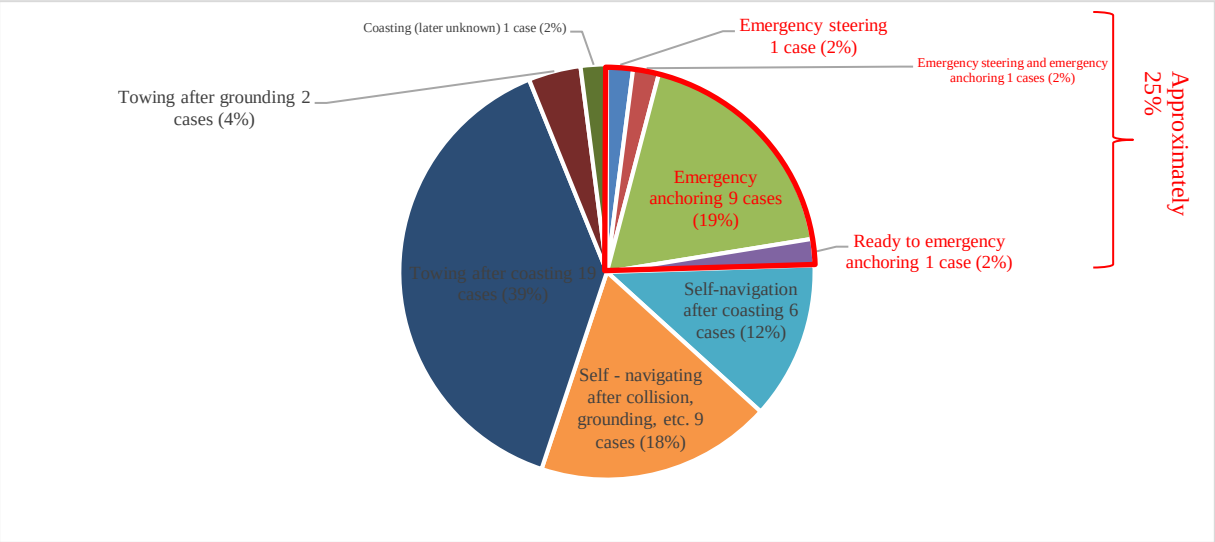
The installation of equipment to guide the ship to a safe place by piloting the ship temporarily is also effective when the main onboard power is not supplied by the blackout.



7. Prepare for a sudden blackout!

A blackout is a sudden engine trouble that is difficult to predict when and where due to various causes. According to past statistical data, as shown in the graph below, about 25% of the cases involved emergency anchoring after a blackout occurred. Even if emergency measures were taken, there were cases where accidents could not be avoided and resulted in grounding, etc., but the damage would be reduced.

Therefore, it is important to take action after the blackout occurs.



Therefore, it is considered to be effective to prepare a manual or a response procedure based on "5. (2) Response Guidelines" assuming that a blackout would be occurred and to train crew members.

It is important for ship crews to understand the components, piping, and automated equipment of their own power generation equipment.

In addition, it is important to investigate the cause of the blackout after the power supply in the ship recovers from the blackout, and to prevent similar problems from occurring again in both hardware and software aspects.

* The relevant information is posted on the website of JTSB. http://www.mlit.go.jp/jtsb/iken-teikyo/s-teikyo16_20190425.pdf

(3) Measures for preventing anchor dragging accidents in the event of a very strong typhoon

(Information provided on April 25, 2019)

Points of preventing anchor dragging accidents in the event of a very strong typhoon!

Take the following measures to prevent anchor dragging accidents in the event of a very strong typhoon.

1. To prevent anchor dragging, you should adopt a **double-anchoring method in principle**. Take the best possible measures, such as **extending the anchor chain as long as possible and ensuring sufficient amounts of holding and mooring power using the anchor and anchor chain**.
   Each vessel should determine the method of anchoring and the extension of the anchor chain depending on the situation of the vessel (size, shape, type, cargo) , the environment of the anchorage (traffic congestion, nature of the seabed, water depth).

2. Even if you choose the best anchoring method and anchor chain extension, there may still be a risk of anchor dragging in strong wind if you rely only on the holding and mooring power available from the anchor and anchor chain.
   Stand by the engine and use its power depending on the quickly changing wind directions and speeds to prevent anchor dragging. Precisely control the output of the engine depending on the changes in the environment.

3. Even if you take all the measures described in 1. and 2. above, still consider the risk of anchor dragging. **Select an anchorage where there are no critical facilities in the downwind direction, and there is enough distance between other vessels.**

4. When a typhoon is passing, wind directions and speeds will change quickly. You need to **obtain the latest information on weather and sea conditions (of the typhoon)** and accurate forecasts. **It is crucial to consider the exact timing in implementing each measure.**

* The relevant information is posted on the website of JTSB.

http://www.mlit.go.jp/jtsb/iken-teikyo/s-teikyo17_20190425.pdf

Column

Looking back at the Oshima Ohashi Bridge Collision Accident

Marine Accident Investigator

At around 0 : 27 a.m. on October 22, 2018, the Maltese Cargo ship collided with the bridge girder of the Oshima Ohashi Bridge between Yanai City and Suo-Oshima Town, Yamaguchi Prefecture. The water pipe installed under the bridge girder was broken, and water supply was cut off for about 40 days in almost the whole area of Suo-Oshima Town. (See page 131 for details of the accident)

It is said that 9,046 households, 14,590 residents and local industries were affected by the suspension of water supply. The JTSB conducted an investigation as an accident that had a particularly serious social impact (serious accident).

Investigators were dispatched to the site from the day after the accident occurred. In addition to the investigation of the hull of the cargo ship, interviews of the crew members, and the collection of voyage data, an initial investigation was carried out to determine the extent of damage to the Oshima Ohashi Bridge. Information on the facts found (height of the mast of the cargo ship and Oshima Ohashi Bridge, track of the cargo ship, extent of damage, etc.) was published in November of the same year.

In March 2019, JTSB published a interim report summarizing factual information found through subsequent research (such as the status of the preparation of a voyage plan by crew members). With regard to the interim report in particular, almost the full text of the progress of the accident was published in the local newspaper, indicating a high level of social interest in the accident.

The Final report released in October 2019 indicated that one of the causes of this accident was that the crew of the cargo ship made a voyage plan going under the bridge without knowing the height of the Oshima Ohashi Bridge. By the time the voyage plan was completed, there were many opportunities to grasp the height of the Oshima Ohashi Bridge. For example, the navigation officer had collected and confirmed the information of the sea area to be navigated using charts and hydrography, etc., the planned route was drawn on the chart and whether there were any problems with it, and the master had confirmed and approved the planned route made by the officer. However, the height of the bridge was not confirmed in any of the situations. As a background, it has been revealed that a route automatically created by using computer software, and that the function of the Electronic Chart Display and Information System (ECDIS) to check dangerous places on the route was not properly used. Therefore, navigation

instruments using IT in recent years should be used properly after fully understanding the function.

This time, the accident resulted in a serious social impact due to the basic error of not confirming the height of the bridge on the planned route. Though it is necessary that each crew member performs daily confirmation appropriately, I felt through the investigation that the operators who manage the crew members are required to provide detailed follow - up, such as the development of manuals and education and training that are easy for the crew members to understand on the spot, based on the situation that navigation instruments and computer software used on the ship are becoming more sophisticated and diverse.

In the publication of the final report, the JTSB requested the relevant organizations to cooperate in disseminating this report so that operators who employ foreign seafarers who are not familiar with the sea areas in Japan can provide guidance based on the recurrence prevention measures of this accident investigation report.

We hope to contribute to preventing the recurrence of similar accidents in the future.

Instrument (ECDIS) screen

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

Cargo oil tank exploded during cleaning operation

Chemical Tanker GOLDEN SUNNY HANA　Explosion (Cargo oil tank)

< Summary of the Accident > At around 10:05 on April 8, 2018, as the chemical tanker GOLDEN SUNNY HANA (2,990 tonnes), with a master and 14 crew members on board, was proceeding southeast off to the southeast of Kunisaki Port, Oita Prefecture, while conducting cleaning work in a cargo oil tank, an explosion occurred in the cargo oil tank.

Two of GOLDEN SUNNY HANA's ordinary seamen were injured and her cargo oil tanks had holes and other damage.

At around 23:00 on April 4, 2018, the Vessel left Pyeongtaek Port, Republic of Korea, for Yeosu Port, Republic of Korea, with approximately 2,000 tons of pyrolysis gasoline.

The Vessel entered Yeosu Port at around 12:25 on April 6, completed unloading her entire cargo of pygas at around 09:10 on April 7, and left port in ballast condition for Chiba Port, Chiba Prefecture at around 15:55 on the same day.

After flushing the cargo lines and tank bottoms, the Vessel decided to conduct cleaning of the cargo oil tanks in preparation for cargo loading at Chiba Port without ventilating the cargo oil tanks using ventilation equipment. She began cleaning with normal temperature seawater using cleaning machines which are installed in No.2 Port tank(the tank in this case) and No.2 starboard tank from around 18:00 and then conducted the Cleaning Work with seawater heated to approximately 75℃ before closing the hatch covers and halting work at around 02:25 on April 8.

The Vessel decided to resume the Cleaning Work using the Cleaning Machine at around 08:00. The seawater to be used in the Cleaning Work was heated to approximately 60℃ in preparation for work: and then approximately 2.6 tons of heated seawater and approximately 180 liters of cleaning agent were sent into the Tank and equal amounts of both were sent into No. 2 starboard tank. For the purpose of starting the Circulation Work, Navigation Officer A started said pump at around 10:00.

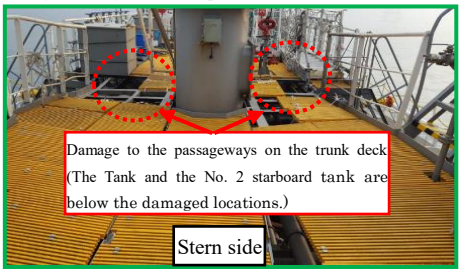
Navigation Officer A decided to inject steam into the Tank and the No. 2 starboard tank for the purpose of raising the seawater's temperature. He instructed Ordinary Seaman C to open the No. 2 starboard tank's steam valve and Ordinary Seaman A to open the Tank's steam valve and Ordinary Seaman A and Ordinary Seaman C opened their respective steam valves at around 10:05.

Cargo oil tank exploded at around 10 : 05.
Ordinary Seaman B and C received burns.

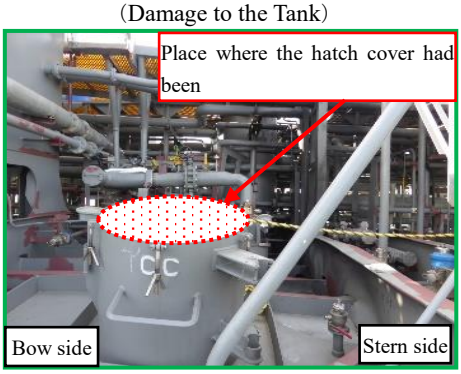
(Analysis of explosion in a cargo oil tank)

It is considered probable that the concentration of the gas mixture in the Tank was in the range of explosion because the Vessel did not ventilate the tank with the ventilation system.
It is considered probable that, as seawater heated to a temperature of 60 ° C was injected into the Tank, all of the 30 ℓ of liquid PY gas remaining in the Tank was vaporized, and the concentration increased after unloading, and the combustible gas mixture existed in the Tank at a concentration higher than the lower limit of the explosion range.
It is considered somewhat likely that the Tank was in a situation where highly charged steam existed as space charge because steam at a temperature of about 120 ° C and a pressure of about 0.7 MPa was injected into the Tank, and that this charge was discharged directly to the protruding objects in the Tank generating sparks.
It is considered somewhat likely that the combustible gas mixture was ignited by sparks discharged in the tank and exploded.

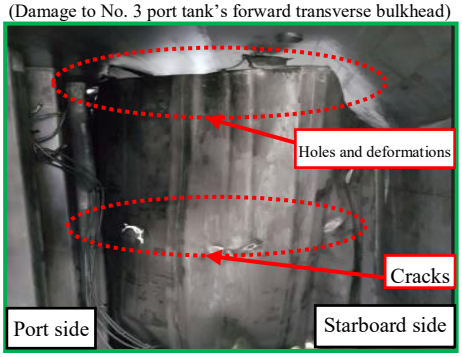
(Damage looking from the top of No. 3 tank toward the bow)



(Damage to the Tank)



(Damage to No. 3 port tank's forward transverse bulkhead)



Probable Causes (excerpt): It is probable that the accident occurred when, as the Vessel was conducting the Circulation Work in the No. 2 port cargo oil tank and the No. 2 starboard cargo oil tank during cargo oil tank cleaning work while off to the southeast of Kunisaki Port, Oita Prefecture, an explosion occurred in the No. 2 port cargo oil tank because steam was injected into the No. 2 port cargo oil tank under conditions in which a combustible gas mixture of vaporized pyrolysis gasoline and air in the explosive range was present.

For details, please refer to the accident investigation report. (Published on March 28, 2019)
http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0023e.pdf

JTSB had made recommendations to HNCC CO., LTD. for preventing the recurrence of similar accidents and reducing damage.
For details, please see Chapter 1 "Summary of recommendations and opinions issued in 2019" (page 32).

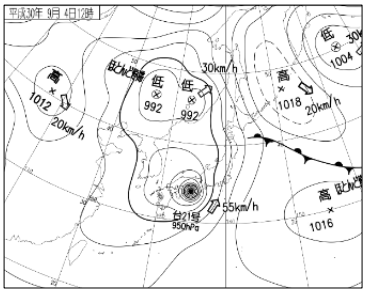
Drugging unchor due to strong winds and waves caused by the typhoon and collided with the Airport Access bridge.
Oil tanker HOUNMARU collision (bridge)

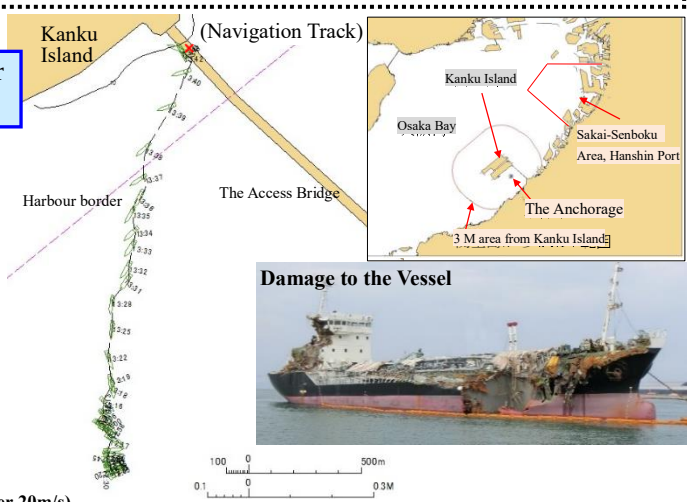
< Summary of the Accident >The oil tanker HOUNMARU (2,591 tonnes), with the master and 10 crew members on board, was anchored off the southeast of the Senshu Port under the situation where Typhoon No. 21 was approaching and a maritime typhoon warning was issued in the Seto Inland Sea including Osaka Bay, was struck by the strong winds which increased with the approach of the typhoon, and being drifted to the north dragging the anchor pushed by the strong winds and waves. As a result, the Vessel collided with Kansai International Airport Access Bridge at around 13:40 on September 4, 2018. The Vessel caused the deck of the starboard bow to be crushed, and Kansai International Airport Access Bridge caused the bridge of the road girder to be bent, broken, scratched, etc., the railway girder to be collapsed, the rail to be warped, the gas pipe to be broken, etc., but there were no casualties among the crew members.

(Ship operation and Weather condition)

The Vessel started single anchoring at the anchorage for the purpose of typhoon evacuation.

Surface weather chart at around 12:00 on September 4





Damage to the Vessel

Around 12:30

(northeast to east-northeast wind, maximum instantaneous wind velocity over 20m/s)

At around 12:30, the master set the main engine to slow ahead and set the joystick to the HOVER position (the rudder angle at which forward and backward thrust is lost).

Around 13:00 (southeast wind, maximum instantaneous wind velocity 27.0m/s)

The master could not confirm the Vessel moved when he was informed by the MARTIS of the anchor dragging around 13:00.

The master noticed anchor dragging, set the main engine to full ahead and operated the joystick to turn the bow upwind.

The master set the main engine to half ahead and the joystick to the HOVER position because the anchor dragging was stopped.

The master noticed that the Vessel drifted toward to leeward side again and operated the joystick to turn the bow upwind with increasing the engine output.

Around 13:31 (south wind, maximum instantaneous wind velocity 48.4m/s)

Around 13:38 (south-southwest wind, maximum instantaneous wind velocity 58.1m/s)

The master instructed all crew members to evacuate from the bridge of the Vessel because he saw the Access Bridge near the starboard stern and thought that the bridge would collide with the Access Bridge.

Damage to the Access Bridge

(Analysis of Selection of the Anchorage)

- The master thought that the typhoon would pass through the east side of the anchorage and the left semicircle of the typhoon would enter the Anchorage.
- The master thought that the typhoon was proceeding at a high speed and that strong wind would not blow for a long time.
- It was surrounded by the shore, the seabed was mud and the anchor would be highly effective, and other ships were anchored at the time for typhoon evacuation.
- The next loading was scheduled to take place in Sakai-Senboku Area, Hanshin Port.
- The master did not know the 2011 leaflet "Let's Prevent Anchor Dragging Maritime Accident" and did not know to anchor avoiding the sea area within 3 nautical miles from Kanku Island.

(Analysis of Anchoring Method)

- The master thought that if both anchors were used, when the wind direction changed, anchor-holding power would decrease because the anchor and the anchor chain tangled.
- The master had the experience of using the main engine to cope with the wind of typhoon.

Collision (at around 13:40)

Probable Causes (excerpt): In this accident, while Typhoon No. 21 was approaching and a maritime typhoon warning was issued in the Seto Inland Sea including Osaka Bay, the Vessel continued single anchoring at the east side of the oil tanker berth located on the southwest side of the Senshu Port, Osaka Prefecture where Kansai International Airport Access Bridge is located about one nautical miles north of the southeast of the Kansai International Airport First Stage Airport Island (Kanku Island), for the purpose of typhoon evacuation, and the Vessel started to drift dragging the anchor pushed by the strong winds and waves with the approach of the typhoon. The master tried to stop anchor dragging using the main engine and it seemed the drift was stopped. He thought that he succeeded to stop anchor dragging so he kept the joystick HOVER position. As a result, the Vessel was again drifted and collided with Kansai International Airport Access Bridge in a situation where there was no sufficient distance to control the Vessel.

For details, please refer to the accident investigation report. (Published on April 25, 2019)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-4-2_2018tk0013.pdf

JTSB had made recommendations to Tsurumi Sunmarine Co., Ltd. for preventing the recurrence of similar accidents and reducing damage.
For details, please see Chapter 1 “Summary of recommendations and opinions issued in 2019” (page 21).

Injured by being caught in a side roller during hauling net
Fishing vessel SEIRYOMARU No.3 Injury of crew member

< Summary of the Accident >At around 04:30 on September 14, 2018, while the Fishing Vessel SEIRYOMARU No. 3 (9.7 tonnes), boarded by the chief fisherman, the master and three other crew members, was anchoring off the west of Oshima Island, Amakusa City, Kumamoto Prefecture, the chief fisherman was caught in a side roller and was seriously injured.

At around 03:30, after the third casting net, all the crew members finished hauling most of the net.

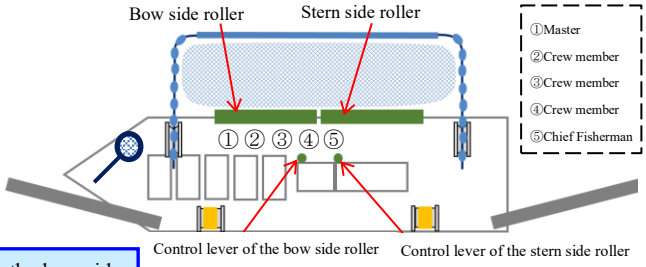
It was decided to carry out preparatory work for fish drawing (work to flatten the bottom of the net by adjusting the hoisting of the net with side rollers on the bow side and the stern side (hereinafter referred to as "rollers") and bringing the fish group to the bow of the net).

As the lifting of the net was proceeding by the stern side roller rather than the bow side roller, it was decided to lift the net with the bow side roller by fixing the stern side roller. The master and 3 crew members were on the bow side roller and the chief fisherman was on the strern side roller.

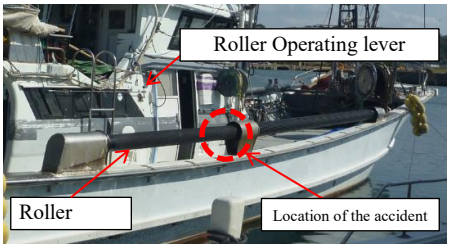
The chief fisherman tried to fix the net to the rotating stern side roller by inserting his left hand into the gap between the roller and the bulwark.

The fingertip part of the rubber glove of the chief fisherman was caught between the net during hauling and the rotating stern side roller, and then the left hand and the left arm was caught and injured (around 04:30).)

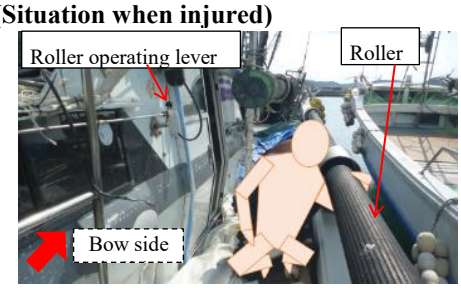
(Image of staffing situation during work)



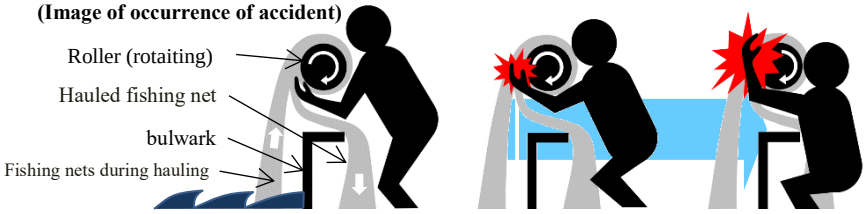
(Roller Position)



(Situation when injured)



(Image of occurrence of accident)



(Analysis of Occurrence of Accident)

A school of fish was unevenly distributed on the bow side, requiring manpower for hauling with the bow side roller, and the chief fisherman independently fixed the net to the stern side roller.

He wore rubber gloves and tried to fix the net to the rotating stern side roller, because he was anxious about returning to the port as soon as possible due to good fishing, and because he was used to the work.

Measures to Safety Actions (Excerpt)

- The hem and the cuff of crew jackets should be tightened to prevent them from being caught in the rollers.
- A person in charge of the lever operation of the roller shall be attached and the work status shall be monitored by the person at all times.
- When fixing the net, the roller should be stopped once, and the operator who fixes the net and the operator in charge of the operating lever should work in cooperation.
- Remove gloves when fixing the net.
- It is desirable to introduce an emergency stop device for rollers.

Probable Cause (excerpt): It is probable that this accident occurred while the Ship was anchoring off the west of Oshima Island, Amakusa City at night, hauling the net by adjusting the winding of the net with the bow side and the stern side roller for gathering a school of the fish to the bow side and making the bottom of the net flat, the chief fisherman who wore rubber gloves tried to fix the net to the stern side roller while the stern side roller was rotating. As a result, the fingertips of the rubber gloves on the left hand were caught between the hauling net and the stern side roller, and then the left arm was got caught in the stern side roller.

For details, please refer to the accident investigation report. (Published on August 29, 2019)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2019/MA2019-8-3_2019tk0016.pdf

JTSB had stated opinions to the Director-General of the Fisheries Agency.
For details, please see Chapter 1 “Summary of recommendations and opinions issued in 2019” (page 28).

A crew member fell from a height of about 11.5m while cleaning in the cargo hold of a cargo ship
Cargo ship ERIK Faitality of a crew member

< Summary of the Accident > At around 17:26 on September 18, 2018, while the cargo vessel ERIK (9,618 tonnes) was moored at the Mitsubishi Naoshima wharf, with the master and 14 crew members on board, 4 crew members were performing the cleaning work of the upper hatch coaming of the cargo holds after unloading cargo, and an able seaman fell from the upper deck to the bottom floor of the cargo hold and dead.

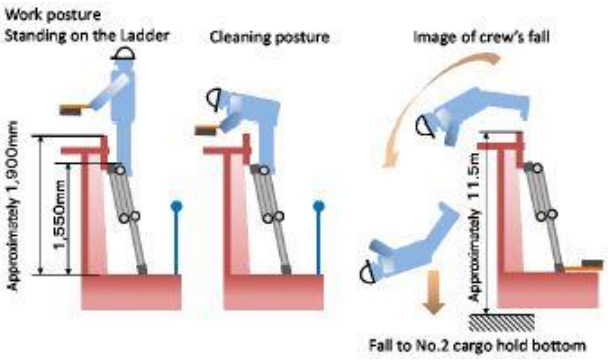
The Vessel completed unloading around 17:20 on the 18th.

The four crew members (Boatswain, able seaman A ,able seaman B,ordinary seaman) started “the cleaning work of the upper hatch coaming of the cargo holds on the upper deck”

The cleaning work was an item of routine works taking about 30 minutes, with the aim of maintaining the watertightness of the cargo hold. To prevent water invasion between the hatch cover of the cargo hold and the hatch coaming, the crew members were sweeping cargo mineral dust using portable ladders and cleaning brushes after the cargo unloading operation. At the time of the accident, the cleaning work was being carried out in the same way as usual.

When doing the cleaning work, Crew Member D, who was at the aft starboard side of the No. 2 cargo hold, saw that Crew Member A’s upper body from his thigh was higher than the top of the hatch coaming on the upper deck starboard side of the No. 2 cargo hold, and that he was doing the cleaning work utilizing the cleaning brush (See Figures and Photo).

(Work posture on the Ladder and situation of fall)



Crew Member D looked at Crew Member A, who came to be in an unstable posture and fell forward, then twisted his body and tried to clutch at the upper hatch coaming of the No. 2 cargo hold with his left hand. However, he fell head-first with his back facing downward to the bottom of the No. 2 cargo hold at around 17:26.

Fell to the bottom of the cargo hold (at around 17: 26)

(Information on Safety Management of Operation Management

A safety management manual based on the International Safety Management Code (ISM Code) was prepared, and a safety work implementation code describing ladder guidelines for handling portable ladders, etc. was designated as a reference document and installed on the Vessel.

Probable Causes (excerpt): It is considered probable that this accident at around 17:26 on September 18 when Crew Member A fell forward and fell from the upper deck to the bottom of the cargo hold bottom occurred because Crew Member A was working while being in an unstable posture on the Ladder when the vessel was doing the cleaning work while the vessel was moored at Mitsubishi Naoshima wharf.

It is considered probable that the vessel carried out the cleaning work by the methods that differed from the Ladder guidelines of the CSWP, and that because there was nothing to support his upper body on the Ladder, Crew Member A was performing the cleaning work while being in an unstable posture on the Ladder.

It is somewhat likely that Company A was insufficient in monitoring that the crew members clearly understood the Ladder guidelines of the CSWP and then applied and performed the Ladder guidelines in the cleaning work, because the vessel carried out the working methods being different from the Ladder guidelines in everyday work.

For details, please refer to the accident investigation report. (Published on February 28, 2019)
http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0014e.pdf

JTSB had made safety recommendations to Krey Schiffahrts GmbH & Co.KG for preventing the recurrence of similar accidents and reducing damage.
For details, please see Chapter 1 “Summary of recommendations and opinions issued in 2019” (page 30).

Collision passing under a bridge lower than the height that a ship can pass
Cargo ship ERNA OLDENDORFF Collision (Bridge)

< Summary of the Accident> At around 00:27 on October 22, 2018, the cargo ship ERNA OLDENDORFF (25,431 tons) was proceeding east in Obatake Seto toward a privately-operated berth in Etajima City, Hiroshima Prefecture, with a master, a second officer and 19 other crewmembers aboard when she collided with Oshima Bridge.

The Vessel received dents and other damage to three of her four cranes as well as a bent damage to her aft mast; however, there were no fatalities or injuries on the Vessel.

Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under its girders was broken and fell, and a water pipe was severed, causing a water outage that lasted for forty days affecting almost all of Suo-Oshima Town, Yamaguchi Prefecture; power cables, communication cables and others were severed as well.

The Vessel, Master A boarded the vessel in Qingdao (People's Republic of China) in place of former master, and entered Port of Onsan (Republic of Korea).

The Vessel, with a master and a second officer, and nineteen other crewmembers aboard, left the Port of Onsan for privately-operated berth in Etajima City, Hiroshima Prefecture.

As the Vessel was proceeding north off the west coast of Yashiro Shima, Master A ordered Navigation Officer A1 to check the height of Oshima Bridge.

Navigation Officer A1 attempted to search the information of Oshima Bridge and check the bridge's height using the index at the end of the Sailing Directions but he could not find a part that contained.

After the Vessel began turning to starboard off the west of Kasasa Shima, Master A was concerned that the Vessel would be pushed by the current, which was flowing toward the west, and he continued proceeding east.

Navigation Officer A1 sensed danger when he got sight of Oshima Bridge's entire form just before arriving at the bridge and he immediately shouted "Hard a starboard".

collision (at around 00:27)

(History of Voyage Plan)

Navigation Officer A1 prepared the route including Isabel – Qingdao – Onsan – Etajima and asked the former master to check it about a week and a half before the accident. Although the former master checked the details of the route from Isabel to Qingdao and signed the voyage plan, he only checked the other part of the route roughly.

Navigation Officer A1 did not consult the information concerning Obatake Seto in the Sailing Directions and imported the data of 'the route from Onsan to Etajima by way of Obatake Seto' (hereinafter referred to as "the Route"), which was automatically created by the Software, into ECDIS and then, although he used the route check function, he overlooked the alert for Oshima

While the Vessel was berthing at the Port of Onsan, Master A checked the Route together with Navigation Officer A. However Master A did not check the details of the Route because he thought that the former master would have already checked it.

(Navigation Track)

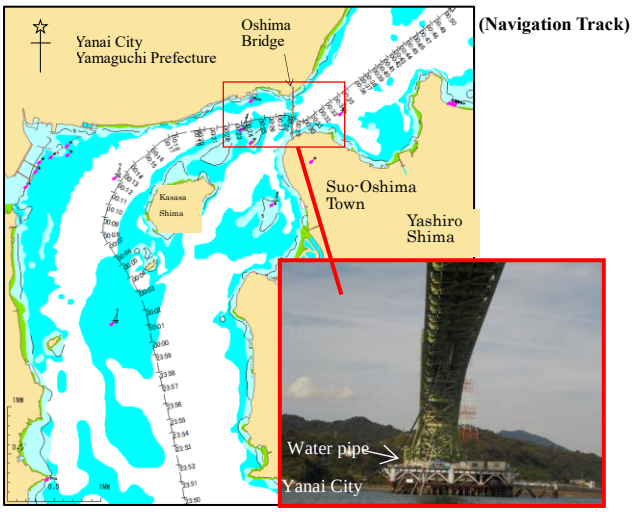


Photo courtesy of the Yanai Engineering Works

Probable Causes (excerpt): It is probable that the accident occurred when, while the Vessel was proceeding east in Obatake Seto at night, the Vessel collided with Oshima Bridge because the Vessel proceeded under a bridge that the Vessel was unable to pass through at the height of crane and mast.

It is probable that the Vessel proceeded under Oshima Bridge which the Vessel was unable to pass through at the height of crane and mast because Master A approved the voyage plan, including the Route which was prepared by Navigation Officer A1, without being aware of the height of Oshima Bridge, and Master A continued navigating while feeling uncertain about the bridge's height after getting close to the bridge.

It is probable that Master A approved the voyage plan including the Route which was prepared by Navigation Officer A1 without being aware of the height of Oshima Bridge because Master A did not check the details of the Route assuming that the former master had already checked it.

It is probable that Master A continued navigating while feeling uncertain about the bridge's height after getting close to the bridge because he waited for a report from Navigation Officer A1 after Master A ordered Navigation Officer A1 to check the height of the bridge, and Master A was concerned that the Vessel would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after the Vessel turned to starboard off the west of Kasasa Shima.

For details, please refer to the accident investigation report. (Published on October 31, 2019)
http://www.mlit.go.jp/jtsb/eng-mar_report/2019/2018tk0020e.pdf

JTSB had made safety recommendations to OLDENDORFF Carriers GmbH & Co. KG and the authorities of the Republic of Malta.
For details, please see Chapter 1 "Summary of recommendations and opinions issued in 2019" (page 33).

Chapter 6 Efforts toward accident prevention

1 Information dissemination for accident prevention

The Japan Transport Safety Board prepares and issues various publications as well as individual reports, regarding specific cases so that it can better understand the efforts being made to prevent recurrence and contribute to accident prevention.

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

The e-mail magazine distribution service is being used by people, including aviation, railway, and ship-related businesses, government agencies, and educational and research institutions.

In September and October 2019, the JTSB held accident investigation meetings respectively with business operators in each field of aviation, railways, and ships.

At the meeting, the JTSB first introduced the case of the accidents relevant to recent increase in the severity of natural disasters, such as an accident caused by anchor dragging during a very strong typhoon and a derailment accident caused by bridge pier sinking. It also introduced the recent trend of small aircraft accidents, and the operators introduced examples of efforts to ensure safety.

At the exchange of opinions, the participants expressed their desire to develop useful reports regardless of mode, “I would like to know how other modes overcame this issue,” and “I feel a little closer to the JTSB.”

In the future, 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

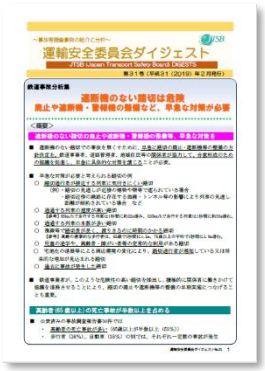
With the aim of fostering awareness of safety, and preventing similar accidents from occurring, we issue "JTSB Digests." This publication introduces you to statistics-based analyses and must-know cases of accidents.

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

In 2019, we released three issues of "JTSB Digests" (February, March, August: Issues No. 31-33).

The contents of each issue are as follows.

(1) JTSB Digest No. 31 [Railway accident analysis digest] "Level crossings without automatic barrier machine are dangerous. Urgent measures are needed, such as the abolition of the system and the installation of automatic barrier machine and road warning device." (Published February 26, 2019)



This report summarizes the situations in which accidents occurred at level crossings without automatic barrier machine (Class 3 and Class 4), possible measures to prevent accidents, and the points of cases in which level crossings without automatic barrier machine were abolished.

- Occurrence of fatal accidents at level crossings without automatic barrier machine.
- Accident investigation case "An accident at a level crossing where the visibility to a train is limited from the level crossing and the speed of the passing train is high"
- Accident investigation case "An accident at a level crossing where it is difficult to see an approaching train when a driver is in a car"
- Accident investigation case "An accident in which a person (bicycle) passing a level crossing did not stop once before the crossing"
- Accident investigation cases "Accidents considered to be affected by the physical condition of level crossing passer by (Class 3 level crossing)" etc.

(2) JTSB Digest No. 32 [Marine accident analysis digest] "Accidents Lurking in Fun Leisure! ~ Accidents while towing floating bodies such as banana boats are increasing rapidly, and Casualties due to jets of water are also increasing ~" (Issued March 28, 2019)

This report introduces accidents caused by personal water craft towing a floating body and fatal and injury accidents caused by jets of water, and summarizes measures to alert and prevent dangerous acts that could lead to accidents.

- Analysis of accidents related to floating body
- Analysis of jets of water accident
- Accident investigation case "The ship collided with an oyster raft and injured the passenger because the ship approached at a shorter distance than the towing rope and turned."
- Accident investigation case "A floating body towed at a high speed was shaken by centrifugal force and overturned, and a passenger was injured."

・ Accident investigation case “The personal water craft approached the floating body having intention to sprash water and collided it resulted multiple persons on board including children were died or injured.”
・ Accident investigation cases “A passenger fell from the rear end of the boat when the boat accelerated, damaging the body cavity by jets of water and leading to death by blood loss”, etc.

(3) JTSB Digest No. 33 [Marine accident analysis digest] “For safe operation of fishing boats - Prevention of accidents involving net hauler and others during fishing” (issued on August 29, 2019)

We introduces some of the most frequent cases of accidents involving net hauler, which have been increasing in the rate of occurrence in fishery-related accidents or incidents. We also summarized the points for preventing accidents involving net hauler.

・ Analysis of accidents involving net hauler and others
・ Measures to prevent accidents involving net hauler and others
・ Accident investigation case “A net was fixing to a roller that was rotating independently, and a glove was caught in the roller and left arm was injured”
・ Accident investigation case “A rope was pushed from the front of a rotating roller, and the rope was caught and injured”
・ Accident investigation case “An accident in which a worker took his eyes off from his hands to see a box net and was injured by his hand caught between a capstan roller and a rope.”
・ Accident investigation case “An injury caused by a leg being caught between a rope and a side edge due to an unintentional crossing of a rope" and others.”

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 2019)

Yokohama	**Be careful of light pollution caused by urban lighting during nighttime navigation!** **~ Introduction to Keihin Port Tokyo Area ~** (Main contents) ・ Example of lighting of a light buoy being mixed in lighting on land ・ An example of a vessel's lighting being mixed in lighting on land ・ Examples of a vessel’s lighting being mixed in lighting on land and a large number of small vessel’s lighting ・ An example of a dolphin sign light being mixed in other lighting in a port ・ Example of difficulty in seeing lights due to glare

Kobe	**Lake Biwa Marine Accident Prevention Handbook** (Main contents) ・ Statistics and analysis of marine accidents for 10 years ・ Lake Biwa Marine Accident Hazard Map ・ Introduction of accident cases (4 cases) ・ Points for accident prevention 
Hiroshima	**Sink in a short time!** **A series of accidents involving boat with a sterndrive** (Main Contents) ・ The shaft seal was damaged by the broken universal joint, and seawater entered the engine room through the shaft hole of the stern shell plate. ・ Case introduction "Engine room is flooded! The boat sank in 4 minutes after the abnormality occurred." ・ Summary 
Moji	**Look, you're going to capsize!** **Why did the capsizing accident happen?** (Main contents) ・ Statistics : Proportion of fatalities and missing persons Collisions or Grounding ＜ Capsizing ・ Case 1 : Seaworthiness and weather ~ Can your ship withstand weather changes? ~ ・ Case 2 : Caution in the Estuary ~ Surfs become high on the Coast ~ ・ Case 3 : Inspection of the Hull - Make sure the maintenance of the engine ・ Points (Prevention of capsizing and preparation for unexpected events) 
Nagasaki	**Fishermen engaged in Purce Seine Fishing and Stick-held Dip Net Fishing in the West Coast of Kyushu.** **There have been many accidents in which the arm is caught in the side roller during the lifting of the net, resulting in serious injury.** (Main contents) ・ Status of occurrence of similar accidents ・ Equipment to prevent similar accidents ・ Summary (to prevent the recurrence of similar accidents) ・ Accident prevention check sheet 

Naha	**Se - ika (or Sode - ika) Voices of the Fishermen -- Linking the Voices of the Seaman and the Lessons Learned from the Research Report to Tomorrow's Safety –** (Main contents) ・ Questionnaire on squid fishing ・ Case 1 : Falling asleep while returning to the port, passing the planned site of change of course, resulted grounding. ・ Case 2 : The main engine became unable to operate, and the main engine impeded and the boat drifted. ・ Pay attention, especially when returning to port after fishing. 

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.

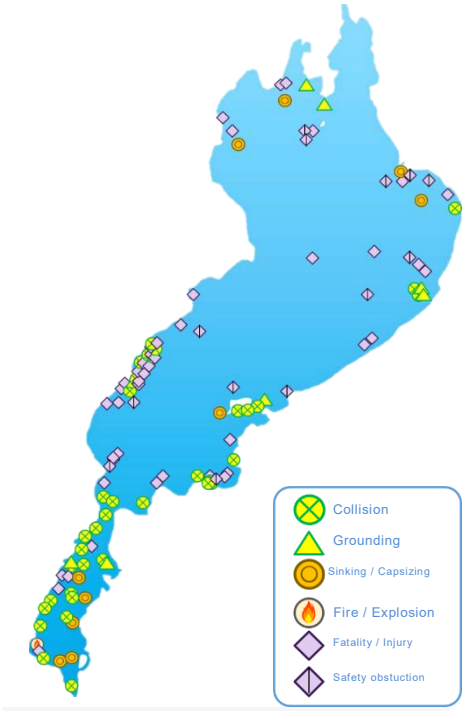
Column

Efforts to Prevent Marine Accidents in Lake Biwa

Kobe Office

The Kobe Office has jurisdiction over Lake Biwa and has conducted 143 accident investigations (191 vessels) over the past 10 years.

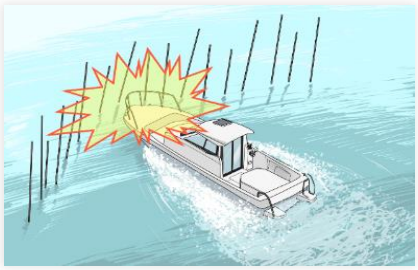
Although Lake Biwa is the largest lake in Japan, it has the largest number of marine accidents (accidents involving lakes and rivers), with more than 100 people died or injured in the past 10 years. Besides, we received a request to make statistical material because there is few statistical data on marine accidents that are specific to Lake Biwa, so we decided to make Lake Biwa Marine Accident Prevention Handbook be prepared for the purpose of preventing marine accidents in Lake Biwa.



Marine accident hazard map of Lake Biwa

The contents of the “Lake Biwa Marine Accident Prevention Handbook” are composed of statistical analysis of marine accidents that have occurred in Lake Biwa from various angles, specific examples of accidents, a marine accident hazard map of Lake Biwa, and five points of accident prevention. Statistical analysis showed that leisure related vessels (pleasure boats and personal watercraft) accounted for the majority (93%) for the total number of accidents in Lake Biwa.

Hazard map revealed the characteristics of the accident by region of Lake Biwa as follows; there were many fatal and injury accidents caused by falling into water from personal watercraft and wakeboarding in the Kosei area, and there were many collision accidents caused by pleasure boats for the purpose of bus fishing and capsizing accidents caused by misreading weather information in the Konan area.



Impact on the “Eri”

Besides, the Lake Biwa Marine Accident Prevention Handbook contains not only the contents of the investigation by the Board, but also information useful for accident prevention with the cooperation of local organizations such as the Shiga Prefectural Police. For example, it contains information such as a gust of wind "Hira - oroshi" that occurs in the Kosei region, a warning for collision accidents to the “Eri”, which is a fishing method unique to Lake Biwa, and traffic rules unique to Lake Biwa. The Lake Biwa Marine Accident Prevention Handbook has been distributed to facilities in Shiga Prefecture and marinas around Lake Biwa and is widely used. We will continue to make efforts to spread safety measures that focus on local areas.

Column Convey!! Voices of Umincyu(Fishery Workers) from Churaumi (Beautiful-sea)

Naha Office

At the Naha Office, the first collection of analyses in the Reiwa period was compiled with a focus on the actual condition of squid fishing, in which Okinawa has the largest catch volume in Japan and many Umincyu (fishery workers) are engaged.

Although the themes were decided, there were many issues, such as what kind of analysis should be done on marine accidents related to squid fishing, what is an accident analysis book that is really useful for seamen and people in Okinawa Prefecture, how to make the analysis book widely known, and when is the timely time to publish.

In order to solve these problems, we thought that it would be necessary to conduct an analysis based on the voices of the fishermen living in a harsh environment where they repeatedly slept, ate and operated on a ship far off the coast, with a new idea regardless of the past efforts. We actually went to 32 fishery cooperatives in Okinawa Prefecture to ask for their cooperation, and conducted a questionnaire to the fishermen.

Although this was the first time for us to conduct a survey, we received many comments from seamen, and it took longer than expected to complete the survey. However, we also received comments that were useful for actual survey work and were helpful for reference. Based on the comments we received from the seamen, we were able to introduce easy to understand safety measures. The survey results were published on a timely schedule, with the lifting of the ban on fishing in November.

After the release of the analysis report, we actively carried out public relations activities. In order to contribute to the prevention of accidents and the reduction of damage, we will continue to disseminate information in a timely and appropriate manner and utilize it in accident investigations.

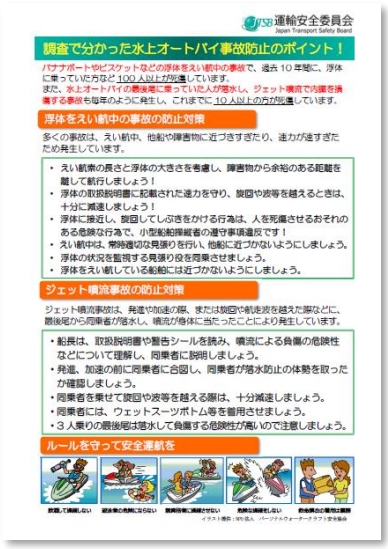
4 Issuance of the JTSB Annual Report

JTSB issued “the JTSB Annual Report 2019” in July 2019 to widely prevent accidents based on the lessons learned from accidents and so on by introducing the overall activities of the JTSB in 2018. It also looks back on the 10th anniversary of the JTSB establishment and looks ahead to the next 10 years.

As part of our efforts to provide information overseas, we issued the English version of the report “Japan Transport Safety Board Annual Report 2019” on December 2019. We did so to let people overseas know about the topics in this Annual Report.

5 Preparation of safety leaflet

When the Japan Transport Safety Board published the JTSB Digest or releases investigation reports on accidents and incidents for which measures to prevent the recurrence thereof need to be urgently implemented, it prepared single-page, A4-sized leaflets to let as many people as possible see various safety information mentioned in them. To raise attention to the prevention of accidents, the board distributed the leaflets at event venues and asked organs concerned for cooperation in distributing them.



Personal watercraft accident prevention points discovered in investigation!

For the safe operation of fishing boats
–Prevention of accidents caused by being caught in fishing net hauler–

Illuminating the laser pointer is dangerous to other ships!

6 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.

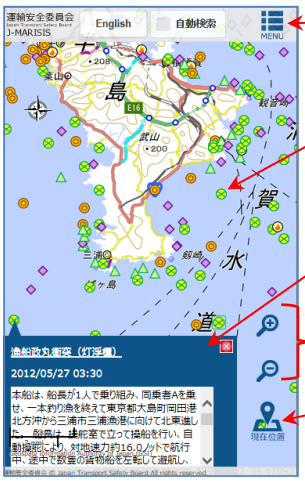
Given the increase in the number of people using the Internet on mobile terminals, as well as requests to make this system easier to use on smartphones and tablets, we released the mobile version of J-MARISIS at the end of June 2015.

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 https://jtsb.mlit.go.jp/hazardmap/mobile/index.html

Top page

Screen showing the information of current location using GPS function



Screen showing accident information

○ The service can be used free of charge, excluding the connection fee. The traffic volume of ships and fishing points will also be indicated.

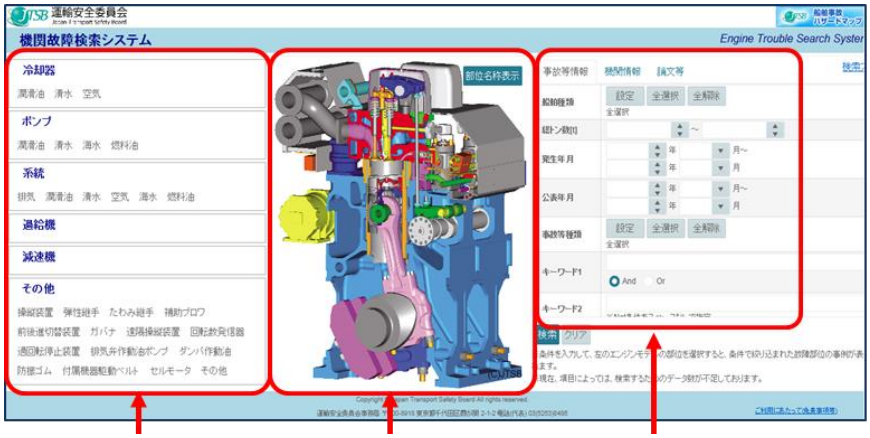
The Japan Transport Safety Board welcomes your views, requests and other comments/communication from users of J-MARISIS. Please use the "Contact us" section of our website.

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

7 Engine Trouble Search System ~ Easy Search with Click ~

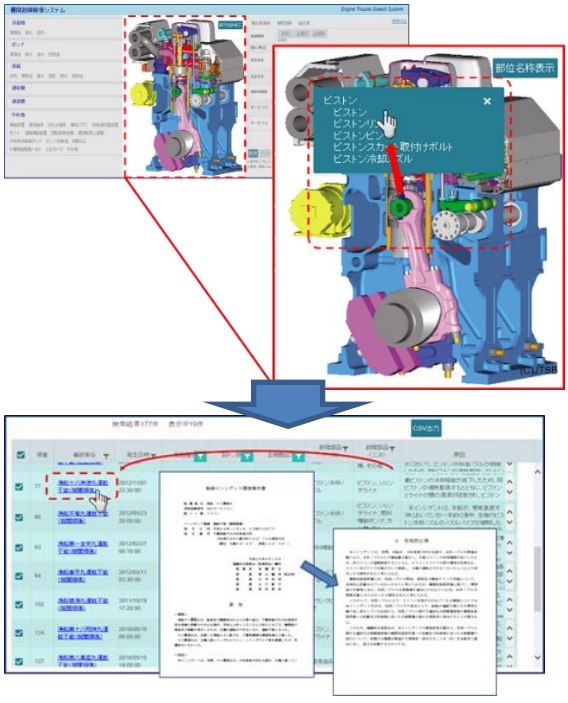
The Japan Transport Safety Board (JTSB) established the Engine Trouble Search System (ETSS) in response to requests from people involved in maritime affairs for tools that can easily search and utilize accident investigation reports from engine trouble parts. This system has been available since April 2019. ETSS is designed to search for marine accidents and incidents from engine failure parts and parts, and to use reports that are appropriate for the purpose of use. You can use ETSS free of charge other than internet communication fees.

Engine Trouble Search System https://jtsb.mlit.go.jp/hazardmap/etss/



You can look at it from the place, the appearance, or the condition.

<Usage Example>
As part of the engine was overheated, select the place (piston part) and investigate the case of trouble.



(1) When you select the piston part in the appearance view, the part related to the piston part is displayed in more detail. Select to display a list of related reports.

(2) If the number of cases is large, it can be narrowed down by ship type, gross tonnage, output, damaged parts, cause, etc. By selecting “fishing boat”, a gross tonnage of "1 - 20 tons", and an output of “400 - 500”, and refine your reasrch, the phrase “The cooling function was deteriorated, and the piston of the equipment expanded due to overheating.” was discovered.

(3) You can find and use reports that may be relevant.

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

Scene of an outreach lecture

The Japan Transport Safety Board holds a series of outreach lectures as part of its efforts to raise awareness on the work of JTSB, 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)

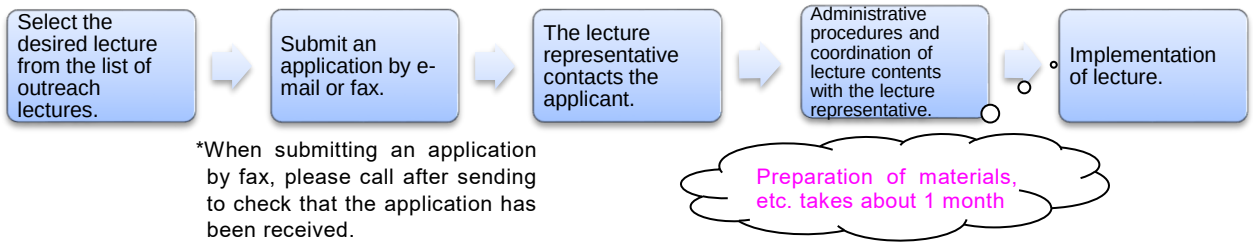
List of outreach lectures

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



9 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 2019, information on accident investigation and other matters was provided to 127 persons, including the victims, of 40 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, Gunma 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 including the “Inori no Mori (Memorial Grove), the site of the Fukuchiyama Line Accident in Amagasaki City, Hyogo Prefecture, 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

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

(Front)

(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 investigation while 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 2019.

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 Committee, and 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 Navigation meetings, a variety of working groups and panel meetings, which are called in for certain projects. As of March 2020, 193 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).

The Accident Investigation Panel (AIGP), which is a subordinate organization of the Civil Aviation Committee, is mainly a forum for discussion on the revision of Annex 13 and the preparation of guidance materials. The JTSB has participated as a member since the fourth meeting held in May 2018. At the Fifth Accident Investigation Panel Meeting (AIGP/5) held in April 2019, an administrative officer and an aircraft accident investigator participated from the JTSB. They joined in the two of working groups (WGs), "WG of Safety Recommendation of Global Concern" and the "WG of Timely Publication of Investigation Information" established under the panel, for the first time as a member. They participated in the discussion especially from the viewpoint of the State of Design and Manufacture in relation to the development of domestic passenger jet.

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/7 (Malaysia)

At the Seventh Asia - Pacific Regional Accident Investigation Group Meeting (APAC-AIG/7) held in Putrajaya, Malaysia in July 2019, two aircraft accident investigators from the JTSB participated in discussions on issues related to accident investigations, taking into account the regional characteristics of the Asia - Pacific region, and discussed measures to improve the

investigation capabilities of the region and promote cooperation among countries in the region.

(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 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 2020, IMO has 174 member states/territories and three regions as associate members.

III6

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 subsequently 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, MEPC and other IMO subcommittees. The III6 was held in July 2019. 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.

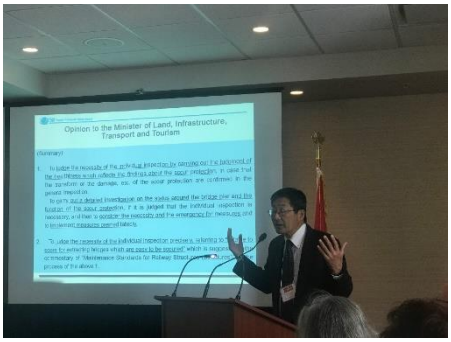
(URL: http://www.mlit.go.jp/jtsb/casualty_analysis/casualty_analysis_top.html)

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

(1) Participation in international meetings

① Chairperson 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 2020, the international organization has members from the transport accident investigation authorities of 17 countries and territories. Organizations that are permitted to join must be permanent accident investigation authorities that are independent from any regulatory authority.



ITSA 2019 Meeting of the Chairpersons (Canada)

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 chairperson 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 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.

At the conference held in Quebec City, Canada in June 2019, the Chairperson and the Board member participated from the JTSB. Chairperson Mr.Takeda gave a presentation about the efforts as a State of Design and Manufacture for the launch of domestic jet flights. Board member Mr.Okumura gave a presentation about train derailment accident caused by increased rainfall and landslides. Many comments were received from the United Kingdom, India and the other countries that these presentations were very informative.

② International Society of Air Safety Investigators and 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 authorities, 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 Japan has participated in each one of them since the establishment of Japan Aircraft Accident Investigation Commission in 1974. In this seminar, working groups including the Flight Recorder Working Group, the Investigator Training and

ISASI Annual Seminar (Netherlands)

Education Working Group, the Cabin Safety Working Group, and the Government Air Safety Investigators Group are held in parallel with the general meeting. Japan also participates in these working groups to contribute to technical improvements in these areas.

In the 2019 Annual Seminar held in the Hague, the Netherlands, with the theme “Future Safety: Has the past become irrelevant?”, JTSB’s aircraft accident investigatorsparticipated and exchanged opinions actively with those who are involved in accident investigations in other countries.

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

In AsiaSASI, JTSB currently serves as Chairperson, with Hong Kong Civil Aviation Department as Vice Chairperson, and Transport Safety Investigation Bureau of Singapore as Secretariat.

③ 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 authorities of each country hold a meeting every year. JTSB has participated in nearly all the conferences since 2006.

The 2019 meeting was hosted by the JTSB in Tokyo in September, with participation from 15 countries and regions. In this meeting, they collect and accumulate the latest information related to the analysis of flight recorders by exchanging information and opinions.

④ 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.

MAIIF28 (Italy)

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.

In the 28 th Conference held in Naples, Italy, in October 2019, JTSB's marine accident investigator participated and gave a presentation on "Cases and risks of laser pointers used to alert other vessels" from the JTSB marine accident investigation report.

⑤ 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.

MAIFA22(Malaysia)

In the 22nd Meeting held in Penang, Malaysia in November 2019, JTSB's marine accident investigators participated and gave a presentation on major marine accident investigation cases in which JTSB was involved.

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

In March 2019, while a Boeing 787-8, belonging to Jetstar Airways, was descending toward Kansai International Airport, the thrust of both engines of the twin engine aircraft dropped temporarily, JTSB conducted an investigation in cooperation with the accident investigation authorities of the United States, the state of design/manufacture, and Australia, the state of registry/the operator and New Zealand, the Relevant State. In June 2019, while a Boeing 787-8, belonging to All Nippon Airways, was flying toward Narita International Airport, two air-conditioning systems failed one after another, making it impossible to maintain cabin pressurization, JTSB conducted an investigation in cooperation with the accident investigation authority of the United States, the state of design/manufacture.

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 JTSB launched investigations in 2019, with regard to the 12 serious accidents involving ships engaged on international voyages, the accident investigation authorities of the states to which the ships were registered were notified of the accidents.

In September 2019, the cargo ship BUNGO PRINCESS registered with Panama collided with the Minamihonmoku Hama road in Kanagawa Prefecture. JTSB conducted an investigation in cooperation with the accident investigation authority of Panama, the flag state of the ship.

Among the marine accident and incident investigation reports that were published in 2019, JTSB sent seven draft reports to the flag states and other interested states upon request in order to invite their comments.

4 Technical cooperation

Since successive railway accidents occurred in India, a railway safety expert team constituted by the Japanese government, including a board member and two railway accident investigators of JTSB, was dispatched to Delhi. In the seminar held there, JTSB explained the Japanese accident investigation system and procedures based on the current state of accident investigations in Japan.

After that, according to the request from the Indian Government, "The Project for Capacity Development on Railway Safety" was launched as a technical cooperation of JICA (Japanese International Cooperation Agency). The first meeting of the project was held in Delhi in December 2018, and a board member and two railway accident investigators of JTSB attended.

A meeting was held in June 2019 in Delhi, where two railway accident investigators from the JTSB participated.

In July, 10 staff members from India, including senior officials from the Ministry of Railways and railway accident investigation organizations, visited Japan. Training on railway accident investigations was conducted in Tokyo for two weeks from July 1 to 12. (This was the first time the JTSB hold the training in Japan for railway accident investigators from overseas.)

On the last day of the training, the participants prepared an action plan for the future in their home country. In January 2020, a general meeting was held in Delhi to check the progress of the project. a Board member and two railway accident investigators participated in the meeting and provided advice on the future implementation of the project.

JTSB will actively participate in the project that is about to begin, and provide information on the railway accident investigation procedures in Japan, so as to contribute to the improvement of railway safety in India.

5 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 2019, 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.

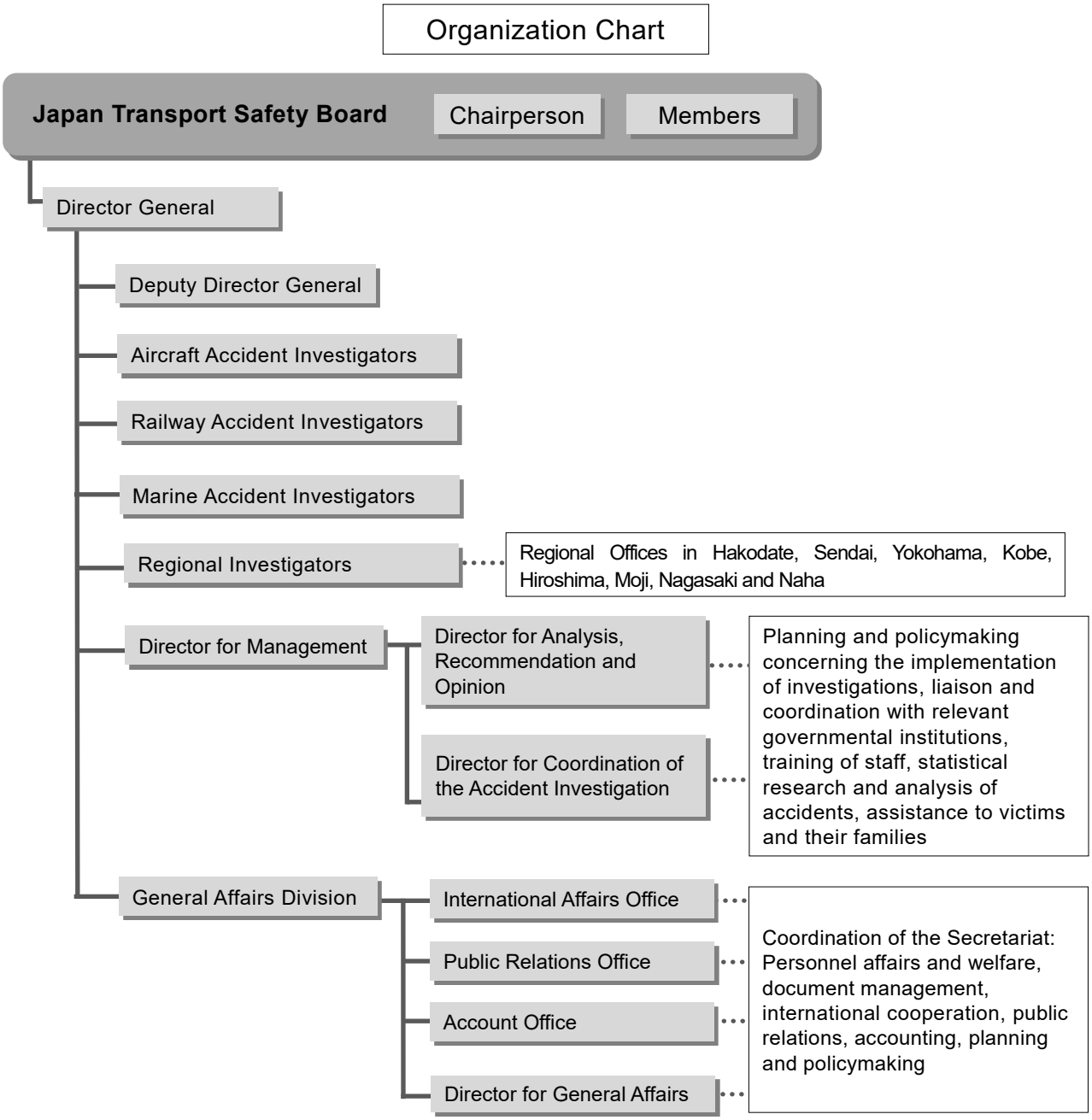
JTSB also dispatched an aircraft accident investigator to training held by a manufacturer in Canada to be familiarized with analysis software to analyze data from DFDRs in preparation for future investigations.

Appendices

Appendices

1 Outline of the organization

The Japan Transport Safety Board consists of the Chairperson, 12 members, and 179 secretariat staff (as of the end of March 2019). 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 Chairperson, and five part-time members, with its assemblies convened by the Chairperson. 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, 2020

TAKEDA Nobuo, Chairperson (Full-time), Director of Aircraft Committee

TAKEDA Nobuo was appointed as Chairperson of the Japan Transport Safety Board on April 1, 2019; belongs to the Aircraft Committee, the Railway Committee and the Marine Committee with special expertise in aerospace engineering, strength of materials and composite materials engineering.

Career summary: PhD, University of Florida and D. Engr, the University of Tokyo
Emeritus Professor, Former Vice President, the University of Tokyo
Former Technical Advisor in Structures and Advanced Composite Research Unit, Aeronautical Technology Directorate of the Japan Aerospace Exploration Agency (JAXA)

KAKISHIMA Yoshiko, Member (Full-time)

KAKISHIMA Yoshiko was appointed as a member on April 1, 2019; belongs to the Aircraft Committee, the Railway Committee and the Marine Committee, with special expertise in Anglo-American law and others.

Career summary: Graduated from the Department of Law, the University of Tokyo
LL.M., Harvard Law School
Emeritus Professor, the University of Tokyo

MIYASHITA Toru, Member (Full-time), Vice-Chairperson, Deputy Director of Aircraft Committee

MIYASHITA Toru 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

MARUI Yuichi, Member (Full-time)

MARUI Yuichi 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.

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

OKUMURA Fuminao 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

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

ISHIDA Hiroaki 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

SATO Yuji, Member (Full-time), Director of Marine Committee

SATO Yuji was appointed as a member on October 1, 2017; belongs to the Marine Committee and the Marine Special Committee, with special expertise in ship operation and maritime traffic safety.

Career summary: Graduated from Japan Coast Guard Academy
Former Commandant of Japan Coast Guard
Former President of Japan Coast Guard Foundation

TAMURA Kenkichi, Member (Full-time), Deputy Director of Marine Committee

TAMURA Kenkichi was appointed as a member on October 1, 2017; belongs to the Marine Committee and the Marine Special Committee, with special expertise in naval architect.

Career summary: Doctor of Engineering, Graduate School of Engineering, the University of Tokyo
Former Senior Director for Research of National Maritime Research Institute, National Institute of Maritime, Port and Aviation Technology

MIYAZAWA Yoshikazu, Member (Part-time)

MIYAZAWA Yoshikazu was appointed as a member on April 1, 2019; belongs to the Aircraft Committee, with special expertise in flight dynamics of aircraft, guidance and control.

Career summary: Doctor of Engineering, Graduate School of Engineering, the University of Tokyo
Emeritus Professor in Kyushu University
Contract Researcher in Electronic Navigation Research Institute

NAKANISHI Miwa, Member (Part-time)

NAKANISHI Miwa 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)

SUZUKI Mio, Member (Part-time)

SUZUKI Mio was appointed as a member on December 6, 2019; belongs to the Railway Committee, with special expertise in traffic engineering and human factors.

Career summary: Doctor of Engineering, Department of Built Environment, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology
Associate Professor in the Department of Civil Engineering, Tokai University (current post)

NIITSUMA Mihoko, Member (Part-time)

NIITSUMA Miho was appointed as a member on December 6, 2019; belongs to the Railway Committee, with special expertise in electrical engineering.

Career summary: Doctor of Engineering, Department of Electrical Engineering and Information Systems, Graduate School of Engineering, The University of Tokyo
Associate Professor in the Department of Precision Mechanics, Faculty of Science and Engineering, Chuo University (current post)

OKAMOTO Makiko, Member (Part-time)

OKAMOTO Makiko was appointed as a member on October 1, 2017; belongs to the Marine Committee and the Marine Special Committee, with special expertise in safety ergonomics.

Career Summary: Doctor of Human Sciences, Graduate School of Human Sciences, Waseda University
Lawyer
Associate Professor in the Faculty of Societal Safety Science, Kansai University (current post)

The chairperson 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.

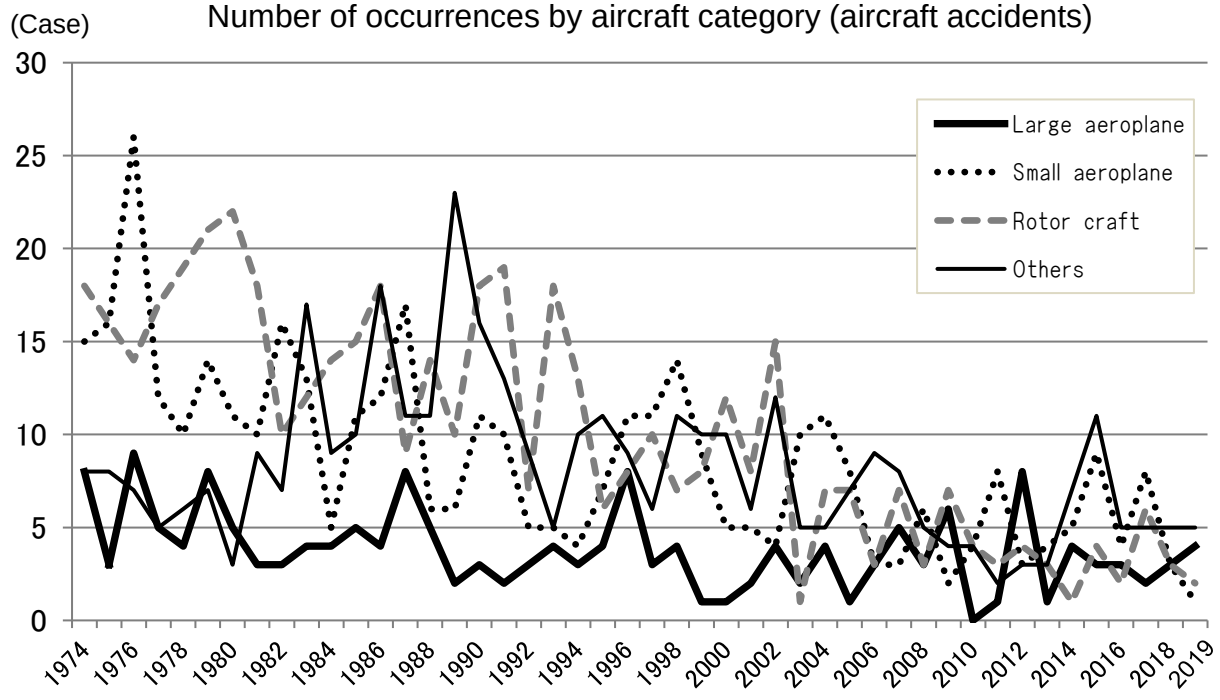
4 Number of occurrences by aircraft category (aircraft accidents)

(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	3	4	1	2	0	4	0	14
2017	2	8	3	5	1	2	0	21
2018	3	3	4	3	0	1	0	14
2019	4	1	2	2	0	3	0	12
Total	175	393	171	438	25	207	2	1,411

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents 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. Ultralight planes include self-made, ultralight plane-shaped aircraft.
5. Gyroplanes include self-made, gyroplane-shaped aircraft.



5 Number of fatalities in accidents (aircraft accidents)

(Persons)

Year of occurrence \ Category		Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane	Glider	Total	
2008	Crew	0	1	1	2	0	1	5	5
	Passengers and others	0	0	0	0	0	0	0	
2009	Crew	2	0	2	5	0	0	9	9
	Passengers and others	0	0	0	0	0	0	0	
2010	Crew	0	2	1	14	0	0	17	17
	Passengers and others	0	0	0	0	0	0	0	
2011	Crew	0	5	0	1	0	0	6	6
	Passengers and others	0	0	0	0	0	0	0	
2012	Crew	0	0	0	0	0	0	0	1
	Passengers and others	0	1	0	0	0	0	1	
2013	Crew	0	0	0	0	0	1	1	2
	Passengers and others	0	0	0	0	0	1	1	
2014	Crew	0	1	0	0	0	0	1	2
	Passengers and others	0	1	0	0	0	0	1	
2015	Crew	0	1	1	2	0	1	5	10
	Passengers and others	0	2	1	2	0	0	5	
2016	Crew	0	1	0	0	0	3	4	8
	Passengers and others	0	3	0	0	0	1	4	
2017	Crew	0	2	0	2	1	1	6	22
	Passengers and others	0	4	0	12	0	0	16	
2018	Crew	0	0	2	1	0	0	3	11
	Passengers and others	0	0	0	8	0	0	8	
2019	Crew	0	0	1	0	0	0	1	1
	Passengers and others	0	0	0	0	0	0	0	
	Crew	2	13	8	27	1	7	58	94
	Passengers and others	0	11	1	22	0	2	36	
	Total	2	24	9	49	1	9		

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission in 2008
2. Death tolls represent data for the respective years of occurrence relisted from the annual reports published for those years.
3. Large aeroplanes are aircraft with a maximum take-off weight of more than 5,700kg.
4. Small aeroplanes are aircraft with a maximum take-off weight of 5,700kg or less, excluding Ultralight

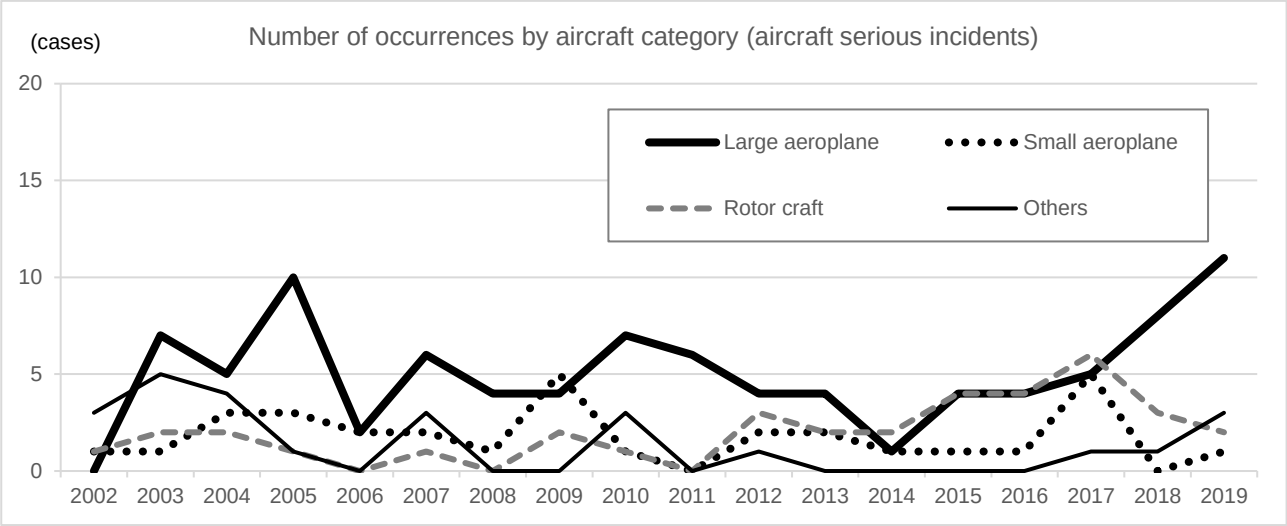
planes.
5. Ultralight planes include self-made, ultralight plane-shaped aircraft.
6. Gyroplanes include self-made, gyroplane-shaped aircraft.

6 Number of occurrences 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	4	2	0	3	0	1	0	10
2013	4	2	0	2	0	0	0	8
2014	1	1	0	2	0	0	0	4
2015	4	1	0	4	0	0	0	9
2016	4	1	0	4	0	0	0	9
2017	5	5	0	6	0	1	0	17
2018	8	0	0	3	0	1	0	12
2019	11	1	0	2	0	3	0	17
Total	95	32	16	36	0	9	0	188

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission. The number of cases for 2001 represents those that occurred from October onward.
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. Ultralight planes include self-made, ultralight plane-shaped aircraft.



7 Number of occurrences by type (railway accidents)

(Cases)

Year of occurrence \ Type	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
2017	0	9	0	7	0	2	1	0	0	0	0	0	0	0	19
2018	0	2	0	9	0	0	0	0	0	0	0	0	0	0	11
2019	0	9	0	7	0	1	0	0	0	0	0	0	0	0	17

Total	7	196	13	59	0	15	3	1	9	0	0	3	0	0	306

(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 fatalities in accidents (railway accidents)

(Persons)

Death Classification / Year of occurrence	crew members	Passengers	Others	Total
2008	0	0	2	2
2009	0	0	3	3
2010	0	0	2	2
2011	0	0	1	1
2012	0	0	1	1
2013	0	0	1	1
2014	0	0	6	6
2015	0	2	4	6
2016	0	0	15	15
2017	0	0	10	10
2018	0	0	9	9
2019	0	0	8	8
Total	0	2	62	64

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accident Investigation Commission in 2008
2. Dealt tolls represent data for the respective years of occurrence relisted from the annual reports published for those years.
3. As investigations began to cover fatal accidents at third- and fourth-class crossings without crossing gates in April 2014, the number of deaths occurring in those locations were added.

9 Number of occurrences by type (railway serious incidents)

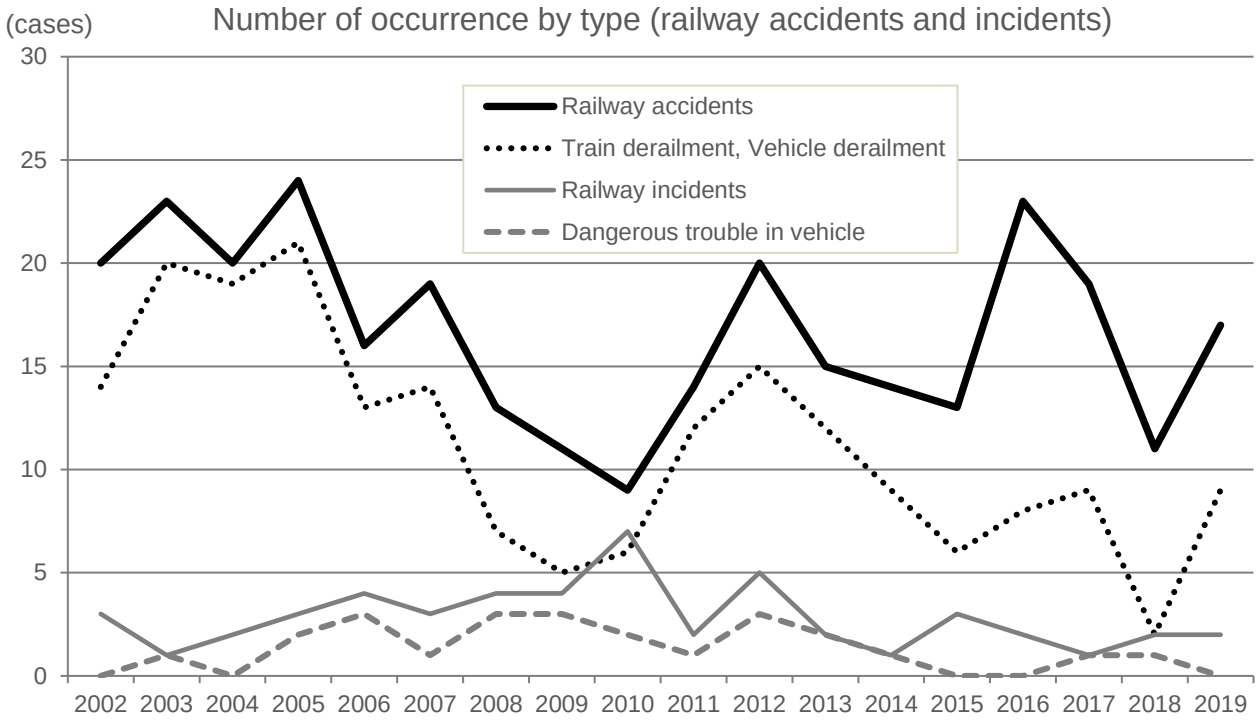
(Cases)

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

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	
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
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
2017	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2018	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
2019	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
Total	1	7	0	0	7	2	3	25	0	3	3	1	0	0	0	0	0	52

(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.



10 Number of occurrences by area (marine accidents and incidents)

(Cases)

Area / Year	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	673	44	39	910
2016	147	636	43	23	849
2017	155	671	35	47	907
2018	194	731	38	47	1,010
2019	210	707	54	32	1,003
Total	2,609	9,077	426	652	12,764

(Note) The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2020 (including those carried over from the former Marine

Accident Inquiry Agency).

11 Number of occurrences by type (marine accidents and incidents)

(Cases)

Type / Year	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	265	12	18	56	32	1	23	142	1	103	10	1	35	1,126
2012	246	133	264	5	21	55	44	2	33	155	0	113	5	4	35	1,115
2013	264	145	210	10	25	49	33	2	38	163	2	106	7	3	25	1,082
2014	265	116	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	122	1	85	4	4	12	910
2016	217	94	163	5	19	46	26	3	21	144	0	85	6	6	14	849
2017	200	96	181	14	22	55	27	3	23	144	0	115	4	3	20	907
2018	253	90	182	22	26	57	25	2	29	182	0	119	10	0	13	1,010
2019	215	89	197	12	25	61	31	1	24	142	0	172	15	0	19	1,003
Total	3,048	1,466	2,934	135	220	632	383	26	342	1,768	9	1,232	159	29	381	12,764

(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 2020 (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.

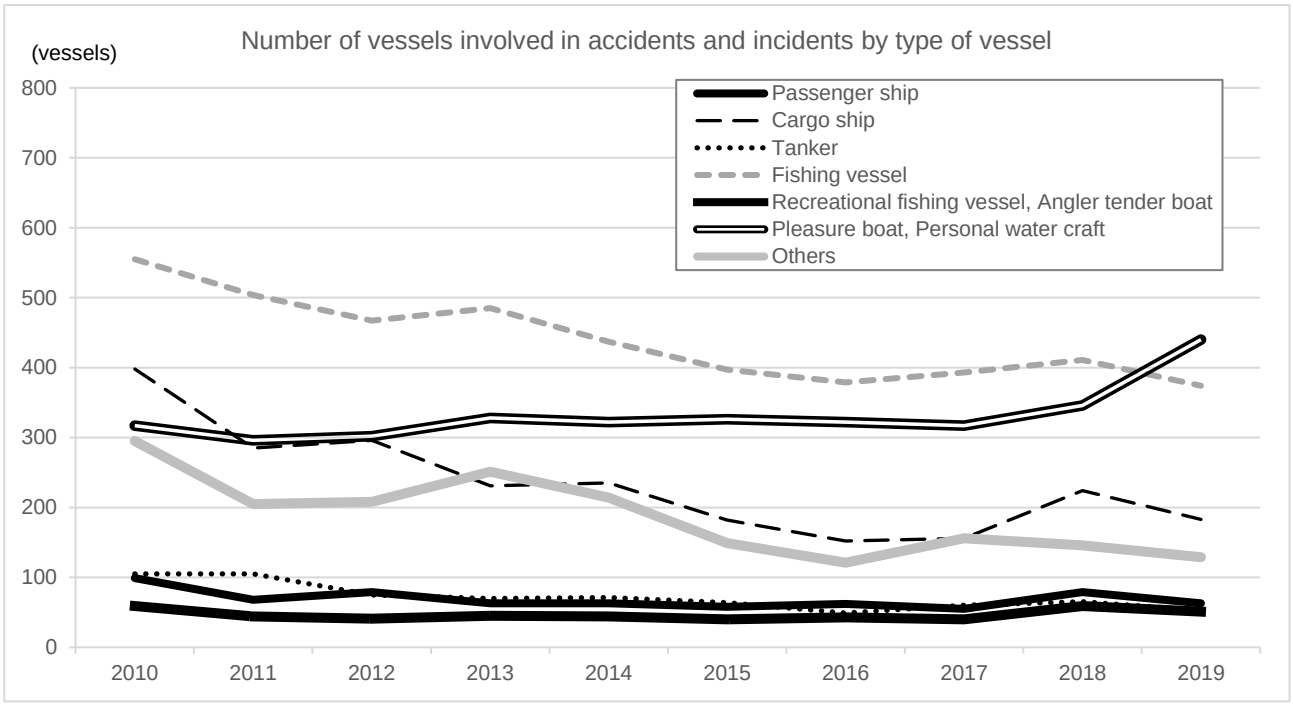
12 Number of vessels involved in accidents and incidents by type of vessel (marine accidents and incidents)

(Cases)

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	5	35	104	40	249	65	23	1,994

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
2010	99	398	105	555	123	53	6	48	82	24	251	66	18	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	63	231	70	485	100	41	4	37	72	24	264	64	18	1,473
2014	63	235	71	437	89	39	5	36	58	17	253	69	14	1,386
2015	58	182	64	397	53	33	7	27	45	14	278	48	10	1,216
2016	62	152	49	379	45	36	7	27	33	11	254	68	5	1,128
2017	55	156	60	393	62	37	3	29	45	12	275	42	8	1,177
2018	79	224	65	411	55	51	8	22	37	14	286	60	18	1,330
2019	63	183	53	374	48	45	6	24	33	11	395	45	13	1,293
Total	849	3,141	855	5,314	1,016	473	71	377	678	208	3,127	659	163	16,931

(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 2020 (including those carried over from the former Marine Accident Inquiry Agency).



13 Number of vessels involved in accidents and incidents by gross tonnage (marine accidents and incidents)

(Vessels)

Year \ Gross tonnage	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	839	46	86	145	87	38	26	29	17	17	56	1,386
2015	762	43	66	112	65	32	18	27	22	19	50	1,216
2016	745	31	64	104	61	23	17	21	18	10	34	1,128
2017	757	39	80	116	69	24	14	22	17	6	33	1,177
2018	840	35	83	127	83	48	31	18	17	12	36	1,330
2019	862	27	40	117	59	26	20	34	10	14	84	1,293
Total	9,588	604	1,350	2,021	1,017	412	283	362	231	185	878	16,931

(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 2020 (including those carried over from the former Marine Accident Inquiry Agency).

14 Number of vessels involved in accidents and incidents in 2019 by type of accident/incident and type of vessel (marine accidents and incidents)

(Vessels)

Type of vessel \ Type of accident/ incident	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	13	14	7	1	0	0	1	0	1	16	0	1	0	0	9	63
Cargo ship	85	22	36	1	0	0	3	0	3	11	0	11	8	0	3	183
Tanker	27	8	10	0	1	0	0	0	0	2	0	4	1	0	0	53
Fishing vessel	140	27	32	6	6	36	18	1	5	79	0	24	0	0	0	374
Tug boat, push boat	15	4	17	0	0	3	2	0	3	3	1	0	0	0	0	48
Recreational fishing vessel	20	5	7	0	2	1	0	0	0	1	0	9	0	0	0	45
Angler tender boat	0	1	2	0	0	0	1	0	0	1	0	1	0	0	0	6
Work vessel	6	2	10	0	0	3	0	0	1	1	0	1	0	0	0	24
Barge, Lighter	10	3	9	1	0	2	2	0	1	4	1	0	0	0	0	33

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	
Public-service ship	3	1	2	0	0	0	3	0	0	2	0	0	0	0	0	11
Pleasure boat	93	17	79	6	16	22	4	0	12	19	0	116	7	0	4	395
Personal water craft	21	0	0	0	0	0	0	0	0	20	0	4	0	0	0	45
Others	2	0	1	0	1	3	1	0	0	3	0	2	0	0	0	13
Total	435	104	212	15	26	70	35	1	26	162	2	173	16	0	16	1,293

(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 2020.
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.

15 Number of fatalities in accidents (marine accidents)

(Persons)

Year of occurrence / Type of Vessel		Passenger ship	Cargo ship	Tanker	Cargo ship	Recreational fishing vessel・Angler tender boat	Pleasure boat・Personal water craft	Others	Total	
2008	Crew	0	2	2	51	1	21	1	61	71
	Passengers	0	0	0	0	2	0	0	2	
	Others	0	0	0	0	1	6	1	8	
2009	Crew	3	1	2	109	0	26	4	145	191
	Passengers	0	0	0	0	3	0	0	3	
	Others	1	5	0	6	0	27	4	43	
2010	Crew	1	10	1	74	0	11	2	99	129
	Passengers	0	0	0	0	1	0	0	1	
	Others	0	3	0	1	1	22	2	29	
2011	Crew	3	4	8	83	3	18	7	126	146
	Passengers	4	0	0	0	2	0	0	6	
	Others	0	2	0	0	0	12	0	14	
2012	Crew	2	6	4	79	1	22	3	117	133
	Passengers	1	0	0	0	2	0	0	3	
	Others	1	1	0	1	0	8	2	13	
2013	Crew	0	17	2	69	0	19	7	114	134
	Passengers	0	0	0	0	1	0	0	1	
	Others	0	2	0	0	0	16	1	19	

Year of occurrence \ Type of Vessel		Passenger ship	Cargo ship	Tanker	Cargo ship	Recreational fishing vessel・Angler tender boat	Pleasure boat・Personal water craft	Others	Total	
2014	Crew	0	11	3	89	0	17	3	123	138
	Passengers	0	0	0	0	2	0	0	2	
	Others	0	1	1	1	0	10	0	13	
2015	Crew	3	5	0	44	0	12	5	69	87
	Passengers	2	0	0	0	2	0	0	4	
	Others	0	0	0	0	0	13	1	14	
2016	Crew	1	4	5	45	1	10	4	70	93
	Passengers	0	0	0	0	2	0	0	2	
	Others	0	2	0	2	0	15	2	21	
2017	Crew	2	4	0	46	0	7	20	79	93
	Passengers	0	0	0	0	0	0	0	0	
	Others	0	0	0	0	0	12	2	14	
2018	Crew	0	2	1	48	0	10	2	63	88
	Passengers	0	0	0	0	1	0	0	1	
	Others	1	0	0	1	0	18	4	23	
2019	Crew	0	15	0	55	1	11	1	83	98
	Passengers	0	0	0	0	1	0	0	1	
	Others	0	3	0	1	0	9	1	15	
Total	Crew	15	81	27	792	7	168	59	1,149	1,401
	Passengers	7	0	0	0	19	0	0	26	
	Others	3	19	1	13	2	168	20	226	
	Total	25	100	28	805	28	336	79		

(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 2020 (including those carried over from the former Marine Accident Inquiry Agency).

Japan Transport Safety Board Annual Report 2020

Issue in July, 2020

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Japan Transport Safety Board

ANNUAL REPORT

2020